



National Transportation Safety Board Aviation Accident Final Report

Location:	Boynton Beach, FL	Accident Number:	ERA15FA141
Date & Time:	03/02/2015, 1252 EST	Registration:	N787Z
Aircraft:	COLYAER SL FREEDOM	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The airline transport pilot departed in his light sport aircraft with a friend, who held a student pilot certificate, on a cross-country flight to another airport for lunch. GPS data showed the airplane maneuvered near the accident site for about 30 minutes, performing multiple climbs, descents, and turns. Several witnesses reported hearing the engine "sputter," which was immediately followed by an advance in engine power. Although the airplane's final movements were not captured by witness reports or radar/GPS data, examination of the accident site showed that the airplane was in a steep descent when it impacted a swamp. The impact geometry was consistent with an in-flight loss of control and subsequent uncontrolled descent to ground impact. A postcrash fire ensued, which consumed most of the airplane.

Postaccident examination of the airplane and the engine did not reveal any mechanical anomalies that would have precluded normal operation. Although the environmental conditions were favorable for light icing at glide or cruise power, witnesses reported that the engine regained power after "sputtering"; such a gain in power is not consistent with a carburetor ice condition. The cause of the "sputtering" reported by the witnesses could not be determined because the extensive fire damage precluded testing of the engine-driven fuel pump, carburetors, and ignition system components.

The pilot reported a vibration in the control stick to the airplane manufacturer in the days leading up to the accident. The manufacturer responded to the pilot on the morning of the accident and stated that the vibration could be the result of an inadequately balanced engine or propeller. However, the propeller's effect on the airplane's performance could not be determined because two of the blades were not recovered from the accident site and the acetal pitch change slide block within the propeller hub was consumed by postcrash fire.

Although sedating medications were found in toxicological specimens from both occupants, and the pilot's autopsy found evidence of severe coronary artery disease, the investigation could not determine if these physiological conditions contributed to the accident.

Probable Cause and Findings

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

An in-flight loss of control for reasons that could not be determined based on the available evidence.

Findings

Aircraft	Performance/control parameters - Not attained/maintained (Cause)
Not determined	Not determined - Unknown/Not determined (Cause)

Factual Information

History of Flight

Enroute-cruise	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On March 2, 2015, about 1252 eastern standard time, a Colyaer Freedom S100, N787Z, collided with terrain after a loss of control near Boynton Beach, Florida. The airline transport-rated pilot and passenger were fatally injured, and the airplane was destroyed by impact forces and postcrash fire. The airplane was registered to the pilot and was being operated as a 14 *Code of Federal Regulations* Part 91 local personal flight. Visual meteorological conditions prevailed, and no flight plan was filed. The flight departed from Palm Beach County Park Airport (LNA), West Palm Beach, Florida at 1217.

The pilot's wife reported that the pilot and passenger had planned to fly to Okeechobee, Florida, for lunch and then return home. The airplane's flight path was captured by data recovered from an onboard Garmin 496 global positioning satellite (GPS) unit. A review of the data showed that, after its departure, the airplane maintained a westerly course to a wildlife refuge about 9 nautical miles (nm) west of LNA. The airplane then maneuvered over the wildlife refuge completing numerous descents, climbs, and turns. The last GPS point recorded was at 1251:18 and showed the airplane at a GPS altitude of 883 ft with a ground speed of 57 knots.

According to witnesses who were fishing about 1/2 mile from the accident site, they observed the airplane flying over the wildlife refuge for about 20 to 30 minutes and then heard the engine make a sound that they described as a "sputter." One witness said the sound resembled a sound his boat motor makes when it runs out of fuel and the cylinders are misfiring. The engine then "revved up" almost instantaneously, which was followed by a loud boom about 30 seconds later. The witnesses did not observe the airplane's descent or impact but did notice smoke coming from the wreckage after it came to rest.

