Aviation Investigation Final Report

Location:	Haskell, Oklahoma	**Accident Number:**	CEN20LA173
Date & Time:	May 9, 2020, 06:45 Local	**Registration:**	N318WH
Aircraft:	Titan TITAN TORNADO S	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

The student pilot departed on a flight in a kit-built airplane to test the winglets he had recently installed on the airplane's stabilator, which were intended to eliminate the airplane's uncommanded yaw. The flight was the airplane's first winglet test flight away from the airport traffic pattern and at a higher altitude. The student stated that during the flight, he decreased the pitch attitude to level off at 2,000 ft above ground level and the airplane suddenly vibrated aggressively and it "felt like the tail was thumping." He decreased the engine power, but the thumping and vibrating continued, so the pilot pitched the airplane down for an off-field emergency landing. Before he was able to land, the airplane rolled inverted and descended into the trees, resulting in the separation of the right wing.

Postaccident examination revealed that the stabilator control horn had fractured due to overstress and separated from the push-pull tube. According to an airplane kit manufacturer engineer, winglets added to the stabilator produce flutter. Based on the evidence, it is likely that the winglets led the stabilator to flutter, which overstressed the stabilator control horn and resulted in the control horn's failure.

Probable Cause and Findings

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

The student pilot/builder's addition of winglets to the stabilator, which resulted in flutter and overstress failure of the stabilator control horn.

Findings

Aircraft	Horizontal stabilizer - Capability exceeded
Aircraft	Horiz stab misc structure - Design
Personnel issues	Modification/alteration - Student/instructed pilot
Aircraft	(general) - Attain/maintain not possible
Personnel issues	Aircraft control - Student/instructed pilot

Factual Information

History of Flight

Enroute-climb to cruise	Flight control sys malf/fail (Defining event)
Emergency descent	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 9, 2020, about 0645 central daylight time, an experimental Titan Tornado S airplane, N318WH, was substantially damaged when it was involved in an accident about 3 miles north of Haskell Airport (2K9), Haskell, Oklahoma. The pilot sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 test flight.

The student pilot stated that the airplane had experienced uncommanded yaw on previously flights which he was trying to eliminate. After some research and a conversation with the airplane kit manufacturer, he installed vortex generators. The vortex generators did not eliminate the yaw, so he installed makeshift winglets on the stabilator, which were made from ½ inch plywood and aircraft speed tape. He did not ask the airplane kit manufacturer about the use of winglets on the stabilator, nor was he required to.

The student pilot conducted a test flight with the makeshift winglets and the uncommanded yaw was eliminated. Since the winglets proved successful, he created new winglets out of composite material, then attached them to the stabilator with glue and rivets. He completed 3 to 4 test flights with the new winglets and remained in the traffic pattern for all of the test flights. The airplane maintenance logbooks did not contain any entry for the winglets because the pilot was still conducting test flights and was not ready to have a mechanic sign off on the installation.

The student pilot stated that on the morning of the accident, he intended to complete the first winglet test flight away from the airport and at a higher altitude than the other test flights. He departed from 2K9 and climbed about 600 feet per minute to 2,000 ft where he intended to level off. He stated that the airplane flew really well with no anomalies noted at that point. As he decreased the pitch attitude, the airplane suddenly vibrated aggressively and it "felt like the tail was thumping." He decreased the engine power to slow the airplane down and descend in altitude, but the thumping and vibrating continued. He pitched the airplane down for an off-field emergency landing. Before he was able to land, the airplane rolled inverted and descended into the trees.

The responding Federal Aviation Administration (FAA) inspector stated that the airplane was found in a densely wooded area with the right wing separated and significant impact damage to the entire airplane. The stabilator control horn was found fractured and disconnected from the push-pull tube.

A postaccident examination of the stabilator control horn revealed that it fractured due to overstress from gross mechanical deformation. The part also exhibited impact damage from the stabilator being actuated from control stop to control stop during the flight.

The airplane kit manufacturer engineer stated that winglets added to the stabilator would change the balance of the control surface and cause flutter. The stabilator is installed with a counterweight calibrated specifically for the stock stabilator. He had never seen anyone add winglets to the stabilator before and he hoped that a builder would contact him before adding winglets. He would tell a builder not to add winglets because it would alter the balance on the control surface.

Pilot Information

Certificate:	Student	**Age:**	33,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	None None	**Last FAA Medical Exam:**	June 18, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	162.3 hours (Total, all aircraft), 33 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Titan	**Registration:**	N318WH
Model/Series:	TITAN TORNADO S Undesignat	**Aircraft Category:**	Airplane
Year of Manufacture:	2015	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	S12XXXC0HK0546
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	April 26, 2020 100 hour	**Certified Max Gross Wt.:**	1140 lbs
Time Since Last Inspection:	230 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Rotax
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	912 ULS
Registered Owner:	On file	**Rated Power:**	100 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dawn
Observation Facility, Elevation:	KMKO,610 ft msl	**Distance from Accident Site:**	19 Nautical Miles
Observation Time:	06:53 Local	**Direction from Accident Site:**	131°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.29 inches Hg	**Temperature/Dew Point:**	6°C / 4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Haskell, OK (2K9)	**Type of Flight Plan Filed:**	None
Destination:	Haskell, OK (2K9)	**Type of Clearance:**	None
Departure Time:	06:30 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	HASKELL 2K9	**Runway Surface Type:**	
Airport Elevation:	588 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	35.864166,-95.655555(est)

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Robert Harger; Federal Aviation Administration; Oklahoma City, OK
Original Publish Date:	May 5, 2021
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=101254