Aviation Investigation Final Report

Location:	Briggs, Texas	**Accident Number:**	CEN21LA346
Date & Time:	July 30, 2021, 14:40 Local	**Registration:**	N304AB
Aircraft:	HpH, Spol. S.R.O. Glasflügel 304S	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was departing on a local flight in the experimental glider when the glider unexpectedly separated from the towline shortly after liftoff. The glider then entered a left turn and landed in a wings-level attitude. The tailboom was substantially damaged during landing. The tow airplane and the towline were not damaged during the event.

Postaccident examination determined that the elevator control tube installed in the vertical stabilizer was corroded along the entire length of its inner surface, reducing its wall thickness. Water likely entered the control rod, either through a witness hole near the upper end of the control tube or as moisture carried in by humid air. There was no drain hole at the bottom end of the control tube and, as a result, there was no way for liquid water to drain out of the control tube.

The wall thickness eventually thinned sufficiently to cause the tube to burst in the longitudinal direction near its upper end. After the control tube burst, the resulting hole on the side of the tube allowed for the easy ingress of water that made its way past the boot seal. The corrosion product and standing water at the base of the tube eventually reduced the tube wall thickness to a point where it could no longer withstand the typical operational loads and subsequently fractured in overstress near the clevis fitting during the accident flight. The overstress failure of the control tube prevented the pilot's control of the elevator during the accident flight.

The last condition inspection of the glider was completed 24 days before the accident. The corresponding logbook entry noted that the flight controls were inspected, and that the glider was in an airworthy condition. The longitudinal fracture near the upper end of the elevator control tube would have been readily visible with the rubber boot removed and, as such, it is likely the mechanic did not remove the rubber boot to adequately inspect the elevator control tube during the last condition inspection.

Probable Cause and Findings

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

The overstress fracture of the elevator control tube due to reduced wall thickness from water intrusion and subsequent corrosion. Contributing to the accident was the lack of a drain hole at the bottom of the elevator control tube, which allowed the tube to collect water, and the mechanic's inadequate inspection of the elevator control system during the recent condition inspection.

Findings

Aircraft	Elevator control system - Fatigue/wear/corrosion
Aircraft	Elevator control system - Design
Aircraft	Elevator control system - Inadequate inspection
Personnel issues	Scheduled/routine maintenance - Maintenance personnel

Factual Information

History of Flight

Takeoff	Flight control sys malf/fail (Defining event)
Landing	Hard landing

On July 30, 2021, about 1440 central daylight time, a HpH, Spol. S.R.O Glasflügel 304S experimental glider, N304AB, was substantially damaged when it was involved in an accident near Briggs, Texas. The pilot was seriously injured. The glider was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the pilot of the tow plane, shortly after takeoff and while the tow plane was about 300 ft above the runway, the glider unexpectedly released from the towline. The glider entered a left turn and landed in a wings-level attitude. The tailboom separated from the aft fuselage during the landing. The tow airplane and the towline were not damaged during the event.

Pilot Information

Certificate:	Private	**Age:**	79,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	Glider	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	None None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 11, 2021
Flight Time:	2878 hours (Total, all aircraft), 1603 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	HpH, Spol. S.R.O.	**Registration:**	N304AB
Model/Series:	Glasflügel 304S	**Aircraft Category:**	Glider
Year of Manufacture:	2008	**Amateur Built:**	
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	004-S
Landing Gear Type:	Retractable - Tandem	**Seats:**	1
Date/Type of Last Inspection:	July 6, 2021 Condition	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo jet
Airframe Total Time:	2062 Hrs as of last inspection	**Engine Manufacturer:**	HpH, Spol. S.R.O.
ELT:	Not installed	**Engine Model/Series:**	Jet Propulsion Unit
Registered Owner:	On file	**Rated Power:**	900 Lbs thrust
Operator:	On file	**Operating Certificate(s) Held:**	None

According to the maintenance logbook, on July 6, 2021, the glider was inspected and found to be in an airworthy condition. The aviation mechanic with inspector authorization noted in the corresponding logbook entry that he had “checked controls” and that the condition inspection had been completed in accordance with Federal Aviation Regulations Part 43, Appendix D.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KGRK,1015 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	14:56 Local	**Direction from Accident Site:**	25°
Lowest Cloud Condition:	Scattered / 6000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.06 inches Hg	**Temperature/Dew Point:**	33°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Briggs, TX	**Type of Flight Plan Filed:**	None
Destination:	Briggs, TX	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	FLF Gliderport TX23	**Runway Surface Type:**	Grass/turf
Airport Elevation:	1150 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	16	**IFR Approach:**	None
Runway Length/Width:	4500 ft / 300 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	30.856293,-97.945853(est)

The experimental glider was equipped with a T-tail empennage. The elevator is controlled, in part, by a steel control tube, part number 304S-46-12, installed inside the vertical stabilizer in a vertical orientation. The upper end of the control tube terminates with a rod end bearing and the lower end of the control tube terminates with a clevis fitting. A rubber sealing boot is installed over the control tube at the upper end.

