



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Umatilla, FL	<b>Accident Number:</b>	ERA17FA339
<b>Date &amp; Time:</b>	09/28/2017, 1122 EDT	<b>Registration:</b>	N152AH
<b>Aircraft:</b>	HICKOX ANDY ANDYS GYROPLANE	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Abrupt maneuver	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Personal		

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## Analysis

The private pilot, who was endorsed for solo flight in the experimental, amateur-built gyroplane, was conducting a personal flight. About 1 1/2 hours after takeoff, a witness saw the gyroplane flying about 50 to 60 ft above ground level then heard two "bang" or "pop" sounds. The engine then lost all power and a section of one main rotor blade separated about the same time. The gyroplane entered an uncontrolled descent and impacted a wooded area. Components of the gyroplane consisting of the vertical stabilizer and rudder, which exhibited evidence of contact by the main rotor, and pieces of foam and propeller blade fragments were located along the energy path. Postaccident examination of the gyroplane revealed no evidence of preimpact failure or malfunction of the flight controls for the main rotor, while examination of the engine revealed that the electrical connection from the coil of the crank triggered ignition, which did not have a secondary locking device, was disconnected; this would have resulted in the loss of engine power. The investigation could not determine if any prior maintenance was performed on the gyroplane which would have resulted in disconnecting and reconnecting the crank triggered electrical connection.

Although the pilot's control response following the loss of engine power could not be determined, main rotor contact with the vertical stabilizer/rudder is consistent with either an unloading of the main rotor blades, or an overcorrection (excessive control input) following the loss of engine power.

While toxicology testing indicated that the pilot had used diphenhydramine at some time before the accident, the blood level of the potentially impairing medication could not be determined. Based on the circumstances of the accident, it is unlikely that the pilot's use of diphenhydramine contributed to the accident.

## Probable Cause and Findings

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

The pilot's improper response to a total loss of engine power, which resulted in main rotor blade contact with the rudder and vertical stabilizer, and a subsequent uncontrolled descent. The loss of engine power was due to the separation of the electrical connector to the coil of the crank triggered ignition system.

## Findings

<b>Aircraft</b>	Performance/control parameters - Capability exceeded (Cause) Ignition system wiring - Malfunction (Cause)
<b>Personnel issues</b>	Incorrect action performance - Pilot (Cause)

## Factual Information

### History of Flight

<b>Enroute-cruise</b>	Loss of engine power (total) Abrupt maneuver (Defining event) Part(s) separation from AC
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On September 28, 2017, about 1122 eastern daylight time, an experimental, amateur-built gyroplane, N152AH, impacted terrain near Umatilla, Florida. The private pilot was fatally injured and the gyroplane was destroyed. The gyroplane was privately owned and operated by the pilot as a Title 14 *Code of Federal Regulations (CFR)* Part 91 personal flight. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed for the flight, which originated about 1 hour 22 minutes earlier from Bob White Field Airport (X61), Zellwood, Florida.

A witness reported to a Federal Aviation Administration (FAA) inspector that he saw the gyroplane flying in a north-northwesterly direction about 50 to 60 ft above ground level. He heard the engine running, followed by the sounds of two "bangs" or "pops." The witness reported seeing a large main rotor blade separate, which occurred "as soon as the engine stopped working." The gyroplane began descending and he lost sight of it, but then heard the impact. He drove to the accident site and informed the property owner of the accident.

The pilot's route of flight between the departure airport and the witness sighting immediately before the accident could not be determined.

### Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	73, Male
<b>Airplane Rating(s):</b>	Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	BasicMed With Waivers/Limitations	<b>Last FAA Medical Exam:</b>	07/10/2017
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	3140 hours (Total, all aircraft), 23 hours (Total, this make and model), 23 hours (Last 90 days, all aircraft), 6.4 hours (Last 30 days, all aircraft)		

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. He received an endorsement from a flight instructor for solo flight training in the accident gyroplane on August 30, 2017, in accordance with 14 *CFR* Part 61.87(c). The pilot's was operating under the provisions of Basic Med and his most recent physical examination was completed on July 10, 2017.

A review of his 4th pilot logbook, which contained entries from January 10, 2010, to September 24, 2017, revealed that the pilot logged about 3,140 hours of flight experience. There were no logged flights between May 29, 2013, and July 8, 2017; between July 8, 2017, and August 31, 2017, he logged 11 dual flights with an instructor in the accident gyroplane, totaling about 20 hours. Between August 31, 2017, and September 24, 2017, he logged six solo flights totaling about 3 hours; one of the flights did not have the flight duration listed.

