



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Calhoun, Georgia	<b>Accident Number:</b>	ERA19FA134
<b>Date &amp; Time:</b>	March 23, 2019, 15:35 Local	<b>Registration:</b>	N257AR
<b>Aircraft:</b>	HOGAN Innovator	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Flight test		

## Analysis

The pilot, who was also the owner/designer/builder of the experimental amateur-built airplane, had no recent flight experience and a medical certificate that had expired about 20 years before the accident flight. Despite assurances to his employees that he would not fly the airplane on what was its second test flight, video from inside the accident airplane showed that the pilot departed on the accident flight and the airplane immediately displayed rapid divergences in both the pitch and roll axis that were demonstrated on the airplane's first test flight. The airplane remained at treetop height throughout the upwind leg and into the crosswind turn and reached about 200 ft above ground level in level flight on the downwind leg. As the airplane accelerated, rapid pitch oscillations (phugoid) were exhibited. A handheld radio secured to the copilot's seat shoulder harness and the pilot himself were seen to "float" in the cockpit each time the airplane pitched nose down as the amplitude of the phugoid progressively increased, the duration of weightlessness displayed each time also increased. During one phugoid, an audible "oil pressure" warning was heard. The video ended abruptly as the pilot became unseated for about the fourth time and as the airplane appeared near treetop height. The airplane then impacted terrain.

The pilot had no experience in the accident airplane, which was the prototype for an airplane he intended to mass produce. A test pilot had completed the airplane's first flight in the traffic pattern. He described significant stability issues, which were captured by onboard video, and said the airplane departed controlled flight uncommanded about a dozen times. After the test pilot was able to safely land the airplane, it was disassembled, returned to the factory, modified according to the accident pilot's specifications based on captured data and the test pilot's observations, and then brought back to the departure airport for taxi testing the day before the accident.

According to employees of the company, the pilot was pressured by investors and missed deadlines, and was sleep-deprived and ill from a "severe" cold for which he was self-medicating. This pressure likely influenced the pilot's decision to test the prototype airplane himself despite his lack of experience and the stability issues demonstrated by the airplane on its initial test flight.

Examination of the wreckage and aircraft data captured from avionics systems, as well as statements from witnesses confirmed that the engine operated smoothly and continuously through the end of the flight. The condition of the wreckage precluded a thorough accounting of the flight control system; though based on statements provided by the previous test pilot, it is likely that the stability portrayed in the video of the first test flight remained during the accident flight, and when combined with the pilot's lack of experience, resulted in him being unable to maintain control of the airplane.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain aircraft control during the airplane's second test flight, which resulted in a collision with terrain. Contributing to the accident was the pilot allowing external pressures to guide his decision to fly the airplane when he possessed little total flight experience, no recent flight experience, and no experience in the accident airplane or similar airplane.

### Findings

Aircraft	Pitch control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Environmental issues	Financial pressure - Decision related to condition
Environmental issues	Time/schedule pressure - Decision related to condition
Personnel issues	Stress - Pilot
Personnel issues	Total experience w/ equipment - Pilot
Personnel issues	Recent experience - Pilot

# Factual Information

## History of Flight

Approach-VFR pattern downwind	Loss of control in flight (Defining event)
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On March 23, 2019, at 1535 eastern daylight time, an experimental amateur-built Commuter Craft Innovator, N257AR, was destroyed by collision with terrain during an uncontrolled descent after takeoff from Thomas B. David Field (CZL), Calhoun, Georgia. The pilot/owner/designer/builder was fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight test which was conducted under the provisions of 14 *Code of Federal Regulations* Part 91.

According to employees of Commuter Craft, the airplane was the prototype for an airplane planned for mass production. The airplane was flown for the first time by a test pilot on February 25, 2019 at Tom B. David Field (CLZ), Calhoun, Georgia. The test pilot completed one traffic pattern and landed. The airplane was disassembled, returned to the factory, modified according to the pilot/builder based on captured data and test-pilot observations, and then brought back to CLZ for taxi testing the day prior to the accident.

