Aviation Investigation Final Report

Location:	Covington, Tennessee	**Accident Number:**	ERA18FA240
Date & Time:	September 1, 2018, 17:20 Local	**Registration:**	N815EY
Aircraft:	LANCE M HOOLEY JETEZ	**Aircraft Damage:**	Destroyed
Defining Event:	Aircraft structural failure	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airline transport pilot was flying the experimental amateur-built airplane about 200 ft above ground level when its left wing failed, causing the airplane to abruptly depart controlled flight and subsequently impact terrain. Two witnesses indicated that the left wing began a flutter-like movement (described as an oscillation and a "wave like movement"/"wiggle") immediately before the wing failed at its mid-span. The speed of the airplane at the time of the left wing failure could not be determined. However, a witness who had extensive experience observing the accident airplane during flight reported that the pilot performed an intentional low pass over the airport at a speed that may have been near the airplane's maximum structural limits.

The National Transportation Safety Board's Materials Laboratory examined portions of the internal left wing material and found a lack of penetration and bonding of epoxy resin, which resulted in wing sections in which the adhesive had disbonded, leading to the wing's failure. This finding indicated a fabrication problem during manufacture and not wear over time or an environmental degradation failure. The lack of impregnation of the resin into the wing skin pieces indicated a lack of a vacuum seal during the curing process. The airplane's builder records were not located during the investigation; therefore, the method and timeline for manufacturing the wings could not be determined. Nevertheless, the findings indicated that the left wing was not properly designed and manufactured, which resulted in flutter at high speeds.

It is likely that the airplane's left wing entered a flutter condition during the high-speed low-pass maneuver and that the left wing's internal composite structure near the wing's mid-span subsequently experienced a failure of the adhesive between the composite layers.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The improper manufacture of the left wing, which resulted in a left wing flutter event and failure at low altitude and high speed.

Findings

Aircraft	(general) - Failure
Personnel issues	Fabrication - Owner/builder
Aircraft	Airspeed - Capability exceeded

Factual Information

History of Flight

Maneuvering-low-alt flying	Aircraft structural failure (Defining event)
Maneuvering-low-alt flying	Part(s) separation from AC
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On September 1, 2018, about 1720 central daylight time, an experimental amateur-built JETEZ airplane, N815EY, was destroyed after an in-flight breakup and a subsequent impact with terrain near Covington Municipal Airport (M04), Covington, Tennessee. The airline transport pilot was fatally injured. The airplane was owned by the pilot and operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed for the local flight.

According to a witness who routinely observed the accident airplane's flights and was familiar with the airplane's design, the purpose of the flight was for the accident airplane and another canard jet airplane based at M04 to fly together. The witness reported that the accident airplane departed runway 19 before the other airplane, climbed to an altitude of about 1,000 ft above ground level (agl), and then started a 270° descending right turn. He also reported that the airplane crossed over the middle of M04 at an altitude of about 200 ft agl and an estimated speed of 200 to 210 knots and in a level pitch and bank attitude. He further reported that, shortly after the airplane crossed the runway, he observed the left wing and winglet "oscillate" about five times and that the left wing then "exploded."

This witness subsequently observed pieces of the airplane falling, the airplane abruptly pitching up about 90°, the right wing separating from the fuselage, and the airplane descending into a cotton field. He reported that the airplane's engine "sounded fine" throughout the flight. The witness provided an additional statement about 3 months after the accident, indicating that the airplane was traveling "at least 200 knots, it could have been 230 knots" just before the left wing failure.