According to the flight instructor who flew with the pilot during the 11 instructional flights, at that time, the gyroplane was not equipped with a horizontal stabilizer on the mast or on the tail, but it was equipped with a standard pitch trim configuration, which preloaded the main rotor blades with springs. Training provided to the accident pilot included loss of engine power ("engine-out") maneuvers that were performed on final approach and on the downwind and base legs of the airport traffic pattern. At no time was the engine secured as part of the training; the engine-out was simulated by operating the engine between 2,800 and 3,000 rpm, which produced the same aerodynamic drag as an engine at idle. That power setting resulted in greater drag than if the propeller was stopped, which would result in an increased rate of descent. At the completion of the training, he endorsed the pilot's logbook for solo flight, and also logged ground training that he provided the pilot.

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	HICKOX ANDY	<b>Registration:</b>	N152AH
<b>Model/Series:</b>	ANDYS GYROPLANE NO SERIES	<b>Aircraft Category:</b>	Gyroplane
<b>Year of Manufacture:</b>	2008	<b>Amateur Built:</b>	Yes
<b>Airworthiness Certificate:</b>	Experimental	<b>Serial Number:</b>	H2-97-8-279
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	06/20/2017, Condition	<b>Certified Max Gross Wt.:</b>	1320 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Subaru
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	2.2
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The two-place gyroplane, kit serial number H2-97-8-279, was manufactured in 2008 as an RAF 2000 model, and was equipped with a Subaru 4-cylinder 2.2 engine, which drove a composite three-bladed propeller. A digital engine tachometer and separate digital main rotor tachometer were located in the wreckage, but neither tachometer contained non-volatile memory. The builder/previous owner reported the gyroplane was considered to have a high thrust line (the propeller thrust line was above the center of gravity).

Review of the gyroplane's maintenance records revealed that its most recent condition inspection was completed on June 20, 2017. The total time at the time of the last inspection was not recorded. The previous owner reported that the gyroplane had about 218 hours total time when it was sold to the accident pilot on July 5, 2017.

The flight instructor who gave the dual instruction reported that the gyroplane flew well and that the rotor was smooth.

An entry in the engine logbook, dated August 26, 2017, indicated that the accident pilot secured the wires from the "coil" of the crank triggered ignition to an adjacent tube with silicone, and changed the spark plugs. It could not be determined if the coil wire was disconnected and reconnected at that time or any other time during the gyrocopter's operational history.

The preflight checklist specified to make sure all electrical wires in the engine compartment were secure, and included, "Special note should be made of the coil wire."

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	LEE, 76 ft msl	<b>Distance from Accident Site:</b>	10 Nautical Miles
<b>Observation Time:</b>	1053 EDT	<b>Direction from Accident Site:</b>	241°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	8 Miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	Light and Variable /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	Variable	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.95 inches Hg	<b>Temperature/Dew Point:</b>	32° C / 22° C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Zellwood, FL (X61)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Zellwood, FL (X61)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	1000 EDT	<b>Type of Airspace:</b>	

At 1053, a surface weather observation taken at Leesburg International Airport (LEE), Leesburg, Florida, located about 10 nm west-southwest of the accident site, reported variable wind at 3 knots, 8 miles visibility with clear skies, temperature 32°C, dew point 22°C, and an altimeter setting of 29.95 inches of mercury.

### Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	28.907778, -81.636389

The gyroplane crashed into a wooded area on private property. Components of the gyroplane consisting of pieces of the propeller blades, foam, fiberglass, and components of the vertical stabilizer and rudder were located on the ground along the direction of flight, south of the resting position of the main wreckage. A section of main rotor blade measuring about 12 ft long was located along the direction of flight south of the main wreckage (see Figure of Google Earth plot depicting key position of components).



Figure: Google Earth Plot Depicting Key Position of Components.

The wreckage was upright and resting on its right side at the base of a pine tree, and was oriented on a magnetic heading of 080°. The horizontal stabilizer and tailwheel were not located, and the longitudinally oriented structural member in the area of the electric fuel pumps was fractured consistent with overload. The rudder flight controls exited the tailboom but were fractured consistent with overload. Examination of the separated section of main rotor blade revealed black, chordwise-oriented marks on the bottom of the blade about 16 inches outboard from the fracture surface. The spar at the blade root was fractured and displaced upward. The fracture surfaces of the main rotor blade were removed and submitted to the NTSB Materials Laboratory, which revealed a highly textured, matte gray fracture surface consistent with an overstress separation. No indications of pre-existing cracking such as fatigue or corrosion were noted at the fracture. The adjacent portions of the spar and skin were deformed and cracked, consistent with nearly 90° of upward blade bending when the spar separation occurred. Examination of the other main rotor blade revealed that it was deformed upward about 90°; chordwise-oriented black marks were noted on the bottom surface of the blade near the blade retention straps.

The upper left side of the rudder exhibited a smooth cut oriented on an angle about 20° down from the forward edge, while the upper portion of the vertical stabilizer exhibited a smooth cut surface about a 50° downward angle from the manufactured upper edge. Both cuts were consistent with being made by the main rotor blade(s).

