Aviation Investigation Final Report

Location:	Titusville, Florida	**Accident Number:**	ERA22FA015
Date & Time:	October 14, 2021, 15:51 Local	**Registration:**	N755V
Aircraft:	Velocity SE RG	**Aircraft Damage:**	Destroyed
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was conducting a personal flight in an experimental amateur-built airplane that he had owned for about 5 years before the accident. During short final approach, the airplane pitched up, climbed about 300 ft, descended nose down, and impacted a grass area next to the runway. A postcrash fire consumed most of the wreckage.

The elevator push-pull tube section that connected to the control stick was recovered with no threaded rod end engaged, and the rod end was not recovered. Metallurgical examination of the elevator push-pull tube section revealed no contact marks from the jam nut. Also, the first three threads in the threaded plug were missing. The threads had fractured in shear overstress, and likely resulted in the push pull tube separating during flight and the pilot's subsequent loss of airplane control.

Review of the airplane kit assembly manual revealed instructions to have at least 0.5 inches of thread engagement with the rod end in the 1.5-inch threaded plug (with a note indicating that "all the way in is best"). Due to the lack of maintenance documentation, the investigation could not determine when or why the most recent adjustment to the rod end was made.

Toxicology testing identified doxylamine in the pilot's specimens. The main effect from doxylamine that can degrade performance is sleepiness. Because sleepiness would not have likely led to the airplane's sudden pitch up during landing, the pilot's use of doxylamine likely did not contribute to the accident.

Probable Cause and Findings

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

The separation of the airplane’s elevator control push-pull tube, which resulted in a loss of control during the approach.

Findings

Aircraft	Elevator control system - Failure

Factual Information

History of Flight

Approach-VFR pattern final	Flight control sys malf/fail (Defining event)
Approach-VFR go-around	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On October 14, 2021, about 1551 eastern daylight time, an experimental amateur-built Velocity SE RG airplane, N755V, was destroyed when it was involved in an accident near Space Coast Regional Airport (TIX), Titusville, Florida. The pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

The pilot owned the airplane, which was based at TIX. The airplane flew uneventfully from TIX to Sebastian Municipal Airport (X26), Sebastian, Florida, earlier during the day of the accident. While at X26, the pilot visited the airplane kit manufacturer's facility to replace a landing-gear-up switch fuse because the landing gear was not retracting. Afterward, the pilot removed the pilot seat and the rear seat from the airplane and left the rear seat at the facility so that maintenance technicians could match color and specifications ahead of an interior aesthetics renovation planned for the next month. The pilot then reinstalled the pilot seat and departed X26 uneventfully about 1528 for the return flight to TIX.

According to witness statements, automatic dependent surveillance-broadcast data, and airport surveillance video, while the airplane was on short final approach to runway 9 at TIX, the airplane pitched up, climbed about 300 ft, then descended nose down. The airplane impacted a grass area about 400 ft right of the runway centerline and about 2,000 ft from the runway threshold. A postcrash fire ensued that consumed most of the wreckage.

Pilot Information

Certificate:	Airline transport; Commercial; Flight engineer; Flight instructor	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	July 19, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 13000 hours (Total, all aircraft), 200 hours (Total, this make and model)		

The pilot's logbook was not recovered. The president of the airplane kit manufacturer, who knew the pilot, estimated that the pilot had about 200 hours of total flight experience in the accident airplane make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	Velocity	**Registration:**	N755V
Model/Series:	SE RG	**Aircraft Category:**	Airplane
Year of Manufacture:	2006	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	DMO408
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Condition	**Certified Max Gross Wt.:**	2300 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	IO-390-A
Registered Owner:	On file	**Rated Power:**	215 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The maintenance logbooks were not recovered. The pilot purchased the airplane in 2016, about 10 years after it was assembled.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	TIX,33 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	15:47 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Scattered / 6000 ft AGL	**Visibility**	7 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.91 inches Hg	**Temperature/Dew Point:**	32°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Sebastian, FL (X26)	**Type of Flight Plan Filed:**	None
Destination:	Titusville, FL	**Type of Clearance:**	None
Departure Time:	15:28 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Space Coast Regional Airport TIX	**Runway Surface Type:**	Asphalt
Airport Elevation:	33 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	09	**IFR Approach:**	None
Runway Length/Width:	5000 ft / 100 ft	**VFR Approach/Landing:**	Go around;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	28.513889,-80.804444