According to another witness, who was an airline transport pilot, he observed the accident airplane cross over the airport at an altitude of about 200 ft agl. He stated the airplane's engine sounded as if it "was not at idle" and "had power." This witness continued watching the accident airplane after it flew over the airport and observed a "gentle pull-up" followed by a "wave like movement" or "wiggle" in the left wing, and then the "left wing failed at mid-span." Subsequently, the airplane pitched up "violently," the right wing "snapped off" in one piece, and several additional pieces departed the airplane as it "tumbled down to the left" and impacted terrain. He then observed fire and smoke.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	59,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	Balloon	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	March 22, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 22000 hours (Total, all aircraft), 100 hours (Total, this make and model)		

According to Federal Aviation Administration (FAA) records, the pilot held an airline transport pilot certificate with an airplane multiengine land rating and a commercial pilot certificate with airplane single-engine land and lighter-than-air balloon ratings. He also held a flight instructor certificate for airplane single- and multiengine land; and type ratings for the Airbus A320, Jetstream BA-3100, Embraer EMB-120, and Saab SF-340; and a repairman experimental aircraft builder certificate for the accident airplane as well as the DR-107 experimental amateur-built airplane.

The pilot was issued an FAA first-class medical certificate dated March 22, 2018, with a limitation that required him to wear corrective lenses. At that time, the pilot reported 22,000 hours of total flight experience, including 5 hours during the preceding 6 months. The pilot's logbooks were not recovered.

Aircraft and Owner/Operator Information

Aircraft Make:	LANCE M HOOLEY	**Registration:**	N815EY
Model/Series:	JETEZ	**Aircraft Category:**	Airplane
Year of Manufacture:	2014	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	2009-815EY-1
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	3500 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo jet
Airframe Total Time:	100 Hrs at time of accident	**Engine Manufacturer:**	General Electric
ELT:	Not installed	**Engine Model/Series:**	GE-T58-8B
Registered Owner:		**Rated Power:**	840 Lbs thrust
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA airworthiness records and publicly available information, the airplane was a two-seat, original-design, canard-style airplane manufactured by the pilot. The airplane was powered by a

modified GE-T58-8B turbine engine, which was originally designed for a military helicopter. The airplane received a special airworthiness certificate on June 30, 2014. The witness who was familiar with the operation of the accident airplane reported that it had accumulated about 100 total hours of operation. The maintenance records and builder records were not located. Extensive online content described how the accident pilot designed, manufactured, and operated the airplane.

In May 2018, *KITPLANES* magazine published an article authored by the accident pilot that was titled, "JET EZE, Turning a Dream into Reality, Part 1 and 2." The article included a photograph of the accident airplane at an unknown date and time before the accident flight, as shown in figure 1.

Figure 1. Accident airplane. (Source: *KITPLANES* magazine, May 2018.)

According to the article, the airplane was designed and manufactured over a 13-year period, with 11 years of "active building." The airplane had blended composite winglets in which a C-channel wing spar was extended to the tip of the winglets. The article stated that 5-ft peel ply was used in the composite layup process of the winglets. The article also stated that the canard was a "stock GU" design and that

each wing contained two inner fuel pods and two outer baggage pods.

In February 2018, the accident pilot described the design, manufacture, and operation of the accident airplane in a narrated webinar titled "*So, You Want to Build a Jet?*" that was hosted by the Experimental Aircraft Association. A recording of the webinar appeared on the Jet Guys' YouTube channel (https://www.youtube.com/watch?v=_Izm3CGZDFo).

According to the "Jet Guys" website, they specialized in canard jet airframe modifications, repairs, powerplants, electrical modifications, and condition inspections. The owner and operator of Jet Guys was a witness to the accident (his account was provided first in this report). He was also the FAA designated airworthiness representative that signed off the airplane's special airworthiness certificate in 2014.

During the 1 hour 27-minute webinar, the pilot reported that the accident airplane had a Vne (never exceed airspeed) of 250 knots indicated airspeed (KIAS), or 310 knots true airspeed, and stated, "Have I been past that [airspeed]? Yeah, it was exciting, and I won't tell you how far I went past it." He explained that the airplane was "airframe limited" because the jet engine could propel the wings faster to loads that they could not tolerate. He also reported that the airplane's first flight was in 2017, although the airplane had received its FAA special airworthiness certificate in June 2014.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	M04,280 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	17:15 Local	**Direction from Accident Site:**	244°
Lowest Cloud Condition:	Few / 5000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	130°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	31°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Covington, TN (M04)	**Type of Flight Plan Filed:**	None
Destination:	Covington, TN (M04)	**Type of Clearance:**	None
Departure Time:	17:18 Local	**Type of Airspace:**	Class G

The weather conditions reported at M04 at 1715 included visibility of 10 statute miles, few clouds at 5,000 and 5,500 ft agl, wind from 130° at 6 knots, temperature 31°C, and dew point 23°C.