Pilot Information

Certificate:	Airline Transport; Commercial; Flight Engineer	Age:	64, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	Unknown
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 With Waivers/Limitations	Last FAA Medical Exam:	02/04/2015
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	19400 hours (Total, all aircraft), 132 hours (Total, this make and model)		

Pilot-Rated Passenger Information

Certificate:	Student	Age:	66, Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	None	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Sport Pilot None	Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	35.9 hours (Total, all aircraft), 0 hours (Total, this make and model)		

The pilot, age 64, held an airline transport certificate with ratings for airplane multi-engine land and single-engine sea. He reported a total flight experience of 19,400 hours and 300 flight hours in the previous 6 months on his latest first-class medical certificate application, which was dated February 3, 2015. A copy of the pilot's personal logbook was provided by his family, but it did not contain any entries beyond December 2013. According to the logbook entries, the pilot had accumulated a total of 128 flight hours from March 2008 to December 2013 in the accident airplane make and model. The pilot's wife estimated that the pilot had accrued an additional 5 flight hours between January 2014 and the day of the accident.

A follow-up interview with the pilot's wife was used to construct a 72-hour history of the pilot's activities. In the days leading up to the accident, the pilot completed some construction projects around the house and attended a church service. He received about 9 hours of uninterrupted sleep the night before the accident. The pilot's wife observed no abnormalities in the pilot's behavior or sleep patterns on the day of the accident nor did she detect any unusual behavior from the pilot in the 3 days that preceded the accident. She further remarked that her husband would not have allowed the passenger to fly the airplane.

The passenger, age 66, held a student pilot certificate with an endorsement to conduct solo flights in a Czech Sport Aircraft Sportcruiser. He did not possess a medical certificate. A copy of

the passenger's logbook, which included entries from 2013 to February 23, 2015, was provided by his family. According to the logbook, the passenger had accumulated about 36 hours of total flight experience at the time of the accident.

According to a 48-hour history provided by the passenger's wife, he stayed near the house during the 2 days that preceded the accident. The passenger and the pilot had planned the recreational flight a few weeks prior, and her husband had been talking about it in anticipation for several days. She remarked that her husband did not have any health issues and exercised regularly at a local gym; however, he was taking cholesterol medication. He normally went to sleep between 2200 and midnight and woke up around 0700. The passenger's wife did not observe any abnormalities in his behavior or sleep pattern in the days leading up to the accident.

Aircraft and Owner/Operator Information

Aircraft Make:	COLYAER SL	Registration:	N787Z
Model/Series:	FREEDOM S100	Aircraft Category:	Airplane
Year of Manufacture:	2008	Amateur Built:	No
Airworthiness Certificate:	Experimental	Serial Number:	130-001-027
Landing Gear Type:	Retractable -	Seats:	2
Date/Type of Last Inspection:	02/20/2015, Condition	Certified Max Gross Wt.:	1433 lbs
Time Since Last Inspection:	1 Hours	Engines:	1 Reciprocating
Airframe Total Time:	147 Hours at time of accident	Engine Manufacturer:	Rotax
ELT:	C91 installed, activated, did not aid in locating accident	Engine Model/Series:	912ULS
Registered Owner:	On file	Rated Power:	100 hp
Operator:	On file	Operating Certificate(s) Held:	None

According to records collected from the Federal Aviation Administration (FAA) and the pilot's logbook, the pilot purchased the airplane in 2008 from the previous owner, who provided the accident pilot with 6 hours of instructional flight time in the airplane. At the time of purchase, the airplane had accrued a total of about 23 flight hours. About 6 months after he registered the airplane, the pilot visited the airplane manufacturer in Pontevedra, Spain, to receive supplemental flight training with the airplane's designer/builder.

According to FAA records, the amphibious airplane was manufactured in 2008 and registered to the pilot on May 30, 2008. The airplane was powered by a Rotax 912 ULS, a normally-aspirated, direct drive, 4 stroke liquid and air-cooled, 100 horsepower reciprocating engine. The aircraft logbooks were not recovered. A maintenance history was constructed from hand-

written copies of the logbook entries that were provided by the pilot's mechanic. The airplane's most recent condition inspection was completed on February 20, 2015, when the airplane had about 146 total flight hours.

According to the pilot's wife, she and the pilot decided to sell the airplane because they were not flying as much as they had initially planned. The pilot demonstrated the airplane to two prospective buyers about 1 week before the accident. During each flight, he departed from LNA, performed a touch and go in the water near his house, and then returned to LNA. At the conclusion of one of the demonstration flights, a cylinder head temperature probe was replaced. According to the mechanic who replaced the probe, he completed a ground run in the airplane after installing the new probe and did not observe any anomalous temperature indications.

