Aviation Investigation Final Report

Location:	Frederick, Maryland	**Accident Number:**	ERA15FA025
Date & Time:	October 23, 2014, 15:37 Local	**Registration:**	N122ES
Aircraft:	CIRRUS DESIGN CORP SR22	**Aircraft Damage:**	Substantial
Defining Event:	Midair collision	**Injuries:**	1 Minor, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private airplane pilot was conducting a personal cross-country flight, and the commercial helicopter pilot and flight instructor were conducting a local instructional flight. A review of radar and voice communications revealed that the accident airplane pilot first contacted the nonradar-equipped tower when the airplane was 10 miles from the airport and that the local controller (LC) then acknowledged the pilot's transmission and instructed him to contact the tower when he was 3 miles from the airport. At this time, the LC was also handling two helicopters in the traffic pattern, one airplane conducting practice instrument approaches to a runway that intersected the runway assigned to the accident airplane, another airplane inbound from the southeast, and a business jet with its instrument flight rules (IFR) clearance on request. About 1 minute after the accident airplane pilot first contacted the LC, the LC began handling the accident helicopter and cleared it for takeoff. One minute later, the controller issued the business jet pilot an IFR clearance. When the accident airplane was 3 miles from the airport, the pilot reported the airplane's position to the controller, but the controller missed the call because she was preoccupied with the clearance read-back from the business jet pilot. About 1 minute later, the controller instructed the accident airplane pilot to enter the left downwind leg of the traffic pattern on a 45-degree angle and issued a landing clearance. She advised that there were three helicopters "below" the airplane in the traffic pattern, and the pilot replied that he had two of the helicopters in sight.

Data downloaded from the airplane and witnesses on the ground and in the air indicated that, as the airplane entered the downwind leg of the traffic pattern, it flew through the accident helicopter's rotor system at the approximate point where the helicopter would have turned left from the crosswind to the downwind leg. Because of a specific advisory transmitted on the tower radio frequency advising of traffic on the downwind, the pilot of each accident aircraft was or should have been aware of the other. A witness in the helicopter directly behind the accident helicopter had a similar field of view as the accident helicopter, and he reported that he acquired both accident aircraft in his scan before the collision. Given this statement and that the accident helicopter had two commercial pilots in the cockpit, the pilots should have had the situational awareness to understand the conflict potential based on the airplane's position reports. Although the airplane was equipped with a traffic advisory system, its

capabilities could have been limited by antenna/airframe obstruction or an inhibition of the audio alert by the airplane's flap position.

The airplane's data indicated that the collision occurred at an altitude of about 1,100 ft mean sea level (msl). The published traffic pattern altitude (TPA) for light airplanes was 1,300 ft msl. Although several different helicopter TPAs were depicted in locally produced pamphlets and posters and reportedly discussed at various airport meetings, there was no published TPA for helicopters in the airport/facility directory or in the tower's standard operating procedures. According to the Federal Aviation Administration's Aeronautical Information Manual, in the absence of a published TPA, the TPA for helicopters was 500 ft above ground level; therefore, the appropriate TPA for helicopters at the accident airport was about 800 ft msl. The lack of an official helicopter TPA, which was published after the accident, significantly reduced the potential for positive traffic conflict resolution.

Review of the airport procedures, tower capabilities, and the controller's actions revealed no specific departure from proper procedures. Because the tower was not equipped with radar equipment, all of the sequencing and obtaining of traffic information had to be done visually. This would have been especially difficult at the accident airport due to the local terrain and tree lines that extend above the pattern altitudes from the tower controllers' view, which can cause aircraft to easily blend in with the background. Further, the controller spent a lengthy amount of time on the task of issuing the IFR clearance to the business jet while handling multiple aircraft in the traffic pattern. It is likely that the lack of radar equipment in the tower and the controller's inadequate task management also significantly reduced the potential for positive traffic conflict resolution.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the helicopter pilots and the airplane pilot to maintain an adequate visual lookout for known traffic in the traffic pattern, which resulted in a midair collision. Contributing to the accident were the airplane pilot's descent below the published airplane traffic pattern altitude (TPA) and the helicopter pilot's climb above the proper helicopter TPA as prescribed in the Federal Aviation Administration's Aeronautical Information Manual for airports without published helicopter TPAs. Also contributing to the accident were the lack of a published helicopter TPA, the absence of radar equipment in the tower, and the controller's inadequate task prioritization.

Findings

Organizational issues	Availability of policy/proc - Not specified
Environmental issues	Approach/departure - Availability of related info
Personnel issues	Task allocation - ATC personnel
Personnel issues	Incorrect action performance - Pilot of other aircraft
Personnel issues	Incorrect action performance - Pilot
Personnel issues	Monitoring other aircraft - Pilot
Personnel issues	Monitoring other aircraft - Pilot of other aircraft

Factual Information

History of Flight

Approach-VFR pattern base	Midair collision (Defining event)

HISTORY OF FLIGHT

This report was modified on 6/2/2016. Please refer to the public docket for this accident to view the original report.

On October 23, 2014, about 1537 eastern daylight time, a Cirrus SR22 airplane, N122ES, operated by a private individual, and a Robinson R44 II helicopter, N7518Q, operated by Advanced Helicopter Concepts, collided in midair approximately 1 mile southwest of the Frederick Municipal Airport (FDK), Frederick, Maryland. The airplane departed controlled flight after the collision, the ballistic parachute system was deployed, and the airplane landed nose-down in a thicket of low trees and brush. The helicopter also departed controlled flight, descended vertically, and was destroyed by impact forces at ground contact. The private pilot on board the airplane was not injured, and his passenger sustained a minor injury. The flight instructor, commercial pilot, and a passenger in the helicopter were fatally injured. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed for the airplane, which departed Cleveland, Tennessee, on a personal flight about 1247. No flight plan was filed for the helicopter, which departed FDK on an instructional flight about 1535. The flights were conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91.