Airport Information

Airport:	Covington Muni M04	**Runway Surface Type:**	
Airport Elevation:	280 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	35.586387,-89.57833

The airplane's fuselage came to rest inverted in a flat cotton field about 0.5 nautical mile northeast of M04. The fuselage was oriented on a magnetic heading of 065°. The airplane sustained extensive impact damage, and evidence of a postimpact fire was observed. All major components of the airplane were accounted for along the airplane's debris path. Fragments of the outboard portion of the left wing and winglet were found separated from the left wing root about 1,000 ft from the fuselage. Fragments of the outboard portion of the right wing and winglet were found separated from the right wing root about 870 ft from the fuselage.

Flight control continuity could not be established from the control surfaces to the cockpit area because the flight control surfaces had separated from their attachments and the cockpit section was destroyed by the postcrash fire. Fragments of the canard were found separated from the fuselage in the debris path. The engine had separated from the engine mounts and was found with the fuselage. The engine was visually inspected, and no signs of foreign object debris damage were observed. The inlet variable guide vanes were intact and displayed rotational scoring.

Portions of the left wing upper skin plies displayed evidence of fiber material transfer from the lower wing skin. Portions of the left wing upper spar cap and upper skin had a glossy appearance with no apparent evidence of fiber material transfer. The left winglet skin panels showed evidence of fiber material transfer between the winglet skin and the winglet spar caps. After examination, the left and right wing components were laid out. Figure 2 shows the top and bottom portions of the left wing and left aileron.