The airplane came to rest upright and oriented along a magnetic heading of about 230°, and no debris path was observed. The cockpit and cabin were mostly consumed by fire. The flight control stick was not recovered. The pilot seat was identified, and the four bolts and their respective hard points remained attached. The pilot seat pin was also identified, but the seat frame was bent and separated, consistent with impact forces.

A Grand Rapids primary flight display and multifunction display were recovered and retained for data download. Both displays required an installed USB flash drive to record data, but no USB flash drives were installed in the units or recovered in the wreckage.

The left and right ailerons separated from their respective wings and were recovered near the wings. Aileron control continuity was confirmed from the separated ailerons to cables, a bellcrank, torque tubes, and the cockpit. The canard spar was intact but fire damaged and the left and right elevators were not recovered and presumed destroyed in the fire. The elevator push-pull tube section that connected to the control stick was recovered with no threaded rod end engaged, and the rod end was not recovered. Continuity of the elevator was confirmed from the torque tubes to the cockpit except for the push-pull tube section, which was retained for metallurgical examination. The elevator trim actuator was destroyed, and the preimpact elevator trim setting could not be determined. The left rudder was identified, and the right rudder was not recovered and presumed destroyed. The left rudder bellcrank remained intact, and its cable exhibited a broomstraw separation.

The engine separated from the airframe and came to rest upright. The three propeller blades remained attached to the hub, and all three blades separated about 12 inches from their respective roots. The top spark plugs were removed; their electrodes were intact and light gray in color. Borescope examination of the cylinders revealed no anomalies. The rear accessory section sustained thermal damage. After the rear accessory section was removed, the crankshaft could be rotated by hand. Camshaft, crankshaft, and valvetrain continuity were confirmed, and thumb compression was attained on all cylinders. Due to thermal damage, the ignition and fuel systems could not be tested.

Metallurgical examination of the elevator push-pull tube section revealed that it had been exposed to fire, causing a portion of the tube to collapse and melt. No contact marks from the jam nut were observed, and the first three threads in the threaded plug were missing. Examination with a stereo microscope revealed that the first three threads were fractured in shear overstress and that the remaining threads remained intact.

Medical and Pathological Information

An autopsy was performed on the pilot by the Office of the Medical Examiner for Brevard County, Rockledge, Florida. His cause of death was multiple blunt force injuries.

Toxicology testing performed on the pilot by the Federal Aviation Administration Forensic Sciences Laboratory identified doxylamine in the pilot's cavity blood (80 ng/ml) and in his liver. Doxylamine is a sedating antihistamine available over the counter in various products intended to treat allergy and cold symptoms and induce sleep. It carries specific warnings about sleepiness. The usual blood level in which effects would be expected in live people is between 50 and 200 ng/ml.

Additional Information

Review of the airplane kit assembly manual revealed instructions to have at least 0.5 inches of thread engagement with the rod end in the 1.5-inch threaded plug. A note indicated, "all the way in is best." Due to a lack of maintenance documentation recovered, the investigation could not determine when the rod end had been most recently adjusted (for more information, see Materials Laboratory Factual Report in the public docket for this accident).

Administrative Information

Investigator In Charge (IIC):	Gretz, Robert
Additional Participating Persons:	Laura Burns; FAA/FSDO; Orlando, FL Scott Swing; Velocity Aircraft; Sebastian, FL James Childers; Lycoming; Williamsport, PA
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