Witnesses on the ground watched the aircraft approach each other at the same altitude and saw the collision. One witness said the helicopter appeared to be in a stationary hover as the airplane closed on it and the two collided. She said neither aircraft changed altitude as they approached each other.

A flight instructor for the helicopter operator in a company Robinson R22 helicopter followed the accident helicopter in the traffic pattern for landing abeam runway 30 in the infield sod at FDK. He said his helicopter had just completed the turn onto the crosswind leg of the traffic pattern when the accident helicopter came into his view to his front at about the point where it would turn to the downwind leg of the pattern. At the same time, the airplane appeared in his field of view as it "flew through the rotor system" of the helicopter.

Radar and voice communication information from the Federal Aviation Administration (FAA), as well as interviews conducted with air traffic controllers, revealed the following:

At 1534:10, the accident airplane first contacted the FDK tower and was about 10 miles west of the field at 3,000 feet. The local controller (LC) acknowledged the pilot's transmission and instructed him to report 3 miles west for a left downwind to runway 30. At 1534:31, the pilot of the accident airplane acknowledged and read back the controller's instructions.

At the time the accident airplane contacted the LC, other traffic being handled by the tower included two helicopters (two company helicopters N2342U and N444PH) in the VFR traffic pattern, one airplane conducting practice instrument approaches to runway 23, another airplane inbound from the southeast, and a business jet (N612JD) with its IFR clearance on request.

At 1535:02, the LC then cleared the accident helicopter for take-off from alpha taxiway as requested and issued the current winds, and the call was acknowledged.

At 1536:02, the LC contacted the pilot of N612JD and advised she was ready to issue the airplane's instrument clearance. From 1536:06 to 1536:49 (43 seconds), the controller issued the clearance.

At 1536:49, the pilot of N612JD read back his clearance as required. Also at 1536:49, during the read back from N612JD, the pilot of the accident airplane reported on local frequency that he was 3 miles out on a 45-degree entry for runway 30, which the LC did not hear because she was listening to the read back from N612JD on ground control frequency.

At 1537:09, the LC transmitted to helicopter N444PH, "…four papa hotel option to the grass at your own risk use caution and on uh next go around stay at a thousand feet. I have traffic in the downwind."

At 1537:22, the LC instructed the accident airplane to report midfield left downwind for runway 30 and said "I have three helicopters below ya in the uh traffic pattern". At 1537:30, the pilot of the accident airplane acknowledged the request to report midfield downwind and stated he had two of the helicopters in sight. Immediately after that transmission, at 1537:34, the LC said "Alright uh two echo sierra, I have ya in sight runway three zero, maintain your altitude to…until turning base, cleared to land."

At 1537:41, cries were heard over the local frequency, and, at 1537:49, the pilot of a helicopter in the traffic pattern reported that an airplane and helicopter were both "down."

The pilot of the accident airplane was interviewed and provided written statements. His recollection of the flight was consistent with voice, radar, and aircraft data. The pilot stated that as he descended and slowed for the traffic pattern entry, he set the flaps to 50 percent.

The pilot stated that, about the time the airplane entered the downwind leg of the traffic pattern, the tower controller issued a landing clearance, and, "out of nowhere…I saw a helicopter below me and to the left…" The pilot initiated an evasive maneuver, but he "heard a thump," and the airplane rolled right and nosed down. The pilot deployed the ballistic recovery system, and the airplane's descent was controlled by the parachute to ground contact.

PERSONNEL INFORMATION

The airplane pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent FAA second-class medical certificate was issued April 31, 2014. He reported 959 total hours of flight experience, of which 804 hours were in the accident airplane make and model.

The flight instructor on board the helicopter held commercial pilot and flight instructor certificates with ratings for rotorcraft-helicopter and instrument helicopter. His most recent FAA second-class medical

certificate was issued April 31, 2014. Examination of his logbook revealed 832 total hours of flight experience, of which 116 hours were in the accident helicopter make and model.

The helicopter pilot held commercial pilot and flight instructor certificates with ratings for airplane single-engine land, multiengine land, rotorcraft-helicopter and instrument helicopter. His most recent FAA second-class medical certificate was issued April 29, 2013, and he reported 2,850 total hours of flight experience on that date. Excerpts of a pilot logbook for his helicopter time revealed 1,538 total hours of helicopter experience. A review of records revealed that he stopped flying as a helicopter tour pilot in 1994. During the years following, he logged five or fewer helicopter flights per year. Between 2004 and 2011, he logged one flight per year, none in 2011, and one in 2012. In 2014, he logged two flights in September, and two in October prior to the accident flight.

AIRCRAFT INFORMATION

According to FAA records, the airplane was manufactured in 2006. Its most recent annual inspection was completed June 13, 2014, at 1,289.8 total aircraft hours.

The helicopter was manufactured in 2004. Its most recent 100-hour inspection was completed October 2, 2014, at 1,758 total aircraft hours.

METEOROLOGICAL INFORMATION

The 1553 weather observation at FDK included scattered clouds at 4,800 feet, 10 miles visibility, and wind from 330 degrees at 16 knots gusting to 21 knots.

The was 26 degrees above the horizon, and the sun angle was from 225 degrees.

AIR TRAFFIC CONTROL

The air traffic control (ATC) group was formed on October 23, 2014. The group consisted of the group chairman from operational factors and a representative from the FAA compliance services group.

The group reviewed radar data provided by the FAA from Potomac TRACON (PCT), ATC voice recordings, controller training and qualification records, facility logs, standard operating procedures (SOP), letters of agreement (LOA), controller work schedules, and other related documentation. Additionally, the group conducted interviews with the LC who provided services at the time of the accident and the off-duty controller who witnessed the accident and assisted with initial notifications and the after-action response. Tenant operators on the airport were interviewed, including the operator of the accident helicopter. The group also held discussions with the air traffic manager (ATM) at FDK.