Postaccident examination revealed the elevator control tube fractured about 0.75 inch above the clevis fitting located at the lower end of the control tube, and there was a large longitudinal fracture/hole near the upper end of the control tube.

The elevator control tube was further examined by the National Transportation Safety Board Materials Laboratory, Washington, D.C. The control tube fractured in the circumferential direction at two locations at the lower end adjacent to the clevis fitting, as shown in figure 1 and figure 2. The fractures were coplanar with the upper and lower faces of a plug of corrosion product that had filled most of the inner cavity and measured between 0.35 inch and 0.60 inch in length. The fracture surfaces exhibited features consistent with overstress and loss of wall thickness due to corrosion. There was no evidence of a drain hole in the clevis fitting at the lower end of the control tube, as shown in figure 3.

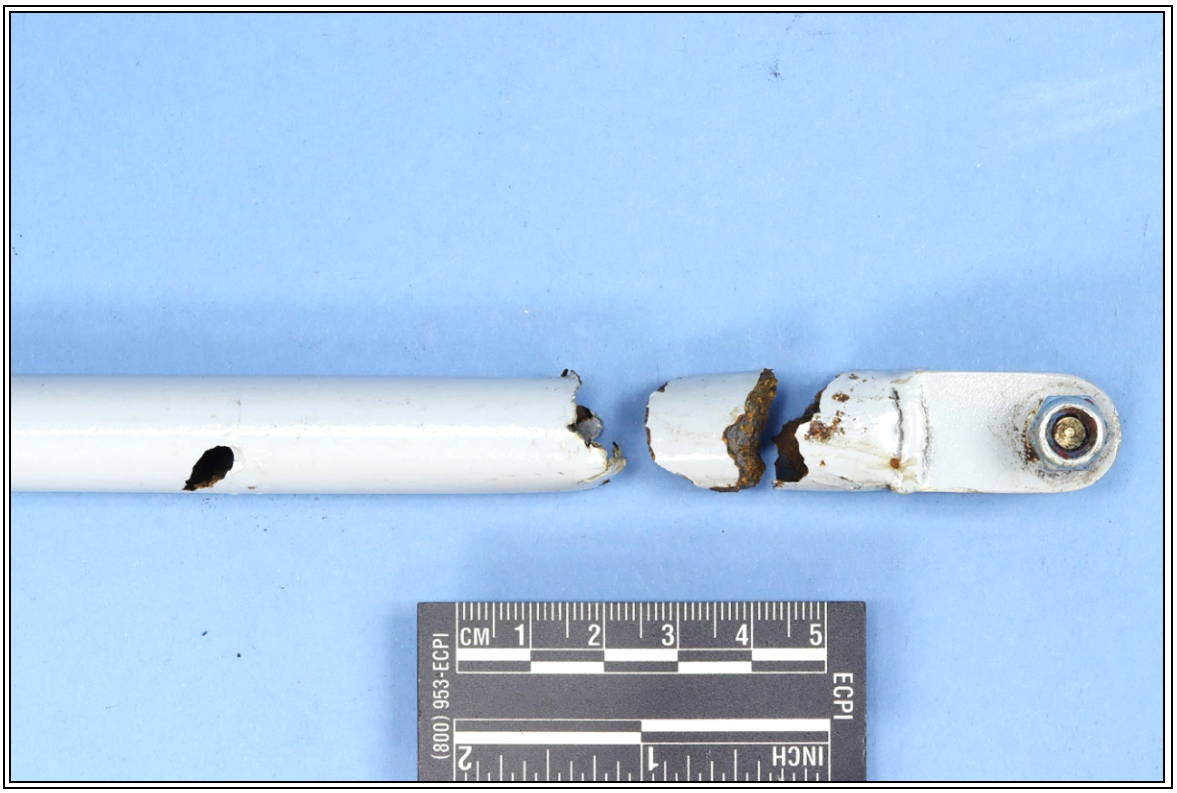

Figure. Fracture of elevator control tube near the clevis fitting.

Figure 2. Fracture of elevator control tube near the clevis fitting.

