



# Aviation Investigation Final Report

<b>Location:</b>	Reno, Nevada	<b>Accident Number:</b>	WPR14FA167
<b>Date &amp; Time:</b>	April 13, 2014, 12:09 Local	<b>Registration:</b>	N78CS
<b>Aircraft:</b>	Sands HELICYCLE	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The student pilot was flying his single-seat helicopter as part of a flight of two helicopters with the intention of flying around the airport traffic pattern. Witnesses located adjacent to the accident site reported that, as both helicopters reached an altitude consistent with pattern altitude, the accident helicopter suddenly pitched down. One witness stated that the helicopter shuddered a few times and then pitched down while rolling in a clockwise rotation. The helicopter subsequently impacted flat desert terrain. Postaccident examination of the helicopter revealed no evidence of any preexisting mechanical anomalies that would have precluded normal operation.

## Probable Cause and Findings

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

The pilot's failure to maintain control of the helicopter while in the traffic pattern.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	(general) - Not attained/maintained

# Factual Information

## History of Flight

Approach-VFR pattern final	Loss of control in flight (Defining event)
Approach-VFR pattern final	Collision with terr/obj (non-CFIT)

On April 13, 2014, about 1209 Pacific daylight time, an experimental amateur-built Sands Helicycle, N78CS, was substantially damaged when it impacted terrain while maneuvering near the Reno-Stead Airport (RTS), Reno, Nevada. The helicopter was registered to and operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91. The student pilot, sole occupant of the single-seat helicopter, sustained fatal injuries. Visual meteorological conditions prevailed and no flight plan was filed for the local personal flight, which originated from RTS at 1204.

Witnesses located adjacent to the accident site reported observing two helicopters fly along a taxiway about 15 feet above ground level (agl) on a southerly heading while in trail from one another. As the helicopters made a left turn to an easterly heading, they ascended to about 500 feet agl. As both helicopters turned to a northerly heading, the lead helicopter began to "pull away" from the second helicopter. Witnesses stated that the second helicopter suddenly pitched downward towards the ground. Subsequently, the helicopter impacted terrain about 1,425 feet northeast of the threshold of runway 32. One witness added that the accident helicopter "shuttered a couple of times, [and] then dove at the ground" while rolling in a clockwise rotation.

The pilot of the lead helicopter reported that the accident pilot and he departed from the west hangars to the east along taxiway Alpha. He stated that the accident pilot intended to follow him on a left traffic pattern for runway 08. As he turned crosswind for the runway, he asked the accident pilot if he was "back there," and the accident pilot responded "yes, I am behind you and everything is fine." The pilot further reported that he continued on downwind and made another radio call to the accident pilot, but did not receive a reply despite multiple attempts to contact him. Shortly thereafter, the pilot located the wreckage of the helicopter.

A friend of the pilot reported to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) that the morning of the day of the accident, the pilot had flown uneventfully around the airport and performed a few low speed quick stops on one of the taxiways. In addition, the friend of the pilot reported that the helicopter was test flown about a week prior to the accident by a test pilot, and the helicopter was within weight and balance limitations.

## Pilot Information

<b>Certificate:</b>	Student	<b>Age:</b>	46
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Center
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	November 30, 2012
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	52.7 hours (Total, all aircraft), 1 hours (Total, this make and model), 4.5 hours (Pilot In Command, all aircraft)		

The pilot, age 46, held a student pilot certificate with an endorsement for an R22 helicopter. A third-class airman medical certificate was issued to the pilot on November 30, 2012, with no limitations stated.

Review of the pilot's logbook revealed that as of the most recent logbook entry, dated March 23, 2014, he had accumulated 52.7 hours of total flight time, of which 4.6 hours was solo flight time. The pilot had logged 4.2 hours of flight time within the preceding 30 days to the accident, of which no solo flight time was logged.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Sands	<b>Registration:</b>	N78CS
<b>Model/Series:</b>	HELCYCLE NO SERIES	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	2014	<b>Amateur Built:</b>	Yes
<b>Airworthiness Certificate:</b>	Experimental (Special)	<b>Serial Number:</b>	5-14
<b>Landing Gear Type:</b>	Skid	<b>Seats:</b>	1
<b>Date/Type of Last Inspection:</b>	January 8, 2014 Condition	<b>Certified Max Gross Wt.:</b>	850 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Solar
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	T-62-32
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	160 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The single-seat experimental amateur-built helicopter, serial number (S/N) 5-14, was completed in 2014, and issued an experimental airworthiness certificate on March 6, 2014. It was powered by a Solar T-62-32 turboshaft engine rated at 160 horsepower. Review of the

airframe logbook revealed that since the issuance of the airworthiness certificate, no further logbook entries were made.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KRNO, 4400 ft msl	<b>Distance from Accident Site:</b>	12 Nautical Miles
<b>Observation Time:</b>	18:55 Local	<b>Direction from Accident Site:</b>	158°
<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>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	130°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.19 inches Hg	<b>Temperature/Dew Point:</b>	13°C / -12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Reno, NV (RTS )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Reno, NV (RTS )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	12:04 Local	<b>Type of Airspace:</b>	