When asked what the traffic pattern altitudes (TPAs) were at FDK, both controllers, as well as the ATM, stated that the altitudes were 900 feet mean sea level (msl) for helicopters, 1,300 feet msl for small fixed-wing airplanes, and 1,800 feet msl for large fixed-wing airplanes and twins. When asked the origin of these TPAs and where they were published, the LC stated that they were published in the SOP and airport/facility directory (AFD). The witnessing controller thought the helicopter TPA was published in the local noise abatement procedures, but not in the AFD, but that the fixed-wing TPAs were in both. The ATM stated that only the fixed-wing TPAs were published in the AFD and that the helicopter TPA had been inadvertently left out without them realizing. The ATM stated that helicopter TPA was agreed

upon during meetings with tower personnel, airport management, and airport tenants prior to the tower's commissioning. The facility was unable to produce any documentation that these meetings were ever held, and they were also unable to produce any documentation of the 900-foot msl helicopter TPA they had mentioned. The only documentation that was found was from old, locally produced noise abatement procedures.

According to FAA Order 7210.3Y, minutes of the meeting were to be taken and distributed to "the appropriate Service Area" office and to each attendee. These minutes were neither recorded nor distributed.

In an interview, the helicopter operator was asked for a copy of his flight school's SOP. He stated there was none. The policies and procedures were made by him, and distributed by word of mouth in periodic meetings. During an initial discussion, the operator stated that the helicopter TPA was between 900 and 1,000 feet msl, and 1,200 feet msl for autorotations. When asked how he decided upon the TPA of 900 feet msl for his pilots and students. He said, "It just kind of morphed into that. The airplanes are at 1,300 feet msl, and we thought we should be below that. They never published that in the AFD, and I wish they would."

According to the chief pilot for the helicopter operator, a 14 CFR Part 141 application would soon be submitted and an SOP would be published concurrent with the application.

AERODROME INFORMATION

FDK was at an elevation of 306 feet and was tower controlled. The tower was an FAA contract tower and was not radar-equipped.

Runway 5/23 was 5,219 feet long and 100 feet wide, and was located along the east side of the field. Runway 12/30 was 3,600 feet long, 75 feet wide, and located on the north side of the field. The two runways intersected at the approach end of runways 23 and 30.

The published TPA in the AFD for single-engine and light-twin airplanes was 1,300 feet msl, and 1,800 feet msl for heavy multiengine and jet airplanes. The traffic pattern was a standard left-hand pattern.

There was no published traffic pattern or TPA for helicopters in the AFD at the time of the accident. According to the FAA's Aeronautical Information Manual (AIM), in the absence of a published TPA for helicopters, the helicopter TPA was 500 feet agl, or about 800 feet msl at FDK.
A pamphlet produced by the City of Frederick, Maryland, depicted the airport traffic patterns and identified the helicopter TPA as 1,100 feet msl.

A poster of the pamphlet's depiction was posted around the airport, and it also identified the helicopter TPA as 1,100 feet msl.

The SOP for the contract operator of the tower had no TPAs published. However, when interviewed, the LC on duty at the time of the accident stated the TPA for helicopters was 900 feet per the SOP.

As a result of the investigation, the AFD was updated on January 8, 2015, with a recommended TPA for helicopters of 1,106 ft msl/800 feet agl.

Radar Data

Radar data for the flights was obtained by the FAA from several radar sites in the area surrounding FDK. Radar data recorded the flight track of the accident airplane until seconds before the accident; however, no data were recorded for the accident helicopter.

At the time of the accident, the floor of the Potomac TRACON radar coverage in the area surrounding FDK appeared to be about 1,200 feet msl. The helicopter never climbed into radar coverage, and the collision between the helicopter and the airplane occurred below the area of radar coverage.

WRECKAGE AND IMPACT INFORMATION

The helicopter wreckage and its associated debris came to rest in a self-storage complex between two buildings, with parts and debris scattered in and around the complex. All major components were accounted for at the scene. The main wreckage came to rest largely upright, and the cockpit, cabin area, fuselage, tailboom, engine, transmission, with main and tail rotors attached. All components were significantly damaged and deformed by impact forces. The "blue" main rotor blade was fractured near its root, and the outboard 11 feet of main rotor spar was located 50 feet from the main wreckage with no honeycomb or blade skin afterbody material attached.

Control continuity could not be established due to numerous fractures in the system, but all fractures exhibited features consistent with overload.

The airplane came to rest nose down, in a dense thicket of brush and low trees, wedged between tree trunks, and held in that position. All major components were accounted for at the scene, except for the right wing flap, aileron, and right landing gear wheel and tire assembly which were located between the helicopter and airplane sites. Examination of the airplane revealed that the trailing edge of the right wing was impact-damaged, and that the flap and aileron hinges were significantly damaged and twisted, and the surrounding sheet metal displayed "saw-tooth" fractures, consistent with overload.

Examination of the cockpit revealed the flap switch handle was in the "50 percent" position; however, the flaps and the flap actuator were positioned consistent with a flaps-up position. Because power was applied to all systems throughout the flight and after ground contact, the flap position could not be determined prior to the collision.

MEDICAL AND PATHOLOGICAL INFORMATION

The Office the Chief Medical Examiner for the State of Maryland performed autopsies on the helicopter flight instructor and helicopter pilot. The autopsy reports listed the cause of death for each as "blunt impact injuries."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological testing of the helicopter flight instructor and helicopter pilot. The tests for each were negative for the presence of carbon monoxide, cyanide, and ethanol.

TESTS AND RESEARCH

Avidyne Primary Flight Display (PFD) Description

The PFD unit from the accident airplane included a solid state Air Data and Attitude Heading Reference System (ADAHRS) and displayed aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading. The PFD unit had external pitot/static inputs for altitude, airspeed, and vertical speed information. Each PFD contained two flash memory devices mounted on a riser card. The flash memory stored information the PFD unit used to generate the various PFD displays. Additionally, the PFD had a data logging function, which was used by the manufacturer for maintenance and diagnostics. Maintenance and diagnostic information recording consisted of system information, event data and flight data.

