Aviation Investigation Final Report

Location:	Scappoose, Oregon	**Accident Number:**	WPR13FA393
Date & Time:	August 31, 2013, 13:57 Local	**Registration:**	N43259
Aircraft:	STUART VORTEX	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The student pilot intended to perform a series of high-speed taxi tests and "crow hops" in the single-seat gyroplane. During the first test, the gyroplane lifted off and climbed to about 30 feet. After flying about half the length of the runway, the pilot reduced engine power for landing, appeared to encounter control difficulties, and then applied power and initiated a go-around. The gyroplane continued to climb and joined the crosswind and then downwind legs of the traffic pattern. As the gyroplane approached the base leg, it rolled aggressively to the left in a nose-high attitude and then rapidly descended to the ground in an uncontrolled manner.

Most of the gyroplane's structure was consumed by postimpact fire. Examination of the remaining engine, rotor, and flight control system components did not reveal any mechanical anomalies that would have precluded normal operation. Witness marks indicated that the engine was producing power during the descent. Damage to the rotor system indicated that the main rotor blades diverged greatly from their track during flight, striking both the forward cabin structure and the engine driven propeller.

The student pilot had very limited flight experience and began his flight training in a fixed wing airplane the year prior. He was not approved for and had not conducted solo flight in the accident gyroplane or any other aircraft.

Probable Cause and Findings

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

The student pilot's unintentional takeoff followed by his failure to maintain control of the gyroplane during the landing approach. Contributing to the accident was the student pilot's lack of both flight training and flight experience and his lack of a solo endorsement.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Lateral/bank control - Not attained/maintained
Personnel issues	Qualification/certification - Student/instructed pilot
Personnel issues	Total experience w/ equipment - Student/instructed pilot
Personnel issues	Total experience - Student/instructed pilot
Personnel issues	Total instruct/training recvd - Student/instructed pilot

Factual Information

History of Flight

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

On August 31, 2013, at 1357 Pacific daylight time, a single-seat experimental amateur-built Sport Copter Vortex, N43259, collided with the ground near Scappoose Industrial Airpark, Scappoose, Oregon. The gyroplane was registered to, and operated by, the pilot under the provisions of 14 Code of Federal Regulations Part 91. The student pilot was fatally injured. The gyroplane sustained substantial damage during the accident sequence, and was subsequently destroyed by post impact fire. The local personal flight departed Scappoose about 2 minutes prior to the accident. Visual meteorological conditions prevailed, and no flight plan had been filed.

A friend of the pilot reported that they had performed minor maintenance earlier that morning to the nosewheel. The pilot did not intend to take off, but rather had planned on performing a series of high speed taxi tests, and "crow hops." The friend further stated that the pilot had never soloed in a gyroplane before, with his only prior solo experience being a series of "crow hops" the previous weekend.

The friend witnessed and video-recorded the initial segment of the accident flight while positioned midfield on the west ramp. He stated that the gyroplane began the ground roll while traveling north on the parallel taxiway west of the runway 33. It took off, and seemed to be flying normally; however, as the pilot initiated the landing attempt, it became unstable and began to wobble. The pilot applied engine power and the gyroplane started to climb, and began a left turn towards the crosswind leg.

A second witness, who stated that he was a certified flight instructor with extensive helicopter and gyroplane flight experience, was located in his hangar at a similar vantage point, further north along the runway. He heard the sound of a gyroplane on the taxiway, and initially thought it was the aircraft of the accident pilot's hangar partner. He looked out and saw the gyroplane "crow hopping" down the taxiway, and then take off. It departed towards the north, and then began a left turn, climbing just over the hangars and trees, where it joined the downwind leg at what he considered to be a slow airspeed. He reported the engine sound as normal, and he did not see any smoke or vapor trailing at any time. He continued to be alarmed about the gyroplane's airspeed, and noted it was flying in a fairly "aggressive" nose-up attitude, while "mushing" through the sky. He was concerned that the pilot did not have complete control of the gyroplane. It then made what appeared to be a left base turn, while descending at a rapid rate. He assumed that the pilot was performing an "aggressive" descent to land, and thinking no more of it, went back into his hangar. A short time later he came back outside and saw smoke in the vicinity of where he last observed the gyroplane descending.

