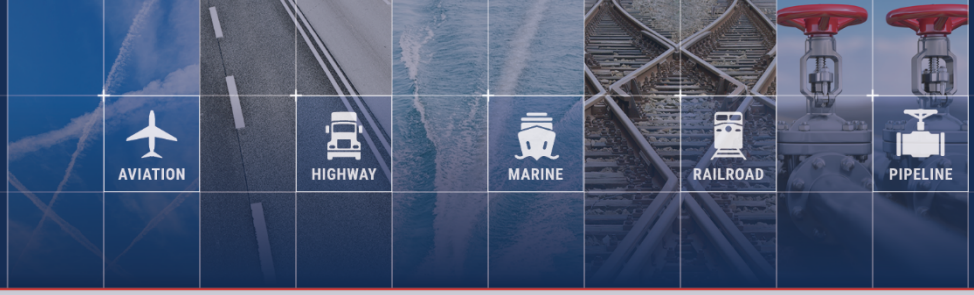

Aviation Investigation Final Report

Location:	Palatka, Florida	**Accident Number:**	ERA19LA141
Date & Time:	March 30, 2019, 16:59 Local	**Registration:**	N81KK
Aircraft:	Flight Design CTLS	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that the cross-country flight was uneventful until he was approaching the destination airport from the north, when the engine lost total power. He was unable to restart the engine and prepared for a forced landing in a clearing. He deployed the airplane's Ballistic Recovery System (BRS); the rocket fired, but the parachute remained in its container. During the forced landing, the airplane was substantial damage and the pilot and passenger were seriously injured.

The pilot reported that he began the flight with about 13.5 gallons of fuel on board, which was consistent with the recorded fuel quantity remaining indicated by the airplane's engine monitoring system (EMS); however, this value was not directly measured and depended on pilot input. There was no odor of fuel or evidence of fuel leaks at the crash site. The fuel tanks were not compromised during the impact and no fuel was found in the fuel tanks during recovery.

The engine and fuel system were examined after the accident and a test run was performed. The engine ran normally on the airframe and no evidence of a preexisting mechanical failure or anomaly was found. Examination of the EMS data revealed that, during the power loss, fuel flow increased to more than twice the normal rate. According to the engine manufacturer, air introduced into the fuel system due to fuel exhaustion can result in a fuel flow increase due to the impeller on the fuel flow transducer speeding up. Given this information, it is likely that the initial fuel-on-board indications were incorrect (as they were not indications, but calculations based on pilot input) and that the loss of engine power was the result of fuel exhaustion.

An examination of the BRS revealed numerous conditions that were indicative of improper or nonexistent maintenance and inspections. These conditions, among others, included the following. The S-folded harnesses were improperly secured inside the egress panel. These harnesses improperly protruded into and blocked the egress opening. They also protruded into and blocked the opening of the parachute canister. During the attempted BRS deployment, a portion of the egress panel remained attached to the airframe due to improper bonding. This condition blocked the parachute container,

caused the rocket to deflect from its intended trajectory and resulted in the failure of the parachute to deploy.

The unairworthy condition of the BRS would have been prevented with proper preventative maintenance and use of the pilot's preflight inspection procedures for the BRS. A review of the aircraft maintenance logbooks showed no compliance with an airframe manufacturer's service bulletin that would have corrected these conditions if properly accomplished. Also, several of the airworthiness issues with the BRS could have been captured if the pilot's preflight procedures for the BRS had been properly performed.

Finally, the EMS data revealed that the pilot allowed the airspeed to decay below best glide speed during the final minute of flight before ground impact. Thus, the vertical speed of the airplane increased and most likely resulted in greater damage and injury versus maintaining best glide speed throughout the forced landing.

Probable Cause and Findings

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

The pilot's improper management of his fuel supply, which resulted in fuel exhaustion and a total loss of engine power. Contributing to the outcome was the improper maintenance of the airplane's ballistic recovery parachute system, which resulted in its failure to properly deploy. Also contributing, was the pilot's failure to maintain the proper glide speed through the subsequent forced landing.