The PFD sampled and stored several data streams in a sequential fashion; when the recording limit of the PFD was reached, the oldest record was dropped and a new record was added. Data from the Attitude/Heading Reference System (AHRS) was recorded at a rate of 5 Hz. Air data information such as pressure altitude, indicated airspeed, and vertical speed was recorded at 1 Hz. GPS and navigation display and setting data were recorded at a rate of 0.25 Hz, and information about pilot settings of heading, altitude, and vertical speed references were recorded when changes were made.

According to the data, at 15:34:30, about 9 miles from the airport, the airplane initiated a descent out of 3,000 feet msl. The descent rate varied between 500-1000 fpm. The descent stopped at 1,600 feet pressure altitude (1,582 feet indicated) for about 10 seconds, at 15:36:40. The airplane then continued its descent at an approximate rate of 700 fpm.

As the descent continued, the airplane entered a right bank of about 15 degrees about 1.5 miles from the airport. While descending and turning right, pitch, vertical, longitudinal, and lateral acceleration experienced a loading event simultaneously at 15:37:36.

When this occurred, the aircraft was 0.75 miles from the field at 1,045 feet pressure altitude (1,027 feet indicated) and 100 kts indicated airspeed. Following the loading, the aircraft rolled a full 360 degrees to the right, pitch recorded extremes of 21 degrees nose- up to 80 degrees nose-down, and heading spun nearly 720 degrees to the right.

Following the loading, altitude was maintained for about 3 seconds before dropping at a maximum recorded rate of 5,470 fpm. The aircraft came to rest at 15:37:52 at 330 feet pressure altitude in a 75-degrees nose-down attitude with the wings rolled 46 degrees to the left. The recording ended with the aircraft static in these conditions.

ADDITIONAL INFORMATION

Traffic Advisory System

The accident airplane was fitted with an L-3 Avionics SKYWATCH Traffic Advisory System (TAS). As installed, the system included an L-3 Avionics SKY 497 transmitter/receiver unit and an L-3 Communications antenna. The traffic information developed by the SKY 497 system was displayed in the cockpit and provided an audio alert.

According to the manufacturer, the SKYWATCH TAS monitored the airspace around the aircraft for other transponder-installed aircraft by querying Mode C or Mode S transponder information. These data would then be displayed visually to the pilot in the cockpit. The system also provided aural

announcements on the flight deck audio system. The audio alert would be inhibited at 50 percent and 100 percent flap settings.

If an intruder aircraft's transponder did not respond to interrogations, the TAS would not establish a track on that aircraft. The system was not equipped with recording capability.

The SKYWATCH system operated on line-of-sight principles. If an intruder aircraft's antenna was shielded from the SKYWATCH system antenna, the ability of the SKY 497 to track the target would be affected. If a SKY 497-equipped aircraft was located directly above an intruder, the airframe of one or both of the aircraft could cause the SKY 497's interrogations to be shielded, depending on antenna location (top-mounted on the accident airplane). The SKY 497 also had the capability to coast (predict) an intruder's track to compensate for a momentary shielding.
In an interview with state police immediately after the accident, the pilot explained the operation of the system to the trooper conducting the interview, and stated he did not receive a traffic alert prior to the collision.

FAA Advisory Circular 90-48c

"Pilots should also be familiar with, and exercise caution, in those operational environments where they may expect to find a high volume of traffic or special types of aircraft operation. These areas include Terminal Radar Service Areas (TRSAs), airport traffic patterns, particularly at airports without a control tower; airport traffic areas (below 3,000 feet above the surface within five statute miles of an airport with an operating control tower…"

Pilot Information

Certificate:	Private	**Age:**	55,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 8, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 24, 2013
Flight Time:	(Estimated) 959 hours (Total, all aircraft), 804 hours (Total, this make and model), 720 hours (Pilot In Command, all aircraft), 38 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CIRRUS DESIGN CORP	**Registration:**	N122ES
Model/Series:	SR22 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	2006	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2008
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 13, 2014 Annual	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:	30 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1320 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-550-N
Registered Owner:	GRAEVES AUTO & APPLIANCE INC	**Rated Power:**	300 Horsepower
Operator:	GRAEVES AUTO & APPLIANCE INC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KFDK,303 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	356°
Lowest Cloud Condition:	Scattered / 4800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 21 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	19°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Cleveland, TN (RZR)	**Type of Flight Plan Filed:**	IFR
Destination:	Frederick, MD (FDK)	**Type of Clearance:**	VFR;IFR
Departure Time:	12:47 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Frederick Municipal FDK	**Runway Surface Type:**	Asphalt
Airport Elevation:	306 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	30	**IFR Approach:**	None
Runway Length/Width:	3600 ft / 75 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 1 None	**Latitude, Longitude:**	39.410831,-77.382499(est)

Preventing Similar Accidents

See and Be Seen (SA-045)

The Problem

Adequate visual lookout while flying in visual meteorological conditions is critical to avoiding other aircraft. While accidents can occur in high-traffic areas (near airports), they can also occur in cruise flight.

All pilots can be vulnerable to distractions in the cockpit, and the presence of technology has introduced challenges to the see-and-avoid concept. Aviation applications on portable electronic devices (PEDs) such as cell phones, tablets, and handheld GPS units, while useful, can lead to more head-down time, limiting a pilot's ability to see other aircraft.

What can you do?