About 1 week before the accident, the pilot wrote to the manufacturer about a small vibration in the control stick that a potential buyer had noticed. The manufacturer responded to the pilot on the morning of the accident and stated that the vibration could be the result of an inadequately balanced engine or propeller. A representative of the mechanic stated that his client installed only "one propeller" in his history with the accident airplane. Maintenance records supplied by the pilot's mechanic indicated that he replaced a Warp Drive propeller with an Airmaster AP332R variable pitch propeller hub with three Warp Drive propeller blades in October 2012. Further, the mechanic stated that he did not observe any anomalies with the propeller following its installation. He did not recall if the propeller had been balanced.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BCT, 13 ft msl	Distance from Accident Site:	8 Nautical Miles
Observation Time:	1253 EST	Direction from Accident Site:	90°
Lowest Cloud Condition:	Scattered / 2200 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 3700 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	7 knots / 14 knots	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	90°	Turbulence Severity Forecast/Actual:	/ N/A
Altimeter Setting:	30.23 inches Hg	Temperature/Dew Point:	26° C / 20° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WEST PALM BEACH, FL (LNA)	Type of Flight Plan Filed:	None
Destination:	Okeechobee, FL (OBE)	Type of Clearance:	None
Departure Time:	1217 EST	Type of Airspace:	

The 1253 recorded weather observation at Boca Raton Airport, Boca Raton, Florida, included wind from 090° at 7 knots gusting 14 knots, 10 statute miles visibility, clouds scattered at 2,200 ft and 2,700 ft, and broken at 3,700 ft, temperature 26° C, dew point 20° C; barometric altimeter 30.23 inches of mercury.

According to an FAA carburetor icing probability chart, the recorded weather conditions were conducive to light icing at glide or cruise power.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	26.520278, -80.222222

The airplane came to rest upright in swamp water on a southeasterly heading about 40 ft from a dirt road and 1 nm from the airplane's final GPS target. All major components of the airplane were accounted for at the accident site. Most of the fuselage and empennage were consumed by fire. The right wing displayed fire damage, the wingtip was separated, and the inboard wood spar was broken at the fuselage. The elevator separated from the tail section and was located several feet behind the main wreckage. All three composite propeller blades had fractured and separated from the propeller hub.

Airframe

Postaccident examination of the airframe was completed at a secure facility by a Federal Aviation Administration inspector (FAA), the NTSB Investigator-in-Charge, and a representative from the engine manufacturer. The aileron flexball cable was traced from the cockpit flight controls to the right aileron through the center bellcrank. The left aileron was destroyed by fire; however, although thermally damaged, the left aileron flexball cable extended from the center bellcrank to an allen bolt that is normally coupled to the left aileron. The wing flap control system was not recovered.

Continuity of the elevator flexball control cable was confirmed from the elevator to the cockpit flight controls. The right and left occupants' rudder pedals moved synchronously, which actuated the center bellcrank assembly. About 6 inches of push rod, which extended from the rudder into the vertical stabilizer, was present; however, the rudder control tubes that connected to the push rod at the vertical stabilizer were not recovered.

The wing fuel tanks were destroyed by fire, but the fuselage tank remained intact and contained trace amounts of blue colored fuel that resembled 100 low lead aviation grade gasoline. The gascolator filter was free of debris, and the gascolator bowl was void of fuel.

The throttle and choke controls were confirmed from the throttle/choke quadrant to the carburetors.

All three composite propeller blades were separated and about 6 inches of each blade remained connected to the propeller hub. Each of the remaining blade sections displayed composite fibers that were thermally damaged. The propeller blade ferrules were covered in soot, and the propeller spinner exhibited blistering, consistent with fire damage. A section of propeller blade that measured about 15 inches in length was co-located with the main wreckage and did not exhibit any fire damage. The other two propeller blades were not recovered. A visual inspection of the propeller extension shaft found that it was about 10 inches in length, which was 4.72 inches beyond the engine manufacturer's maximum limitation.

The propeller hub and blade remnants were sent to the NTSB material's laboratory in Washington, D.C., for further examination. The control wires and metallic components of the pitch change mechanism within the hub were intact; however, the pitch change slide, which was composed of acetal, was melted and not attached to the drive screw.