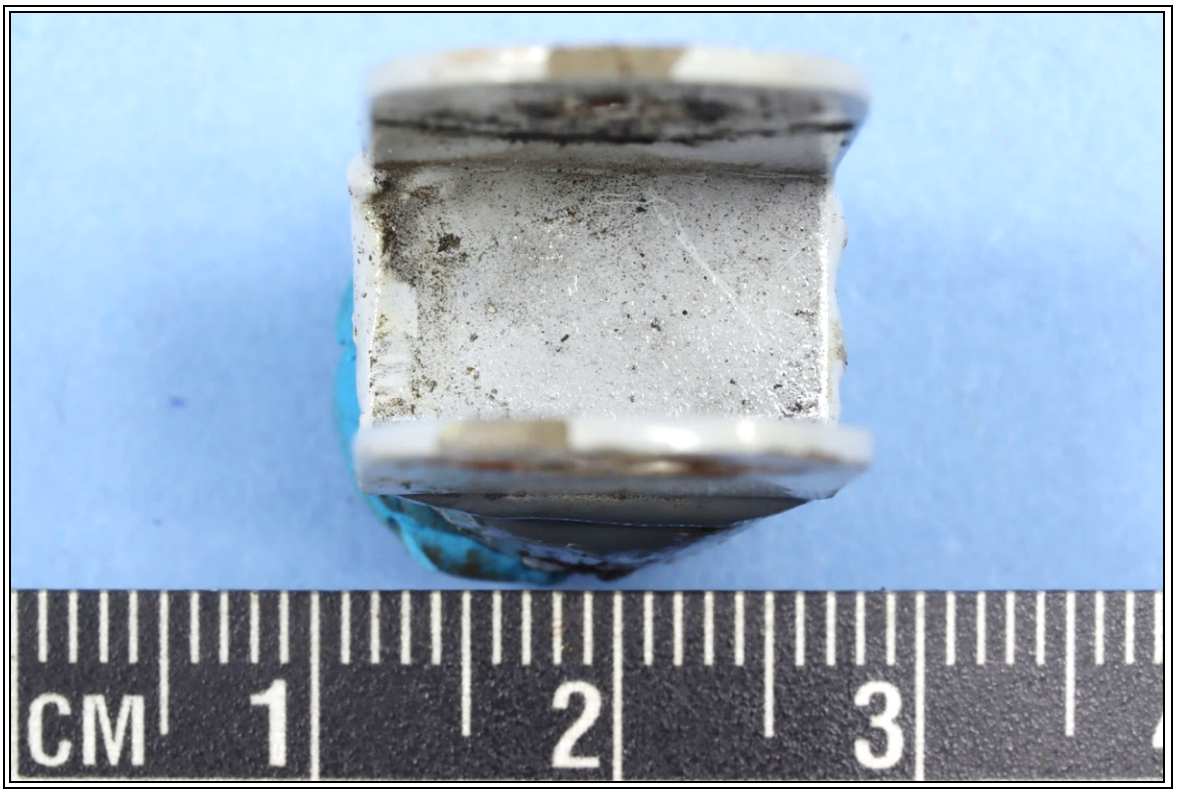

Figure 3. Clevis fitting without drain hole.

The control tube was also fractured in the longitudinal direction near the upper end of the rod, as shown in figure 4 and figure 5. The midpoint of the fracture was about 2.2 inch from the upper end of the tube and it extended about 1.6 inch in the longitudinal direction. The fracture surfaces were corroded as was the inner surface of the tube and the surrounding paint was bubbled and stained. The tube material bulged outward on either side of the fracture. The fracture features were consistent with internal corrosion and an overstress fracture. The outside of the tube above the longitudinal fracture exhibited a dark stain over a length of about 0.87 inch, as shown in figure 6, consistent with contact with the collar of the rubber sealing boot. The stain extended just above the level of the witness hole. Internal corrosion was observed along the entire length of the rod, as shown in figure 7 and figure 8.