A third witness, located on an access road at the departure end of runway 33, about 1 mile from the accident site, observed the downwind portion of the flight. He reported that the gyroplane was flying

200 feet above the surrounding trees. He looked away briefly, and as his gaze returned, the gyroplane shape had changed. He could now see the full disc of the rotor blades, and the fuselage appeared to spin. The gyroplane then tumbled, and rapidly descended to the ground.

Video

Review of the video footage revealed that it closely matched the witnesses' statements. It depicted the gyroplane taxing south along the taxiway with the engine running and rotor blades spinning appropriately. In the next video segment, the gyroplane was airborne and flying north directly over the taxiway, about 30 feet above ground level (agl). As it passed midfield while still over the taxiway, the engine tone decreased in pitch, and the gyroplane yawed to the left and began a rapid descent to about 25 feet agl. The engine tone then increased, the gyroplane recovered, and began to climb. Once the gyroplane reached the end of the taxiway, it began a climbing left crosswind turn to about 150 feet agl. In the final video segment the gyroplane was about 300 feet agl, and was proceeding south on the downwind leg. The video resolution prevented an accurate assessment of the gyroplane's attitude, but the main rotor blades were turning, and the engine was operating. The gyroplane was not trailing any smoke or vapor in any of the recordings.

Student pilot Information

Certificate:	Student	**Age:**	59
Airplane Rating(s):	None	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	October 29, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 26.7 hours (Total, all aircraft), 0.1 hours (Total, this make and model), 0 hours (Pilot In Command, all aircraft), 8.6 hours (Last 90 days, all aircraft), 8.6 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The 59-year-old-pilot held a combined student pilot and third-class aviation medical certificate issued October 29, 2012, with limitations that he must have available glasses for near vision. An examination of his logbook indicated a total flight experience of 26.8 hours since his first training flight on July 30, 2012, through to his most recent logbook entry 11 days prior to the accident. His initial flight training took place in a Cessna 152 fixed wing airplane for the period of July 30, 2012, to December 1, 2012, during which time he accumulated 17 hours of dual flight instruction. He began dual flight instruction in a Calidus gyroplane in Utah on July 23, and by August 15, had accumulated 8.7 hours of flight time.

His last flight entry was for dual instruction in a Vortex II gyroplane, which took place in Scappoose. Neither his flight logbook, nor student pilot certificate contained any entries endorsing him for solo flight, and the flight instructor who provided him with his most recent flight training stated that he was not ready for solo flight. No entries were located indicating any flight experience in the accident gyroplane.

Aircraft and Owner/Operator Information

Aircraft Make:	STUART	**Registration:**	N43259
Model/Series:	VORTEX	**Aircraft Category:**	Gyroplane
Year of Manufacture:	2005	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	058
Landing Gear Type:	Tricycle	**Seats:**	1
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	760 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Rotax
ELT:	Not installed	**Engine Model/Series:**	618
Registered Owner:	On file	**Rated Power:**	74 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The single engine gyroplane was comprised of a tubular aluminum and steel primary structure with composite cabin fairings, and aluminum-skinned vertical and horizontal stabilizers. It was equipped with a Rotax 618 series two-stroke engine, and a three-blade composite propeller.

The gyroplane was manufactured as a kit, and built by the original owner, receiving its special airworthiness certificate in May 2005. Federal Aviation Administration (FAA) records indicated that the accident pilot purchased the gyroplane from this owner in July 2010. No maintenance logbooks were recovered.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSPB,58 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	20:53 Local	**Direction from Accident Site:**	192°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	29°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Scappoose, OR (SPB)	**Type of Flight Plan Filed:**	None
Destination:	Scappoose, OR (SPB)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class D

An automated surface weather observation from Scappoose was issued 4 minutes before the accident. It indicated calm wind and clear skies, with a temperature of 29 degrees C, dew point 12 degrees C, and an altimeter setting at 29.87 inches of mercury.

Airport Information

Airport:	SCAPPOOSE INDUSTRIAL AIRPARK SPB	**Runway Surface Type:**	Asphalt
Airport Elevation:	58 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	5100 ft / 100 ft	**VFR Approach/Landing:**	Traffic pattern

The FAA Airport/Facility Directory entry for Scappoose warned of extensive ultralight activity on the west side parallel taxiway. Witnesses also stated that gyroplane traffic typically utilize this taxiway for takeoffs and landings.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	45.764999,-122.863609

The NTSB investigator traveled in support of this investigation, and performed an examination of the engine and airframe following recovery.