- Be vigilant and use proper techniques to methodically scan for traffic throughout your flight, not only in high-volume traffic areas.
- Divide your attention inside and outside the aircraft and minimize distractions (including nonessential conversations, photography or sightseeing activities, and PED use) that may degrade your ability to maintain awareness of other aircraft.
- Make your aircraft as visible as possible to other aircraft by turning on available lights, including anticollision lights, and consider using high-intensity discharge or LED lighting.
- Clearly communicate your intentions and use standard phraseology, known distances, and obvious ground references to alert other pilots of your location.
- Recognize that some conditions make it harder to see other aircraft, such as operating in areas where aircraft could be masked by surrounding terrain or buildings and when sun glare is present.
- Encourage passengers to help look for traffic and, during instructional flights, ensure that one pilot is always responsible for scanning for traffic.
- Effectively use on-board traffic advisory systems, when available, to help visually acquire and avoid other aircraft and not as a substitute for an outside visual scan.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-045.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

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	David Keenan; FAA AVP-100; Washington, DC Brannon Mayer; Cirrus Aircraft; Duluth, MN Thom Webster; Robinson Helicopter; Torrance, CA
Original Publish Date:	May 23, 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=90293

Aviation Investigation Final Report

Location:	Frederick, Maryland	**Accident Number:**	ERA15FA025
Date & Time:	October 23, 2014, 15:37 Local	**Registration:**	N7518Q
Aircraft:	ROBINSON HELICOPTER COMPANY R44 II	**Aircraft Damage:**	Destroyed
Defining Event:	Midair collision	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

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airplane's position reports. Although the airplane was equipped with a traffic advisory system, its capabilities could have been limited by antenna/airframe obstruction or an inhibition of the audio alert by the airplane's flap position.

The airplane's data indicated that the collision occurred at an altitude of about 1,100 ft mean sea level (msl). The published traffic pattern altitude (TPA) for light airplanes was 1,300 ft msl. Although several different helicopter TPAs were depicted in locally produced pamphlets and posters and reportedly discussed at various airport meetings, there was no published TPA for helicopters in the airport/facility directory or in the tower's standard operating procedures. According to the Federal Aviation Administration's Aeronautical Information Manual, in the absence of a published TPA, the TPA for helicopters was 500 ft above ground level; therefore, the appropriate TPA for helicopters at the accident airport was about 800 ft msl. The lack of an official helicopter TPA, which was published after the accident, significantly reduced the potential for positive traffic conflict resolution.

Review of the airport procedures, tower capabilities, and the controller's actions revealed no specific departure from proper procedures. Because the tower was not equipped with radar equipment, all of the sequencing and obtaining of traffic information had to be done visually. This would have been especially difficult at the accident airport due to the local terrain and tree lines that extend above the pattern altitudes from the tower controllers' view, which can cause aircraft to easily blend in with the background. Further, the controller spent a lengthy amount of time on the task of issuing the IFR clearance to the business jet while handling multiple aircraft in the traffic pattern. It is likely that the lack of radar equipment in the tower and the controller's inadequate task management also significantly reduced the potential for positive traffic conflict resolution.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the helicopter pilots and the airplane pilot to maintain an adequate visual lookout for known traffic in the traffic pattern, which resulted in a midair collision. Contributing to the accident were the airplane pilot's descent below the published airplane traffic pattern altitude (TPA) and the helicopter pilot's climb above the proper helicopter TPA as prescribed in the Federal Aviation Administration's Aeronautical Information Manual for airports without published helicopter TPAs. Also contributing to the accident were the lack of a published helicopter TPA, the absence of radar equipment in the tower, and the controller's inadequate task prioritization.

Findings

Personnel issues	Incorrect action performance - Pilot
Organizational issues	Availability of policy/proc - Not specified
Environmental issues	Approach/departure - Availability of related info
Personnel issues	Incorrect action performance - Pilot of other aircraft
Personnel issues	Task allocation - ATC personnel
Personnel issues	Monitoring other aircraft - Flight crew
Personnel issues	Monitoring other aircraft - Pilot of other aircraft

Factual Information

History of Flight

Approach-VFR pattern downwind	Midair collision

HISTORY OF FLIGHT

This report was modified on 6/2/2016. Please refer to the public docket for this accident to view the original report.

On October 23, 2014, about 1537 eastern daylight time, a Cirrus SR22 airplane, N122ES, operated by a private individual, and a Robinson R44 II helicopter, N7518Q, operated by Advanced Helicopter Concepts, collided in midair approximately 1 mile southwest of the Frederick Municipal Airport (FDK), Frederick, Maryland. The airplane departed controlled flight after the collision, the ballistic parachute system was deployed, and the airplane landed nose-down in a thicket of low trees and brush. The helicopter also departed controlled flight, descended vertically, and was destroyed by impact forces at ground contact. The private pilot on board the airplane was not injured, and his passenger sustained a minor injury. The flight instructor, commercial pilot, and a passenger in the helicopter were fatally injured. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed for the airplane, which departed Cleveland, Tennessee, on a personal flight about 1247. No flight plan was filed for the helicopter, which departed FDK on an instructional flight about 1535. The flights were conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91.

Witnesses on the ground watched the aircraft approach each other at the same altitude and saw the collision. One witness said the helicopter appeared to be in a stationary hover as the airplane closed on it and the two collided. She said neither aircraft changed altitude as they approached each other.

A flight instructor for the helicopter operator in a company Robinson R22 helicopter followed the accident helicopter in the traffic pattern for landing abeam runway 30 in the infield sod at FDK. He said his helicopter had just completed the turn onto the crosswind leg of the traffic pattern when the accident helicopter came into his view to his front at about the point where it would turn to the downwind leg of the pattern. At the same time, the airplane appeared in his field of view as it "flew through the rotor system" of the helicopter.

Radar and voice communication information from the Federal Aviation Administration (FAA), as well as interviews conducted with air traffic controllers, revealed the following:

At 1534:10, the accident airplane first contacted the FDK tower and was about 10 miles west of the field at 3,000 feet. The local controller (LC) acknowledged the pilot's transmission and instructed him to report 3 miles west for a left downwind to runway 30. At 1534:31, the pilot of the accident airplane acknowledged and read back the controller's instructions.