Findings

Aircraft	Fuel - Fluid management
Personnel issues	Use of equip/system - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Emergency equipment - Incorrect service/maintenance
Personnel issues	Scheduled/routine maintenance - Maintenance personnel

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing

On March 30, 2019, about 1659 eastern daylight time, a Flight Design CTLS airplane, N81KK, was substantially damaged when it was involved in an accident near Palatka, Florida. The commercial pilot and one passenger were seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the pilot, preflight and ground operations were routine for the flight from Hilton Head Airport (HXD), Hilton Head Island, South Carolina to Palatka Municipal Airport (28J), Palatka, Florida. There were about 13.5 gallons of fuel on board, and the pilot estimated that 8.25 gallons would be burned on the flight at normal power settings. The flight departed HXD and continued uneventfully until approaching 28J from the north. While at 2,300 ft mean sea level (msl), the engine lost total power. An attempt to restart the engine was unsuccessful. While attempting to locate an area for a forced landing, the pilot chose, to deploy the Ballistic Recovery System (BRS) at an altitude between 1,200 and 1,000 ft msl. He pulled the handle for the BRS and the rocket fired; however, the parachute remained in its container. The airplane impacted terrain and contacted several tree stumps before coming to a stop. The pilot and passenger were met by first responders and taken to a local trauma center for treatment of their injuries.

The airplane was equipped with a Dynon EMS D-120 engine monitoring system. The unit recorded the entire accident flight, beginning at 1515:52 upon engine start, with about 13.625 gallons of fuel remaining on board. The airplane began to taxi at 1519:41 and the takeoff roll commenced about 1524:15.

At 1655:05, while approaching 28J, there was a sudden drop in fuel flow to zero with 5.5625 gallons of fuel remaining. At 1655:16, fuel pressure began to drop to zero. At 1655:44, engine rpm began to drop and fluctuate rapidly. At 1655:48, fuel flow spiked to 10.2 gallons per hour (gph). Normal fuel flow is about 4.8 gph at 5,000 rpm. According to the manufacturer, air introduced into the fuel system can result in a fuel flow indication spike due to the impeller on the fuel flow transducer speeding up.

The pilot reported that once a restart of the engine was unsuccessful, he established best glide speed of 68 kts. The EMS-D120 data revealed that, after the loss of engine power, a glide speed approximating 68 kts was established. The data also showed that, during the final 60 seconds of descent, the airspeed decayed, dropping to about 50 kts ground speed. Altitude data also indicated a high descent rate before ground impact, in excess of 1,700 ft per minute.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	68,Male
Airplane Rating(s):	Single-engine sea	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Sport pilot None	**Last FAA Medical Exam:**	April 1, 1988
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 25, 2018
Flight Time:	818 hours (Total, all aircraft), 176 hours (Total, this make and model), 771 hours (Pilot In Command, all aircraft), 63 hours (Last 90 days, all aircraft), 31 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Flight Design	**Registration:**	N81KK
Model/Series:	CTLS Undesignat	**Aircraft Category:**	Airplane
Year of Manufacture:	2008	**Amateur Built:**	
Airworthiness Certificate:	Special light-sport (Special)	**Serial Number:**	07-12-03
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	December 28, 2018 Condition	**Certified Max Gross Wt.:**	1320 lbs
Time Since Last Inspection:	77 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	627 Hrs at time of accident	**Engine Manufacturer:**	Rotax
ELT:	C91A installed	**Engine Model/Series:**	912 ULS
Registered Owner:	On file	**Rated Power:**	100 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The BRS-6 1350HS parachute installed was serial number 19944. BRS first packed the parachute on July 16, 2007. The parachute bag was marked PO12220, Lot 8. The system was then shipped to Flight Design, where it was installed into the accident airplane.

The BRS-6 1350HS requires a parachute repack every 6 years. BRS Sales Order No. 10204 indicated that parachute serial number 19944 was returned to BRS for repack on or about January 23, 2014. BRS completed the parachute repack on or about January 29, 2014, and then shipped the parachute to the aircraft service provider.