A review of recorded data from the Reno-Tahoe International Airport (RNO) automated weather observation station, located about 15 miles southeast of the accident site, revealed at 1155, conditions were wind from 130 degrees at 5 knots, visibility 10 statute miles, sky clear, temperature 13 degrees Celsius, dew point -12 degrees Celsius, and an altimeter setting of 30.19 inches of mercury. Using the reported weather conditions and field elevation, the calculated density altitude was about 5,751 feet.

### Airport Information

<b>Airport:</b>	RENO/STEAD RTS	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	5050 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	32	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	9000 ft / 150 ft	<b>VFR Approach/Landing:</b>	Unknown

The Reno/Stead Airport is a non-towered airport that operates in class G airspace. The airport features two runways, 14/32, a 9,000-foot long and 150-foot wide asphalt runway, and 8/26, a 7,608-foot long and 150-foot wide asphalt runway. The reported airport elevation is 5,050 feet.

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	39.668056,-119.8675

Examination of the helicopter by a Federal Aviation Administration (FAA) inspector revealed that the helicopter came to rest on its left side in an open desert area. All major structural components of the helicopter were located at the accident site. The wreckage was recovered to a secure location for further examination.

## Medical and Pathological Information

The Washoe County Medical Examiner conducted an autopsy on the pilot on April 14, 2014. The medical examiner determined that the cause of death was "multiple blunt force injuries."

The FAA's Civil Aeromedical Institute (CAMI) located in Oklahoma City, Oklahoma, performed toxicology tests on the pilot. According to CAMI's report, carbon monoxide, cyanide, volatiles, and drugs were tested, and had positive results for an unspecified amount of Diphenhydramine within the liver.

Information obtained from CAMI revealed that Diphenhydramine is a common over the counter antihistamine used in the treatment of the common cold and hay fever. In addition, warnings for the medication include: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).

## Tests and Research

Examination of the recovered airframe and engine was conducted at the Reno-Stead Airport, Reno, Nevada, on May 28, 2014, by the NTSB IIC, and a representative from Eagle R&D.

Examination of the recovered wreckage revealed that one of the two main rotor blades was separated at the blade grip and the retention bolt was sheered. Signatures observed on the blade grip were consistent with the rotor blade separating in a forward direction. The upper, lower, and center portions of the retention bolt remained within the rotor blade and blade grip. The outboard three feet of the blade was

separated, including the blade tip and leading edge spar, which was located about 300 feet southwest of the accident site. Some leading edge gouges were observed near the separated blade tip. Chordwise striations were observed throughout the span of the separated rotor blade. The rotor blade that remained attached to the hub exhibited chordwise striations throughout the blade span and was bent and buckled throughout. The tailrotor assembly was unremarkable. The tailrotor slider functioned normally by hand. The tailrotor driveshaft was intact and twisted at the forward attach point.

Flight control continuity was established throughout the helicopter for all primary flight controls. Separations in the control torque tubes were observed, and the areas of separation exhibited signatures consistent with overload.

The forward portion of the airframe was destroyed. The instrument panel was impact damaged with multiple instruments displaced. The forward portion of both landing skids were bent upward. Impact damage to the fuselage was found consistent with a main rotor blade strike.

The left side engine mount remained intact. The right side engine mount was separated (consistent with a forward motion). All six drive belts were found separated into multiples pieces. The engine was removed from the gearbox. Damage was noted to the pulley and gearbox assembly. Rotational continuity was established throughout the gearbox assembly. Rotational continuity was also established throughout the turbine engine, however, was stiff. The exhaust, combustion housing, and nozzle were removed. Slight scoring rubbing was observed on the nozzle, found consistent with slight turbine wheel contact with the housing. Once the nozzle was removed, the turbine assembly rotated freely.

Examination of the recovered airframe and engine revealed no evidence of any preexisting anomalies that would have precluded normal operation.

For further information, see the NTSB Recovered Airframe and Engine Examination Summary Report within the public docket for this accident.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Cawthra, Joshua
<b>Additional Participating Persons:</b>	William Kunder; Federal Aviation Administration; Reno, NV Blake Estes; Eagle R&D; Nampa, ID
<b>Original Publish Date:</b>	September 15, 2014
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<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89050">https://data.nts.gov/Docket?ProjectID=89050</a>

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