At the time the accident airplane contacted the LC, other traffic being handled by the tower included two helicopters (two company helicopters N2342U and N444PH) in the VFR traffic pattern, one airplane conducting practice instrument approaches to runway 23, another airplane inbound from the southeast, and a business jet (N612JD) with its IFR clearance on request.

At 1535:02, the LC then cleared the accident helicopter for take-off from alpha taxiway as requested and issued the current winds, and the call was acknowledged.

At 1536:02, the LC contacted the pilot of N612JD and advised she was ready to issue the airplane's instrument clearance. From 1536:06 to 1536:49 (43 seconds), the controller issued the clearance.

At 1536:49, the pilot of N612JD read back his clearance as required. Also at 1536:49, during the read back from N612JD, the pilot of the accident airplane reported on local frequency that he was 3 miles out on a 45-degree entry for runway 30, which the LC did not hear because she was listening to the read back from N612JD on ground control frequency.

At 1537:09, the LC transmitted to helicopter N444PH, "…four papa hotel option to the grass at your own risk use caution and on uh next go around stay at a thousand feet. I have traffic in the downwind."

At 1537:22, the LC instructed the accident airplane to report midfield left downwind for runway 30 and said "I have three helicopters below ya in the uh traffic pattern". At 1537:30, the pilot of the accident airplane acknowledged the request to report midfield downwind and stated he had two of the helicopters in sight. Immediately after that transmission, at 1537:34, the LC said "Alright uh two echo sierra, I have ya in sight runway three zero, maintain your altitude to…until turning base, cleared to land."

At 1537:41, cries were heard over the local frequency, and, at 1537:49, the pilot of a helicopter in the traffic pattern reported that an airplane and helicopter were both "down."

The pilot of the accident airplane was interviewed and provided written statements. His recollection of the flight was consistent with voice, radar, and aircraft data. The pilot stated that as he descended and slowed for the traffic pattern entry, he set the flaps to 50 percent.

The pilot stated that, about the time the airplane entered the downwind leg of the traffic pattern, the tower controller issued a landing clearance, and, "out of nowhere…I saw a helicopter below me and to the left…" The pilot initiated an evasive maneuver, but he "heard a thump," and the airplane rolled right and nosed down. The pilot deployed the ballistic recovery system, and the airplane's descent was controlled by the parachute to ground contact.

PERSONNEL INFORMATION

The airplane pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent FAA second-class medical certificate was issued April 31, 2014. He reported 959 total hours of flight experience, of which 804 hours were in the accident airplane make and model.

The flight instructor on board the helicopter held commercial pilot and flight instructor certificates with ratings for rotorcraft-helicopter and instrument helicopter. His most recent FAA second-class medical

certificate was issued April 31, 2014. Examination of his logbook revealed 832 total hours of flight experience, of which 116 hours were in the accident helicopter make and model.

The helicopter pilot held commercial pilot and flight instructor certificates with ratings for airplane single-engine land, multiengine land, rotorcraft-helicopter and instrument helicopter. His most recent FAA second-class medical certificate was issued April 29, 2013, and he reported 2,850 total hours of flight experience on that date. Excerpts of a pilot logbook for his helicopter time revealed 1,538 total hours of helicopter experience. A review of records revealed that he stopped flying as a helicopter tour pilot in 1994. During the years following, he logged five or fewer helicopter flights per year. Between 2004 and 2011, he logged one flight per year, none in 2011, and one in 2012. In 2014, he logged two flights in September, and two in October prior to the accident flight.

AIRCRAFT INFORMATION

According to FAA records, the airplane was manufactured in 2006. Its most recent annual inspection was completed June 13, 2014, at 1,289.8 total aircraft hours.

The helicopter was manufactured in 2004. Its most recent 100-hour inspection was completed October 2, 2014, at 1,758 total aircraft hours.

METEOROLOGICAL INFORMATION

The 1553 weather observation at FDK included scattered clouds at 4,800 feet, 10 miles visibility, and wind from 330 degrees at 16 knots gusting to 21 knots.

The was 26 degrees above the horizon, and the sun angle was from 225 degrees.

AIR TRAFFIC CONTROL

The air traffic control (ATC) group was formed on October 23, 2014. The group consisted of the group chairman from operational factors and a representative from the FAA compliance services group.

The group reviewed radar data provided by the FAA from Potomac TRACON (PCT), ATC voice recordings, controller training and qualification records, facility logs, standard operating procedures (SOP), letters of agreement (LOA), controller work schedules, and other related documentation. Additionally, the group conducted interviews with the LC who provided services at the time of the accident and the off-duty controller who witnessed the accident and assisted with initial notifications and the after-action response. Tenant operators on the airport were interviewed, including the operator of the accident helicopter. The group also held discussions with the air traffic manager (ATM) at FDK.

When asked what the traffic pattern altitudes (TPAs) were at FDK, both controllers, as well as the ATM, stated that the altitudes were 900 feet mean sea level (msl) for helicopters, 1,300 feet msl for small fixed-wing airplanes, and 1,800 feet msl for large fixed-wing airplanes and twins. When asked the origin of these TPAs and where they were published, the LC stated that they were published in the SOP and airport/facility directory (AFD). The witnessing controller thought the helicopter TPA was published in the local noise abatement procedures, but not in the AFD, but that the fixed-wing TPAs were in both. The ATM stated that only the fixed-wing TPAs were published in the AFD and that the helicopter TPA had been inadvertently left out without them realizing. The ATM stated that helicopter TPA was agreed

upon during meetings with tower personnel, airport management, and airport tenants prior to the tower's commissioning. The facility was unable to produce any documentation that these meetings were ever held, and they were also unable to produce any documentation of the 900-foot msl helicopter TPA they had mentioned. The only documentation that was found was from old, locally produced noise abatement procedures.