Flight control continuity was confirmed from the pilot's control to the upper swashplate.

The engine remained attached to the airframe and the propeller remained attached to the engine, but all propeller blades were shattered at varying lengths. Rotation of the propeller by hand revealed crankshaft, camshaft, and valve train continuity to all cylinders. Roughness was noted during rotation of the engine, which was not attributed to be from the propeller gearbox. Disassembly of the engine was not performed. Examination of the spark plugs revealed that all gaps measured within specification and all were light gray in color with no defects noted. The ignition timing was not determined. Examination of the air induction, exhaust, fuel metering, and cooling systems revealed no evidence of preimpact failure or malfunction.

Examination of the coil of the crank triggered ignition system, which was mounted on the top aft portion of the engine at its centerline and adjacent to the propeller gearbox, revealed that the Nos. 2 and 4 spark plug wires remained connected; however, the Nos. 1 and 3 spark plug wires were separated. Examination of the Nos. 1 and 3 spark plug wires revealed that they were secured by plastic ties to the cable housing of the prerotator, which was displaced away from its normal position at the engine centerline. Further examination of the coil of the crank triggered ignition system revealed white-colored sealant at the base of the unit and on the electrical wires extending from the bottom of the unit. The female electrical connector from the coil of the crank triggered ignition system was not secured to any part of the engine, and the mating male electrical connector was separated. Dirt was noted inside each electrical terminal of the male connector. Closer inspection of the female connector from the coil of the crank triggered ignition system revealed that the lock tab exhibited a slight displacement of material at the edge, and an area of the exterior contained white-colored sealant, as did an adjacent support

tube. The male electrical connector from the coil of the crank triggered ignition system was secured by plastic wraps in several locations along its length to the forward portion of the engine with no evidence of displacement of the wire. Further examination of the female and male connectors of the coil from the crank triggered ignition system revealed that the locking tab and associated flat portion of the opposite connector were not fractured or failed. When properly secured, attempts to pull the connectors apart by hand were unsuccessful. There was no secondary locking device on the electrical connection.

A recovered cell phone was submitted to the NTSB Vehicle Recorder Division; there were no videos or pictures on the phone for the accident flight. An application called Avare was active on the phone; however, the tracks function was disabled so no flight data was available.

## Medical And Pathological Information

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An autopsy of the pilot was performed by the District 5 Medical Examiner's Office, Leesburg, Florida. The cause of death was "multiple blunt force injuries due to gyrocopter crash."

Toxicology testing was performed at the FAA Forensic Sciences Laboratory (FAA Laboratory), Oklahoma City, Oklahoma, and NMS Labs, Willow Grove, Pennsylvania. According to the FAA Laboratory toxicology report, no ethanol was detected, but an unquantified amount of diphenhydramine was detected in the liver and muscle specimen. Testing for carbon monoxide and cyanide was not performed.

According to the NMS Labs toxicology report, during testing for ethanol, the value increased from 160 to 620 mg/100g over multiple analyses, which was attributed to be from the nature of the specimen and/or container type, which may not have contained preservative. The report further indicated that, other than ethanol, there were no positive findings of toxicological significance.

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over-the-counter under the names Benadryl and Unisom. Diphenhydramine carries the following Food and Drug Administration warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).

## Tests And Research

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The FAA Rotorcraft Flying Handbook describes that when the propeller thrust line is above the center of gravity, the gyroplane has a tendency to pitch nose up when power is removed. Pilot-induced oscillation (PIO) or porpoising is an unintentional up-and-down oscillation of the gyroplane accompanied with alternating climbs and descents, and often the result of an inexperienced pilot overcontrolling the gyroplane. The handbook also indicates that gyroplanes

experience a slight delay between control input and the reaction of the aircraft, which may cause an inexperienced pilot to apply more control input than required. Because of the nature of delay in aircraft response, it is possible for the corrections to be out of synchronization with the movement of the aircraft and aggravate the undesired changes in attitude.

## Additional Information

According to a designated pilot examiner who had about 3,000 hours of flight experience in gyroplanes and 2,800 hours as an instructor in gyroplanes, a pilot's normal tendency following a loss of engine power would be to push forward on the control stick.

A representative of the gyroplane kit manufacturer reported that main rotor contact with the vertical stabilizer can occur in any gyroplane if the main rotor blades are unloaded in flight, or by excessive control pitch inputs by the pilot (overcorrecting).

The accident pilot's flight instructor reported that the pilot performed well when he would quickly reduce or increase power and had little or no tendency for pilot-induced oscillation (PIO).

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Timothy W Monville	<b>Report Date:</b>	06/25/2019
<b>Additional Participating Persons:</b>	Robert Gonzalez; FAA/FSDO; Orlando, FL		
<b>Publish Date:</b>	06/25/2019		
<b>Note:</b>	The NTSB traveled to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=96105">http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=96105</a>		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).