On the day of the accident, the pilot asked his assistant to fly in a "chase plane" with a camera and photograph the airplane "in case it takes off." The pilot said he did not intend to fly, would land if the airplane lifted off, and would only fly if "he had no other choice." According to his assistant, she watched from the chase plane as the airplane departed "barely above the trees," turned in the traffic pattern, and then descended from view.

According to the chase pilot, the pilot/owner instructed him to depart ahead of the accident airplane. The pilot/owner said he would take off, enter the downwind leg, "verify the plane was flying satisfactorily" and then climb the airplane to 3,000 ft. Once at altitude, the two planes would join up to capture footage of the prototype airplane in flight. Footage of the accident flight was not captured, but the pilot witnessed the accident flight from about 2,500 ft.

Video from a camera mounted on the airplane's right window show that, immediately after takeoff, the airplane displayed rapid divergences in both the pitch and roll axis and that the pilot made pronounced movements of the control stick in response. The airplane remained at treetop height throughout the upwind leg and into the crosswind turn and appeared to reach about 200 ft agl in level flight once established on the downwind leg. As the airplane accelerated, it showed rapid pitch oscillations and the amplitude of the pitch oscillations progressively increased. A handheld radio secured to the copilot's seat shoulder harness and the pilot himself were seen to "float" in the cockpit each time the airplane pitched nose down as the amplitude of the phugoid progressively increased, the duration of weightlessness displayed each time also increased.

Data recovered from an onboard recording device indicated the airplane experienced multiple pitch oscillations between about 1° nose down and 12° nose up. Engine parameters were nominal and show

that the aircraft reached 100 percent power and stayed at a high-power setting until the end of the recording. During one pitch oscillation, an audible "oil pressure" warning was heard. The video ended abruptly as the pilot became unseated for about the fourth time and as the airplane appeared near treetop height. The airplane then impacted terrain.

The chase pilot watched the airplane take off and turn to the crosswind and downwind legs of the traffic pattern. He estimated the accident airplane never climbed more than 200 feet above ground level (agl), and that the airplane struggled "to maintain airspeed or a nose-up attitude." The chase pilot heard the pilot announce his intention to return to the airport, but that a reason was not specified. He said the airplane was "porpoising" in flight before the nose "dipped down" and the airplane collided with trees and terrain.

Another witness, who was also a pilot, watched the accident flight from his car as he approached the airport. The witness said that he saw the airplane, which he presumed had "just taken off," pitching and rolling about 20° left and right and nose-up and nose-down and that it appeared unstable. The witness described the crosswind turn as "steep" and estimated the bank angle at 45°. Another witness, who was inside his workshop when the airplane flew "low" overhead, said the sound of the engine was loud, smooth, and continuous until he heard the sound of impact.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	62, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	December 6, 1999
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	334.7 hours (Total, all aircraft), 0.1 hours (Total, this make and model), 0 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Review of Federal Aviation Administration records revealed the pilot did not hold a valid medical certificate and he had not completed a BasicMed course. A review of his logbook revealed the pilot had logged 334 total hours of flight experience.

Entries in the logbook began in 1986 and gaps of several years where the pilot logged no flights were noted. During 1986-1987, the pilot logged 40.6 hours of flight experience, then did not fly again until 1991. He flew regularly from 1991-1995 but did not fly again until 2011, where he logged only one flight. He logged 2 flights in 2017, and 3 flights in 2018.

The pilot logged 4.7 total hours of flight experience over the 3 flights in 2018. His most recent flight was 1.1 hours on April 27, 2018, in a Flight Design CTLS airplane. According to his employees and his logbook, the pilot had no experience in the Innovator airplane as either a pilot or passenger. Further, a

review of the remarks section throughout his logbook revealed only rudimentary flights and flight training. The pilot had no experience as a test pilot and no such training reflected in his logbook.