According to FAA Order 7210.3Y, minutes of the meeting were to be taken and distributed to "the appropriate Service Area" office and to each attendee. These minutes were neither recorded nor distributed.

In an interview, the helicopter operator was asked for a copy of his flight school's SOP. He stated there was none. The policies and procedures were made by him, and distributed by word of mouth in periodic meetings. During an initial discussion, the operator stated that the helicopter TPA was between 900 and 1,000 feet msl, and 1,200 feet msl for autorotations. When asked how he decided upon the TPA of 900 feet msl for his pilots and students. He said, "It just kind of morphed into that. The airplanes are at 1,300 feet msl, and we thought we should be below that. They never published that in the AFD, and I wish they would."

According to the chief pilot for the helicopter operator, a 14 CFR Part 141 application would soon be submitted and an SOP would be published concurrent with the application.

AERODROME INFORMATION

FDK was at an elevation of 306 feet and was tower controlled. The tower was an FAA contract tower and was not radar-equipped.

Runway 5/23 was 5,219 feet long and 100 feet wide, and was located along the east side of the field. Runway 12/30 was 3,600 feet long, 75 feet wide, and located on the north side of the field. The two runways intersected at the approach end of runways 23 and 30.

The published TPA in the AFD for single-engine and light-twin airplanes was 1,300 feet msl, and 1,800 feet msl for heavy multiengine and jet airplanes. The traffic pattern was a standard left-hand pattern.

There was no published traffic pattern or TPA for helicopters in the AFD at the time of the accident. According to the FAA's Aeronautical Information Manual (AIM), in the absence of a published TPA for helicopters, the helicopter TPA was 500 feet agl, or about 800 feet msl at FDK.

A pamphlet produced by the City of Frederick, Maryland, depicted the airport traffic patterns and identified the helicopter TPA as 1,100 feet msl.

A poster of the pamphlet's depiction was posted around the airport, and it also identified the helicopter TPA as 1,100 feet msl.

The SOP for the contract operator of the tower had no TPAs published. However, when interviewed, the LC on duty at the time of the accident stated the TPA for helicopters was 900 feet per the SOP.

As a result of the investigation, the AFD was updated on January 8, 2015, with a recommended TPA for helicopters of 1,106 ft msl/800 feet agl.

Radar Data

Radar data for the flights was obtained by the FAA from several radar sites in the area surrounding FDK. Radar data recorded the flight track of the accident airplane until seconds before the accident; however, no data were recorded for the accident helicopter.

At the time of the accident, the floor of the Potomac TRACON radar coverage in the area surrounding FDK appeared to be about 1,200 feet msl. The helicopter never climbed into radar coverage, and the collision between the helicopter and the airplane occurred below the area of radar coverage.

WRECKAGE AND IMPACT INFORMATION

The helicopter wreckage and its associated debris came to rest in a self-storage complex between two buildings, with parts and debris scattered in and around the complex. All major components were accounted for at the scene. The main wreckage came to rest largely upright, and the cockpit, cabin area, fuselage, tailboom, engine, transmission, with main and tail rotors attached. All components were significantly damaged and deformed by impact forces. The "blue" main rotor blade was fractured near its root, and the outboard 11 feet of main rotor spar was located 50 feet from the main wreckage with no honeycomb or blade skin afterbody material attached.

Control continuity could not be established due to numerous fractures in the system, but all fractures exhibited features consistent with overload.

The airplane came to rest nose down, in a dense thicket of brush and low trees, wedged between tree trunks, and held in that position. All major components were accounted for at the scene, except for the right wing flap, aileron, and right landing gear wheel and tire assembly which were located between the helicopter and airplane sites. Examination of the airplane revealed that the trailing edge of the right wing was impact-damaged, and that the flap and aileron hinges were significantly damaged and twisted, and the surrounding sheet metal displayed "saw-tooth" fractures, consistent with overload.

Examination of the cockpit revealed the flap switch handle was in the "50 percent" position; however, the flaps and the flap actuator were positioned consistent with a flaps-up position. Because power was applied to all systems throughout the flight and after ground contact, the flap position could not be determined prior to the collision.

MEDICAL AND PATHOLOGICAL INFORMATION

The Office the Chief Medical Examiner for the State of Maryland performed autopsies on the helicopter flight instructor and helicopter pilot. The autopsy reports listed the cause of death for each as "blunt impact injuries."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological testing of the helicopter flight instructor and helicopter pilot. The tests for each were negative for the presence of carbon monoxide, cyanide, and ethanol.

TESTS AND RESEARCH

Avidyne Primary Flight Display (PFD) Description

The PFD unit from the accident airplane included a solid state Air Data and Attitude Heading Reference System (ADAHRS) and displayed aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading. The PFD unit had external pitot/static inputs for altitude, airspeed, and vertical speed information. Each PFD contained two flash memory devices mounted on a riser card. The flash memory stored information the PFD unit used to generate the various PFD displays. Additionally, the PFD had a data logging function, which was used by the manufacturer for maintenance and diagnostics. Maintenance and diagnostic information recording consisted of system information, event data and flight data.

The PFD sampled and stored several data streams in a sequential fashion; when the recording limit of the PFD was reached, the oldest record was dropped and a new record was added. Data from the Attitude/Heading Reference System (AHRS) was recorded at a rate of 5 Hz. Air data information such as pressure altitude, indicated airspeed, and vertical speed was recorded at 1 Hz. GPS and navigation display and setting data were recorded at a rate of 0.25 Hz, and information about pilot settings of heading, altitude, and vertical speed references were recorded when changes were made.

According to the data, at 15:34:30, about 9 miles from the airport, the airplane initiated a descent out of 3,000 feet msl. The descent rate varied between 500-1000 fpm. The descent stopped at 1,600 feet pressure altitude (1,582 feet indicated) for about 10 seconds, at 15:36:40. The airplane then continued its descent at an approximate rate of 700 fpm.