The airframe logbook contained an entry dated February 23, 2014, indicating that the parachute repack was accomplished, and the BRS parachute was reinstalled on the aircraft at that time. The entry stated that the aircraft was inspected in accordance with the manufacturer's maintenance and inspection procedures and was found to be in condition for safe operation.

The airframe logbook further indicated that annual condition inspections were completed on January 27, 2015, January 27, 2016, February 7, 2017, March 7, 2018, and November 28, 2018.

Pursuant to Section 3.1 of the Flight Design Maintenance and Inspection Procedures Manual, during each of these condition inspections, the service provider should have checked for compliance with all service bulletins applicable to the subject aircraft and its component parts. The aircraft maintenance records did not indicate compliance with Flight Design service bulletins.

Specifically, the aircraft maintenance records did not indicate that the airplane was in compliance with Flight Design Service Bulletin SB-ASTM-CTLS-11 - Verification of Rescue System Cover Installation. As a result, the airplane was returned to service without this SB compliance following the January 27, 2016, and later annual inspections. The aircraft maintenance records also did not indicate the BRS annual or 100-hour inspection procedures were ever complied with.

The following WARNING is included in the Dynon EMS 120D Pilot's User Guide (Fuel Computer Page): "The Fuel Remaining and Time Remaining values are not directly measured. These values are calculated based upon measured fuel flow rates and *user input* of fuel quantity. Do not use these values as primary indicators."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SGJ,9 ft msl	**Distance from Accident Site:**	27 Nautical Miles
Observation Time:	16:56 Local	**Direction from Accident Site:**	30°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	110°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.05 inches Hg	**Temperature/Dew Point:**	23°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hilton Head Is, SC (HXD)	**Type of Flight Plan Filed:**	None
Destination:	Palatka, FL (28J)	**Type of Clearance:**	None
Departure Time:	15:20 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	29.718334,-81.673057(est)

Structural damage was found on the lower and aft fuselage and at the wing tips. The airplane was recovered from the accident site by a local automobile recovery company and verification and/or quantification of fuel on board was not accomplished; however, the recovery team noted that no fuel was leaking from the wreckage at the scene and there was no odor of fuel in the area. The recovery team further noted that when the wings of the airplane were removed during the recovery process, no fuel leaked from fuel lines exiting the wing tanks or the aircraft. The fuel tanks were not compromised during the impact. The fuel lines were not capped off as the recovery team did not feel that this was necessary. Also, the fuel tanks were not emptied by the recovery personnel after securing the wreckage at their facility.

On April 1, 2019, the wreckage was retrieved from the automobile recovery company facility and transported to an aircraft recovery and storage facility. Personnel who performed this function reported that the wings were removed prior to their arrival and the fuel tanks were empty.

The wreckage was moved to an aircraft salvage facility for further examination. An examination of the carburetor, engine-driven fuel pump, fuel gascolator, in-line fuel filter, fuel lines, and lubrication system revealed no anomalies. A test run of the engine was conducted while the engine remained on the airframe. The fuel pump inlet line was disconnected and placed inside a surrogate container of fuel. The battery was charged with a battery charger. The starter was engaged and the engine started after a few rotations. The throttle was manipulated by hand and the engine ran without hesitation or stumbling at various power settings until the engine run was concluded. No anomalies were noted with the engine.

The airframe and BRS were further examined at the aircraft salvage facility. An examination of the BRS revealed the S-folded harnesses were improperly secured inside the egress panel. These harnesses improperly protruded into and blocked the egress opening. They also protruded into and blocked the opening of the parachute canister. During the attempted BRS deployment, a portion of the egress panel remained attached to the airframe. The examination revealed that the panel was improperly bonded to the airframe.

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph
Additional Participating Persons:	Donald Andrews; FAA/FSDO; Orlando, FL Thomas Peghiny; Flight Design USA; Woodstock, CT Enrique Dillon; BRS; Miami, FL Jordan Paskevich; Rotech Flight Safety; Vernon
Original Publish Date:	May 6, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99201