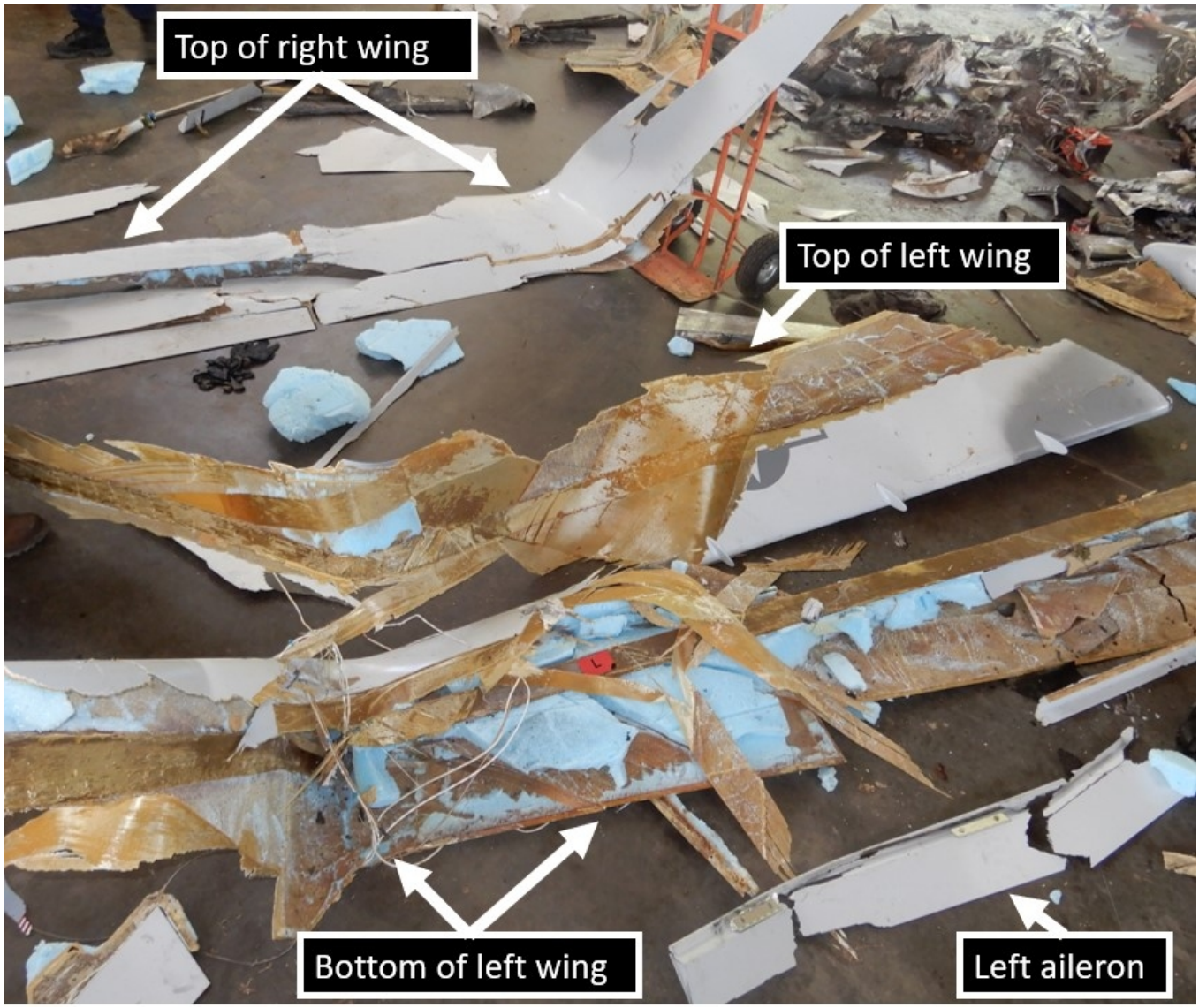

Figure 2. Left and right wing fragments.

Further examination of portions from the internal left wing structure was performed by the NTSB Materials Laboratory in Washington, DC. This examination showed that the upper wing surfaces and the upper spar cap sections had areas that were consistent with a resin-starved or dry laminate. These areas were also consistent with an adhesive disbond between the respective faying surfaces. This adhesive disbond was consistent with a lack of impregnation and interfacial interaction of the resin into and with the glass fiber fabric, resulting in a lack of strong adhesion between the wing skin and the spar cap. These issues were consistent with a fabrication problem during manufacturing of the layup rather than wear over time or an environmental degradation failure. Reference the Materials Laboratory Factual Report in the public docket for additional details and photographs.

Additional Information

The witness who was the owner and operator of Jet Guys reported that, about 2 months after the accident airplane's first flight in 2017, a flutter event occurred with the accident airplane's left wing. The witness stated that he saw the flutter event on a video that the accident pilot had showed him. The video camera appeared to be mounted on the left wing, and the video of the flutter event showed the left winglet moving forward and aft, in a back-and-forth motion, about 4 inches and about one revolution per second. The witness thought that the airspeed during the flutter event was 232 KIAS. The witness reported that he was unaware of any structural repairs or modifications to the accident airplane after that flutter event.

Medical and Pathological Information

An autopsy of the pilot was performed by the Office of the Medical Examiner, West Tennessee Regional Forensic Center, Memphis, Tennessee. The pilot's cause of death was multiple blunt force injuries.

Toxicology testing performed at the FAA Forensic Science Laboratory identified salicylate (a metabolite of aspirin), acetaminophen (commonly marketed as Tylenol), amlodipine (blood pressure medication), and timolol (used orally to prevent recurrent heart attacks and as an eye drop for glaucoma) in the pilot's urine specimens. Amlodipine was found in the pilot's cavity blood specimens. None of the medications were considered impairing. The toxicology tests identified no carbon monoxide or ethanol in the pilot's cavity blood specimens.

Administrative Information

Investigator In Charge (IIC):	Gerhardt, Adam
Additional Participating Persons:	Dan Merrell; FAA/ FSDO; Memphis, TN
Original Publish Date:	April 20, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98206

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available here.