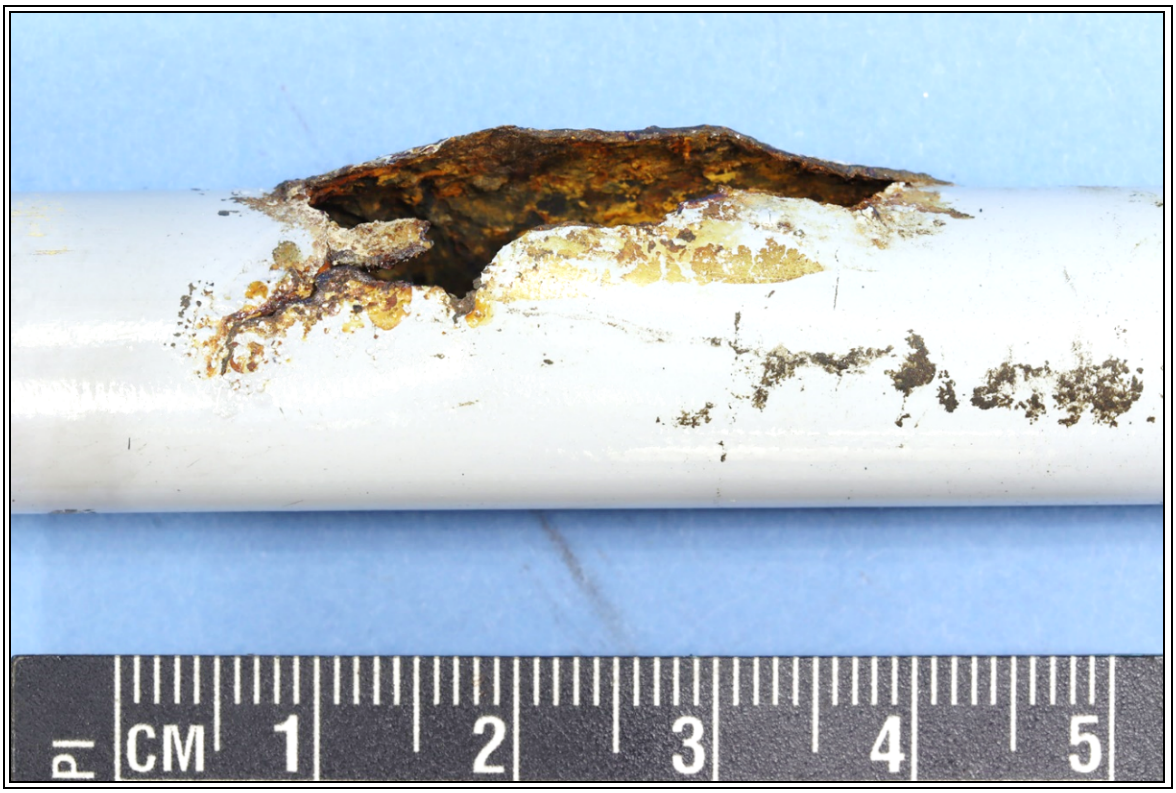

Figure 4. Fracture of control tube near the upper end.