As the descent continued, the airplane entered a right bank of about 15 degrees about 1.5 miles from the airport. While descending and turning right, pitch, vertical, longitudinal, and lateral acceleration experienced a loading event simultaneously at 15:37:36.

When this occurred, the aircraft was 0.75 miles from the field at 1,045 feet pressure altitude (1,027 feet indicated) and 100 kts indicated airspeed. Following the loading, the aircraft rolled a full 360 degrees to the right, pitch recorded extremes of 21 degrees nose- up to 80 degrees nose-down, and heading spun nearly 720 degrees to the right.

Following the loading, altitude was maintained for about 3 seconds before dropping at a maximum recorded rate of 5,470 fpm. The aircraft came to rest at 15:37:52 at 330 feet pressure altitude in a 75-degrees nose-down attitude with the wings rolled 46 degrees to the left. The recording ended with the aircraft static in these conditions.

ADDITIONAL INFORMATION

Traffic Advisory System

The accident airplane was fitted with an L-3 Avionics SKYWATCH Traffic Advisory System (TAS). As installed, the system included an L-3 Avionics SKY 497 transmitter/receiver unit and an L-3 Communications antenna. The traffic information developed by the SKY 497 system was displayed in the cockpit and provided an audio alert.

According to the manufacturer, the SKYWATCH TAS monitored the airspace around the aircraft for other transponder-installed aircraft by querying Mode C or Mode S transponder information. These data would then be displayed visually to the pilot in the cockpit. The system also provided aural

announcements on the flight deck audio system. The audio alert would be inhibited at 50 percent and 100 percent flap settings.

If an intruder aircraft's transponder did not respond to interrogations, the TAS would not establish a track on that aircraft. The system was not equipped with recording capability.

The SKYWATCH system operated on line-of-sight principles. If an intruder aircraft's antenna was shielded from the SKYWATCH system antenna, the ability of the SKY 497 to track the target would be affected. If a SKY 497-equipped aircraft was located directly above an intruder, the airframe of one or both of the aircraft could cause the SKY 497's interrogations to be shielded, depending on antenna location (top-mounted on the accident airplane). The SKY 497 also had the capability to coast (predict) an intruder's track to compensate for a momentary shielding.
In an interview with state police immediately after the accident, the pilot explained the operation of the system to the trooper conducting the interview, and stated he did not receive a traffic alert prior to the collision.

FAA Advisory Circular 90-48c

"Pilots should also be familiar with, and exercise caution, in those operational environments where they may expect to find a high volume of traffic or special types of aircraft operation. These areas include Terminal Radar Service Areas (TRSAs), airport traffic patterns, particularly at airports without a control tower; airport traffic areas (below 3,000 feet above the surface within five statute miles of an airport with an operating control tower…"

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	29
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	March 31, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	832 hours (Total, all aircraft), 116 hours (Total, this make and model), 779 hours (Pilot In Command, all aircraft), 57 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	47
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	April 29, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	2850 hours (Total, all aircraft), 7.3 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER COMPANY	**Registration:**	N7518Q
Model/Series:	R44 II II	**Aircraft Category:**	Helicopter
Year of Manufacture:	2004	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	10281
Landing Gear Type:	N/A; Skid	**Seats:**	4
Date/Type of Last Inspection:	October 2, 2014 100 hour	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	20 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1758 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-540 SER
Registered Owner:	Fly For Fun LLC	**Rated Power:**	245 Horsepower
Operator:	Advanced Helicopter Concepts, Inc	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KFDK,303 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	356°
Lowest Cloud Condition:	Scattered / 4800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 21 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	19°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Frederick, MD (FDK)	**Type of Flight Plan Filed:**	None
Destination:	Frederick, MD (FDK)	**Type of Clearance:**	VFR
Departure Time:	15:35 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Frederick Municipal FDK	**Runway Surface Type:**	Asphalt
Airport Elevation:	306 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	30	**IFR Approach:**	None
Runway Length/Width:	3600 ft / 75 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	39.410831,-77.382499(est)

Preventing Similar Accidents

See and Be Seen (SA-045)

The Problem

Adequate visual lookout while flying in visual meteorological conditions is critical to avoiding other aircraft. While accidents can occur in high-traffic areas (near airports), they can also occur in cruise flight.

All pilots can be vulnerable to distractions in the cockpit, and the presence of technology has introduced challenges to the see-and-avoid concept. Aviation applications on portable electronic devices (PEDs) such as cell phones, tablets, and handheld GPS units, while useful, can lead to more head-down time, limiting a pilot's ability to see other aircraft.

What can you do?

- Be vigilant and use proper techniques to methodically scan for traffic throughout your flight, not only in high-volume traffic areas.
- Divide your attention inside and outside the aircraft and minimize distractions (including nonessential conversations, photography or sightseeing activities, and PED use) that may degrade your ability to maintain awareness of other aircraft.
- Make your aircraft as visible as possible to other aircraft by turning on available lights, including anticollision lights, and consider using high-intensity discharge or LED lighting.
- Clearly communicate your intentions and use standard phraseology, known distances, and obvious ground references to alert other pilots of your location.
- Recognize that some conditions make it harder to see other aircraft, such as operating in areas where aircraft could be masked by surrounding terrain or buildings and when sun glare is present.
- Encourage passengers to help look for traffic and, during instructional flights, ensure that one pilot is always responsible for scanning for traffic.
- Effectively use on-board traffic advisory systems, when available, to help visually acquire and avoid other aircraft and not as a substitute for an outside visual scan.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-045.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

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	David Keenan; FAA AVP-100; Washington, DC Brannon Mayer; Cirrus Aircraft; Duluth, MN Thom Webster; Robinson Helicopter; Torrance, CA
Original Publish Date:	May 23, 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=90293