Engine

The engine was intact and remained attached to the engine mounts. An attempt to rotate the crankshaft at the propeller flange was unsuccessful as a result of the thermal damage to the engine crankcase. A nut on the ignition housing was fused to the crankshaft, which precluded disassembly of the crankcase. A visual examination of the connecting rods and crankshaft through the cylinder portholes did not reveal any anomalies.

The electronic modules and external triggers to the engine's dual capacitor discharge ignition system were consumed by postcrash fire and could not be examined. The functionality of the ignition coils and cables could not be confirmed due to extensive damage. Both the stator and flywheel were damaged by fire, which precluded functional testing.

The engine driven fuel pump was destroyed by fire and could not be tested. Both constant depression diaphragm carburetors were displaced from the intake manifolds and destroyed by fire, which precluded an inspection of the floats, fuel bowls, and diaphragms.

Both the top and bottom spark plugs were removed from each cylinder for inspection; each plug appeared grey in color, consistent with normal operating signatures. All 8 spark plug electrode gaps were within the gap range prescribed by the manufacturer. Rust deposits were observed along the rim of several of the spark plug cases.

The cylinder heads exhibited evidence of exposure to postcrash fire; however, each piston displayed signatures consistent with normal combustion, and all of the cylinder valve faces and seats were in place. Each cylinder bore exhibited cross-hatching with no indications of scoring or oil starvation. An inspection of the valves, valve springs, rocker arms, and push rods did not reveal any anomalies.

An inspection of the oil pump did not reveal any anomalies; however, the unit was thermally

damaged and could not be functionally tested. The oil tank was partially damaged by fire, but remained intact and displayed some oil residue within the sump case. The oil cooler, oil filter, and oil lines were consumed by postcrash fire and could not be examined.

The engine reduction gearbox displayed some soot residue on the case; however, the internal gearset did not display any anomalies. Remnants of oil were observed within the gearbox.

Medical And Pathological Information

Autopsies were performed on both occupants by District 15 - State of Florida, Office of the District Medical Examiner, West Palm Beach, Florida. The autopsy reports listed the cause of death for the pilot and the passenger as blunt impact injuries of head, neck, torso, and thermal injuries. The pilot's autopsy found significant diffuse, calcific, severe coronary artery disease with focal narrowing by 75-80% in both the left anterior descending and right coronary arteries and a scar along the septum.

Forensic toxicology testing was performed on specimens of the pilot and passenger by the FAA Bioaeronautical Science Research Laboratory, Oklahoma City, Oklahoma. Testing on specimens of the pilot detected the presence of cetirizine and losartan in the blood and urine and salicylate in the urine. Toxicology testing performed on specimens of the passenger detected cetirizine, chlorpheniramine, diphenhydramine, hydroxyzine, losartan, naproxen, quinine, and salicylate in the urine. Cetirizine, chlorpheniramine (0.022 ug/ml), diphenhydramine (0.0031 ug/ml), and losartan were also identified in the passenger's cavity blood.

Cetirizine is an antihistamine available over the counter, commonly marketed with the name Zyrtec. It carries a warning, "When using this product, drowsiness may occur; avoid alcoholic drinks; alcohol, sedatives, and tranquilizers may increase drowsiness; be careful when driving a motor vehicle or operating machinery." Chlorpheniramine, diphenhydramine, and hydroxyzine are all sedating antihistamines, and each carries a warning about operating machinery due to drowsiness or "marked drowsiness." Chlorpheniramine is commonly sold under the names Chlortrimeton and Chlor-tab; therapeutic blood levels are between 0.0100 and 0.0400 ug/ml. Diphenhydramine is available in a large number of products marketed as treatments for cold symptoms and allergies. Additionally, diphenhydramine is used as the active ingredient in a number of over the counter sleep aids. Therapeutic blood levels are between 0.0250 and 0.1120 ug/ml. Finally, hydroxyzine is a prescription sedating antihistamine commonly sold under the names Atarax and Vistaril.

Due to their warnings of drowsiness, all four of the antihistamines found in the passenger's blood meet the FAA's criteria for waiting 5 maximum dosing intervals before flight.

Administrative Information

Investigator In Charge (IIC):	Stephen R Stein	Report Date:	03/29/2017
Additional Participating Persons:	John R Stephenson; FAA/FSDO; Miramar, FL Jordan Paskevich; Rotax Engines Silvia Tilves; Colyaer Aircraft; Pontevedra,		
Publish Date:	03/29/2017		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=90801		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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](#).