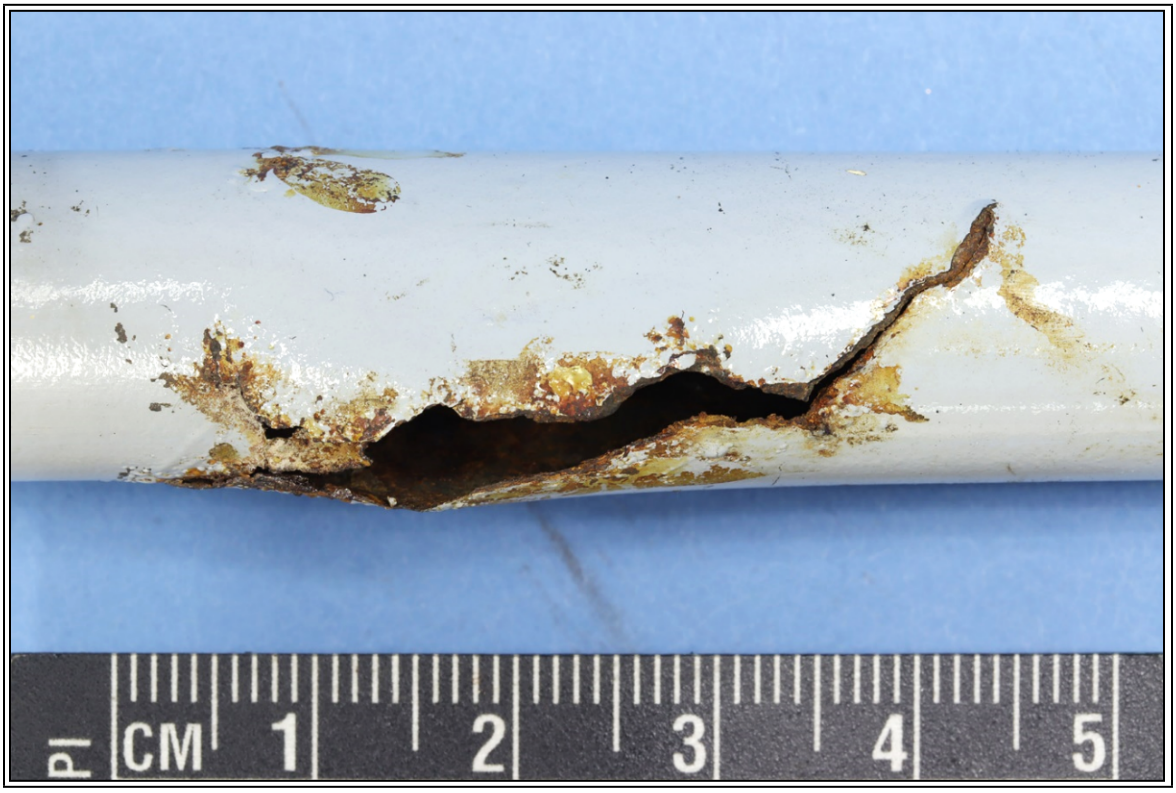

Figure 5. Fracture of control tube near the upper end.

Figure 6. Upper end of control tube.

Figure 7. Inner surface of control tube near the clevis fitting fracture.

Figure 8. Inner surface of control tube about midspan.

Additional Information

On April 23, 2012, the glider manufacturer issued Service Bulletin No. G304C-06a_R01, applicable for glider models G304C, G304CZ and G304CZ17. The service bulletin did not apply to the accident glider model (304S) despite it having a similar vertical stabilizer and elevator control design. The service bulletin described the possibility of water intrusion into the elevator control tube resulting in corrosion and failure. The corrective actions were, in part, to verify if the elevator control tube had a drainage hole and, if not, to conduct a pull test, every 12 months, to determine if the control tube required replacement. Additionally, if the glider had a rubber sealing boot at the top of the vertical stabilizer, the elevator control tube was to be replaced no later than December 31, 2012. If the glider did not have a rubber sealing boot, the control tube was to be replaced no later than December 31, 2013.

After the accident, on October 5, 2021, the glider manufacturer issued Service Bulletin No. G304S-12b for glider models G304S (accident glider), G304MS, and G304eS. The corrective

actions are similar, but not identical, to the service bulletin issued in April 2012. Service Bulletin No. G304S-12b requires, in part, a pull test on the control tube, regardless of the presence of a drain hole condition, and to replace the control tube if there is any change in length. Additionally, the service bulletin requires a visual check for a drain hole at the clevis end of the control tube and to check throughput of the drainage hole. If no drainage hole is present, a borescope should be used to inspect the inner surface of the control tube by entering through the top threaded hole. If the borescope inspection reveals internal corrosion, the control tube is to be replaced within one month. If no corrosion is observed, the inspection is to be repeated every 12 months until the tube is replaced. The service bulletin stipulated that the elevator control tube be replaced no later than December 21, 2022.

Additionally, Service Bulletin No. G304S-12b required a surface sealing and corrosion prevention compound be inserted inside the control tube when installing a new control tube with a drainage hole at the clevis fitting or when an existing control tube is modified with a drainage hole, the installation of shrink tubing to cover the witness hole at the upper end of the control tube, and to trim the rubber sealing boot to prevent water accumulation.

Preventing Similar Accidents

Mechanics Manage Risk and Follow Procedures (SA-022)

The Problem

Mistakes made while performing aircraft maintenance and inspection procedures have led to in-flight emergencies and fatal accidents. System or component failures are among the most common defining events for fatal general aviation accidents.

What can you do?

- Remember that well-meaning, motivated, experienced technicians can make mistakes. Learning about and adhering to sound risk management practices can help prevent common errors that can lead to tragic consequences.
- Understand the safety hazards associated with human fatigue and strive to eliminate fatigue contributors in your life. Fatigue has been linked to forgetfulness, poor decision making, reduced vigilance, and other factors that can interfere with your ability to do your job safely.

- Pay particular attention to the safety and security of the items that undergo maintenance and any surrounding components that may have been disconnected or loosened (possibly to ease access) during that maintenance.
- Carefully follow manufacturers' instructions to ensure that the work is completed as specified. Always refer to up-to-date instructions and manuals when performing a task, and ask questions of another qualified person if something is unfamiliar to you.
- Have a qualified person, other than the person who performed the maintenance, inspect the safety and security of critical items that have received maintenance.
- Be thorough when performing routine inspections. Ensure that items needing immediate attention are addressed rather than deferred.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-022.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Thomas Ballard; Federal Aviation Administration (San Antonio FSDO); San Antonio, TX
Original Publish Date:	September 14, 2023
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=103600