Aviation Investigation Final Report

Location:	Gulf of Mexico, Gulf of Mexico	**Accident Number:**	ERA23FA174
Date & Time:	March 30, 2023, 18:15 Local	**Registration:**	N869AC
Aircraft:	Cessna 525B	**Aircraft Damage:**	Substantial
Defining Event:	Part(s) separation from AC	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Executive/Corporate		

Analysis

The business jet was equipped with wing extensions (via supplemental type certificate) that included winglets and wing extension-mounted aerodynamic control surfaces that automatically deployed to counteract measured structural loads. Before the airplane's descent from flight level (FL) 310, the weather was clear with no turbulence. When the airplane was descending through FL 300 for FL 270, the pilot felt "two jolts of sudden turbulence" that he described as a negative G followed by a significant positive G twice in the span of about 1 second. The pilot noted that the airplane was yawing, and he subsequently observed that the left winglet had separated, resulting in substantial damage to the airplane. He declared an emergency and landed without further incident at a nearby airport.

Review of automatic dependent surveillance-broadcast and GPS revealed that, during the airplane's descent, its airspeed was slightly outside the airplane manufacturer's maximum operating speed (VMO/MMO) performance envelope. At the time of winglet separation, the airplane was descending about 5,300 ft per minute at 275 knots calibrated airspeed.

Eleven days after the accident, the separated winglet was recovered from the Gulf of Mexico; however, the section of the left wing extension that included the aerodynamic control surface was not recovered. Metallurgical examination of the recovered components revealed overstress features and no evidence of fatigue. Additionally, systems testing of the aerodynamic control surface control units, the system computer, and the enhanced ground proximity warning system revealed no anomalies. Because the aerodynamic control surface on the left wing extension was not recovered, the reason for the left wing extension and winglet separation could not be determined.

Probable Cause and Findings

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

The separation of the left wing extension and winglet for reasons that could not be determined based on the available evidence.

Findings

Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Enroute-descent	Part(s) separation from AC (Defining event)

On March 30, 2023, about 1815 eastern daylight time, a Cessna 525B, N869AC, was substantially damaged when it was involved in an accident over the Gulf of Mexico. The airline transport pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 corporate flight. The flight originated about 1647 from Walnut Ridge Regional Airport (ARG), Walnut Ridge, Arkansas, and was destined for Page Field Airport (FMY), Fort Myers, Florida.

The pilot reported that the airplane was in a cruise descent at an indicated airspeed of about 275 knots with the autopilot engaged. Before the descent, the weather was clear with no turbulence. The airplane was descending from flight level (FL) 310 to FL 270 to meet an altitude crossing restriction at the OGGER intersection. When the airplane was near FL 300, the pilot felt “two jolts of sudden turbulence” that he described as a negative G followed by a significant positive G twice in the span of about 1 second.

Afterward, the pilot reduced the throttle in case of further turbulence. He felt the airplane yaw, which he initially thought was asymmetrical thrust, but the engine instruments showed no anomalies. The pilot then looked out the left-side window and saw that the left winglet had separated from the wing (the right winglet remained attached). The pilot disconnected the autopilot, reduced engine power further, and declared an emergency. The pilot made an emergency landing at Tampa International Airport (TPA), Tampa, Florida, without further incident. The pilot did note that he had felt some binding of the ailerons occurred during final approach.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	38,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	January 2, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 11, 2023
Flight Time:	5670 hours (Total, all aircraft), 949 hours (Total, this make and model), 4953 hours (Pilot In Command, all aircraft), 147 hours (Last 90 days, all aircraft), 69 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N869AC
Model/Series:	525B	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	525B0001
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	February 21, 2023 Continuous airworthiness	**Certified Max Gross Wt.:**	14070 lbs
Time Since Last Inspection:	58 Hrs	**Engines:**	2 Turbo fan
Airframe Total Time:	4487 Hrs at time of accident	**Engine Manufacturer:**	WILLIAMS
ELT:	Installed, not activated	**Engine Model/Series:**	FJ 44 SERIES
Registered Owner:	Allegis Corp	**Rated Power:**	2780 Lbs thrust
Operator:	Allegis Corp	**Operating Certificate(s) Held:**	None

The airplane was equipped with a Tamarack Aerospace Group Active Technology Load Alleviation System (ATLAS) via Federal Aviation Administration supplemental type certificate. The Tamarack ATLAS installation was completed in December 2022. Each wing had a wing extension; a winglet; and a Tamarack Active Camber Surface (TACS), which was actuated by a TACS control unit (TCU). The TACS were aerodynamic control surfaces mounted on the wing extensions that automatically deployed to counteract measured structural loads.

The TCUs were replaced in February 2023 as a result of fault alerts observed during two previous flights. The pilot of those flights reported no flight control anomalies associated with the fault alerts. During each flight, the pilot opened and reset the circuit breaker to the system, which cleared the faults, and he subsequently landed the airplane without further incident. No additional anomalies were reported after the TCUs were replaced.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PIE,0 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	129°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	10°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.12 inches Hg	**Temperature/Dew Point:**	28°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Walnut Ridge, AR (ARG)	**Type of Flight Plan Filed:**	IFR
Destination:	Fort Myers, FL (FMY)	**Type of Clearance:**	IFR
Departure Time:	16:47 Local	**Type of Airspace:**	Class A

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	28.175447,-83.054322(est)

Postaccident examination of the airplane revealed that the left-wing extension and the left aileron were substantially damaged. The left-wing extension, winglet, and TACS were missing except for about 28 inches of the leading edge of the wing extension. The left aileron had an impact mark with chipped paint on the lower surface near the outboard end, and the outboard half exhibited buckling damage. Its outboard static wick exhibited fibers consistent with aircraft sealant.

The remaining ATLAS components were examined on the airplane, and no anomalies were noted. The ATLAS main circuit breaker was found in the closed position. A (functional) built-in test of the system was performed, and no anomalies were noted. After the test, the left-wing TACS bellcrank (which remained on the left wing) was between the stops in approximately a neutral position, and the right-wing TACS was in a neutral position.

The left TCU, right TCU, ATLAS control unit, and Honeywell enhanced ground proximity warning system (EGPWS) were retained for further examination. The remaining left-wing extension structure was removed from the airplane and retained for further metallurgical examination.

The left TCU, right TCU, and ATLAS control unit passed an acceptance test procedure at the manufacturer's facility on May 16, 2023. Data were successfully downloaded from the EGPWS at the manufacturer's facility. No faults were recorded during the accident flight. (For more information, see the Systems Group Chair's Factual Report in the public docket for this accident.)

Portions of the left-wing extension assembly and the left winglet assembly were recovered from the Gulf of Mexico 11 days after the accident and provided to the National Transportation Safety Board's Materials Laboratory, Washington, DC. The left TACS, which is normally installed on the left wing extension, was not recovered. Metallurgical examination of the recovered components revealed features consistent with overstress, with no fatigue observed.

Tests and Research

The NTSB conducted a performance study for this accident. The study included a review of automatic dependent surveillance-broadcast and GPS data. Those data revealed that, during the airplane's descent, its airspeed was 2 knots outside the airplane manufacturer's maximum operating speed (VMO/MMO) performance envelope. The study found that, at the time of the winglet separation, the airplane was descending about 5,300 ft per minute through FL 300 at 275 knots calibrated airspeed.

Administrative Information

Investigator In Charge (IIC):	Gretz, Robert
Additional Participating Persons:	Randy Ryhal; FAA/FSDO; Tampa, FL Kurt Gibson; Textron Aviation; Wichita, KS Haldan Gates; Tamarack Aerospace; Sandpoint, ID
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