The gyroplane came to rest on an easterly heading in a field, about 950 feet west-northwest of the approach end of runway 33. The entire structure was contained within the immediate vicinity of the impact site. A group of 130-foot-tall trees bordered the area 50 feet to the north; all of the trees were intact, and did not show any indications of recent damage.

The fuselage was positioned on its left side, and had sustained extensive thermal damage from the aft section of the tail keel through to the rotor mast, consuming most of the cabin structure, flight controls, and structural members. The gyroplane displayed damage signatures consistent with striking the ground in a left-side-low, nose-down attitude, with the vertical stabilizer and rudder bending over the left horizontal stabilizer.

Medical and Pathological Information

An autopsy was performed by the Oregon State Police, State Medical Examiner. The cause of death was reported as the result of multiple fractures and internal injuries.

Toxicological tests on specimens recovered from the pilot were performed by the FAA Civil Aerospace Medical Institute. Analysis revealed no findings for carbon monoxide, and the results were negative for all screened drug substances and ingested alcohol. Refer to the toxicology report included in the public docket for specific test parameters and results.

Tests and Research

The gyroplane was recovered from the accident site, and examined by the NTSB investigator-in-charge, along with an inspector from the FAA, and a representative from Sport Copter. The examination did not reveal any anomalies with the airframe or engine that would have precluded normal operation. The following is a summary of the airframe and engine examination; a detailed report is located within the public docket.

Mast and Rotor Assembly

The rotor assembly sustained minimal thermal damage, and remained largely intact. The folding mast clamp remained intact, and connected to the mast support tubes. The support tubes and mast were thermally consumed about three feet below the clamp. The rotor head pivot bolts remained intact, and the assembly could be pivoted by hand to the stops in both the longitudinal and lateral directions.

All rotor assembly bump stops, bushings, plastic washers, and pivot plates, exhibited significant contact damage, gouge marks, and grazing consistent with over-travel of the primary rotor system components.

Main Rotor Blades

Both main rotor blades remained attached to the blade hub bar, which was connected to the teetering hinge within the rotor head. The first blade exhibited a 10-degree downward curve along its entire length. No leading edge or chord wise scratches or gouges were present, and the trailing edge exhibited wrinkles along the inboard 2/3 of its length.

The hub bar section of the second rotor blade was bent downwards about 5 degrees at the teeter hinge point. The blade exhibited similar trailing edge wrinkles along the inboard 2/3 of its length with a 30-degree upwards bend starting about midspan. A semicircular puncture was present on the lower skin of the blade, about 100 inches from the teeter hinge bolt, and just aft of the leading edge spar. The puncture was consistent with the blade striking the pilots footrest crossbar. Three scour marks coated in grey dust-like material were present on the lower blade surface, about 57 inches from the root. Eight chordwise scratches spaced at 2-inch-intervals emanated outboard from these marks. The marks and scratches were consistent with the main rotor blade and engine propeller blade tips coming into contact with each other while both still rotating.

Fuselage Structure

The majority of the main landing gear support components were consumed by fire, with only the steel attachments and fittings remaining. The keel boom separated from the fuselage just forward of the landing gear trailing arm. Crush damage and a black transfer mark were present on the right side of the keel boom, in the area adjacent to the engine driven propeller rotational plane.

Engine

The engine sustained extensive thermal damage, and the carburetors and most ancillary components were consumed. The engine mounting bolts were in place. The reduction gearbox was intact, and no indication of catastrophic engine or gearbox failures were noted. The engine spark plugs were removed, and all exhibited light gray deposits, with no mechanical damage. The engine cylinders were examined with a borescope, and were free of catastrophic damage.

Propeller

The propeller hub remained attached to the gearbox output drive. All blades had separated about 4

inches from the hub and exhibited tip damage. Two blades sustained thermal damage and were located in the airframe remnants; the third blade was free of thermal damage, and was located about 25 feet north of the engine. This blade exhibited white transfer marks and crush damage to the outboard leading edge.

Administrative Information

Investigator In Charge (IIC):	Simpson, Eliott
Additional Participating Persons:	Tony Moore; FAA FSDO; Portland, OR Jim Vanek; Sport Copter; Scappoose, OR
Original Publish Date:	October 27, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87930

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