According to two of the pilot's employees, the pilot discussed scheduling pressures regarding the development and fielding of the airplane. They each had conversations with the pilot about his role as designer/builder and the head of the company; they each strongly urged him to stay out of the cockpit of the accident airplane. The two employees sought and received assurances from the pilot that he would not fly the accident airplane. His executive assistant urged him to concentrate on running their operation and reported financial pressures on the pilot from an investor.

When asked about the pilot's general health, two employees described the pilot as sleep deprived and that he was sick in the days preceding and on the day of the accident. His assistant said he had a "severe cough, head and chest congestion, and fever" and was self-medicating with over-the-counter "non-drowsy" cold medication.

#### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	HOGAN	<b>Registration:</b>	N257AR
<b>Model/Series:</b>	Innovator No Series	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	Yes
<b>Airworthiness Certificate:</b>	Experimental (Special)	<b>Serial Number:</b>	002
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	Condition	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	Reciprocating
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	IOX-370-CLD1T
<b>Registered Owner:</b>		<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The composite construction airplane was a two-place, twin-tailboom, rear-engine, pusher-propeller airplane, powered by a Titan IOX-370-CLD1T4 engine. According to a company employee, the airplane had accrued about 12 hours on the Hobbs meter, of which about 0.3 hours was actual flight time.

In a written statement, the pilot who performed the initial test flight of the accident airplane provided a detailed description of what he observed and experienced on that flight. He said:

*As soon as I came off the ground the plane went into a wild oscillation of both pitch and roll. I ran out of elevator up trim within the first few seconds of that flight and then had a lot of control pressure involved to keep it flying around the pattern. At that point I realized I needed altitude to sort out the controllability of the aircraft... During the flight I actually bumped off the elevator stop at least three times. I don't know how many times during that flight the aircraft departed straight and level flight, all uncommanded, however I would guess it to be around a dozen times. At one point I considered bailing*

*out of the plane but realized I had enough control to try to line up with the airport runway and attempt a controlled landing, or at least get it back to the airport where help could be given if the landing didn't go well. As it turned out once I reduced the throttle for the final approach I was able to let off some of my control pressure for the elevator and make a very nice controlled decent... In my opinion: the aircraft demonstrated a static stability that was divergent and unstable. While dynamic stability was just barely on the stable side of neutral. These two factors obviously fought each other in the stability of the aircraft.*

Video of the first half of the test flight, which was captured by an onboard camera mounted on the copilot's window, provided a cross-cockpit view of the pilot and views outside his window and part of the windscreen. Audio of ambient noise in the cockpit as well as radio communications was heard throughout. The video viewed was consistent with the narrative description provided by the test pilot. The camera's battery lost its charge mid-flight and the video ended abruptly on the upwind leg over the runway.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KRMG,644 ft msl	<b>Distance from Accident Site:</b>	12 Nautical Miles
<b>Observation Time:</b>	15:53 Local	<b>Direction from Accident Site:</b>	239°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	3 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.2 inches Hg	<b>Temperature/Dew Point:</b>	21°C / -8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Calhoun, GA (CZL )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Calhoun, GA (CZL )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	15:33 Local	<b>Type of Airspace:</b>	Class G

### Airport Information

<b>Airport:</b>	TOM B DAVID FLD CZL	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	655 ft msl	<b>Runway Surface Condition:</b>	Rough;Vegetation
<b>Runway Used:</b>	35	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	6034 ft / 100 ft	<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	34.451389,-84.950836(est)

The airplane was destroyed by impact and displayed no evidence of pre- or post-impact fire. Ground scars and fragmentation of the wreckage were consistent with ground contact in a steep, nose-down attitude at high speed. The wreckage path was about 90 ft long and oriented 132° magnetic. The initial ground scar was in an open field and the main wreckage came to rest inside a narrow wood line between two fields. There was no evidence of fire. Flight control continuity could not be confirmed due to multiple cable breaks and fractures. All breaks and fractures exhibited signatures consistent with overload failure.

The engine was separated from its mounts and entangled with the main wreckage. Engine control continuity was established from the engine to its control quadrant, which remained attached to the engine. The two composite propeller blades of the contestant-speed propeller were both uniformly fractured at their respective hubs and displayed chordwise scratching.

The engine was rotated by hand at the propeller flange and powertrain continuity was confirmed through the accessory section. Thumb compression could not be confirmed on the #1 and #3 cylinders due to impact damage. Internal borescope examination revealed signatures consistent with normal wear and lubrication. The electronic magnetos were impact damaged, and the engine-driven fuel pump was separated by impact.

## Additional Information

The FAA issued Advisory Circular (AC) 90-89B, "Amateur-Built Aircraft and Ultralight Flight Testing Handbook," was issued to make amateur-built aircraft pilots aware that "test flying an aircraft is a critical undertaking," which should be approached with "thorough planning, skill, and common sense" and to provide recommendations and suggestions that could be combined with other sources on test flying (such as, the aircraft plan/kit manufacturer's flight testing instructions, other flight testing data) that would assist amateur owners to "develop a detailed flight test plan, tailored for their aircraft and resources."

The AC also provided guidance on developing a plan for each phase of an amateur-built airplane's production, including preparing for the airworthiness inspection, determining weight and balance, conducting taxi and flight testing, and developing emergency procedures. The suggested flight-testing regimen was separated into 10-hour segments for the 40-plus-hour flight testing requirement.

The AC also included guidelines for the experience level of the test pilot, which included, in part, the following:



The test pilot should be experienced and competent. He/she should have made a minimum of 100 solo flights in similar make, model, and type of ultralight and must follow the FLIGHT-TEST PLAN exactly. The FLIGHT-TEST PLAN aircraft and follow a flight-test plan that should examine the ultralight and its performance capability, beginning with the pre-flight inspection and ending only after the test pilot has explored the ultralight's published flight envelope as described in the flight manual.

The FAA issued AC 90-109A, "Transition to Unfamiliar Aircraft," which describes stability and controllability of unfamiliar aircraft:

7. Stability and Controllability, b. Discussion, (2) - Once the airplane is disturbed from its steady condition, dynamic stability comes into play. A positively stable airplane will return to its pre-disturbed flight condition upon removal of the disturbance. It might do this slowly or quickly, with or without oscillations..... An airplane with negative dynamic stability will develop larger deviations from its original flight condition following a disturbance. Again, this can happen slowly or quickly, with or without oscillations. Obviously, an airplane with negative dynamic stability could be difficult, if not impossible, to fly.

(3) (a) Negative longitudinal dynamic stability (phugoid). If the airplane deviates slower (or faster) from its trimmed airspeed, it will accelerate (or decelerate) beyond its trimmed airspeed, then decelerate (or accelerate) again beyond its trimmed airspeed in ever-increasing airspeed and altitude deviations until it stalls, exceeds VNE [never-exceed speed], or impacts the ground. The pilot cannot rely on the airplane to self-correct even minor airspeed deviations caused by control input, wind gust, thermal activity, etc. This can result in fatigue, as the pilot must continuously suppress the excursions.

## **Medical and Pathological Information**

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The Georgia Bureau of Investigation, Division of Forensic Sciences, Decatur, Georgia, performed an autopsy of the pilot and determined the cause of death as multiple blunt force injuries.

The FAA Forensic Sciences Laboratory performed toxicological testing on the pilot. Testing revealed the presence of Ibuprofen, Naproxen, and Dextromethorphan in muscle tissue and Naproxen and Dextrophan in liver tissue, but use of these medications would generally not present a hazard to aviation safety.



## Administrative Information

<b>Investigator In Charge (IIC):</b>	Rayner, Brian		
<b>Additional Participating Persons:</b>	Juli O'Gorman; FAA/FSDO; Atlanta, GA Mike Council; Continental Engines; Mobile, AL		
<b>Original Publish Date:</b>	December 3, 2020	<b>Investigation Class:</b>	2
<b>Note:</b>	The NTSB traveled to the scene of this accident.		
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=99153">https://data.nts.gov/Docket?ProjectID=99153</a>		

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](#).