

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA22LA404

WRECKAGE EXAMINATION SUMMARY

August 13, 2024

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A. ACCIDENT

Location: Saint Cloud, Florida
Date: September 9, 2022
Time: 1502 EDT
1902 coordinated universal time (UTC)
Airplane: N77VJ, Cirrus Design Corporation SF50

B. WRECKAGE EXAMINATION SUMMARY

IIC Timothy W. Monville
NTSB-OAS/ERA
Washington, DC

Party Coordinator Bradley T. Miller
Cirrus Design Corporation
Duluth, Minnesota

C. SUMMARY

On September 9, 2022, about 1502 eastern daylight time, a Cirrus Design Corporation SF50, N77VJ, was substantially damaged when it was involved in an accident near Saint Cloud, Florida. The private pilot and one passenger sustained minor injuries and one passenger was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

During an instrument approach and in instrument meteorological conditions before reaching waypoint LOJUF, which was the final approach fix for the RNAV GPS Runway 33 approach to Kissimmee Gateway Airport (ISM), Orlando, Florida, the pilot activated the Cirrus Airframe Parachute System (CAPS). The airplane descended under canopy impacting the ground in a marsh behind a residence.

The airplane was recovered and taken to a secure location for further examination.

D. DETAILS OF THE INVESTIGATION

1.0. General Airplane Information

1.1 Airplane Description

The Vision SF50 is a carbon fiber, pressurized, low-wing monoplane with a V-tail. The interior has provisions for up to six passengers and one crew member. It has one cabin entry door and one emergency exit. The aircraft has

a baggage compartment in the empennage. One pylon-mounted Williams International FJ33-5A turbofan engine is mounted on top of the rear fuselage.

The fuselage structure is primarily manufactured from carbon fiber. The forward part up to the aft cabin bulk-head station and the tail cone are fabricated separately and assembled in a fixture. The engine is mounted on top of the aft fuselage. The structure below the engine is manufactured from carbon fiber and covered by a titanium firewall. The attachment of the two V-tail surfaces is via a bolted joint to a carbon fiber bulkhead. The cabin door is located on the left side of the fuselage, and the egress window is located on the right side.

The wing structure is constructed of carbon fiber, producing wing surfaces that are smooth and seamless. The wing cross section is a blend of several high-performance airfoils. A high aspect ratio results in low drag. Each wing contains the fuel tanks and provides attach structure for the main landing gear.

The empennage consists of two large surfaces in V-tail configuration, with two ventral fins and yaw dampers. The stabilizer surfaces are constructed entirely from carbon fiber. The ruddervators are the primary control surfaces for both pitch and yaw. These surfaces are made of aluminum construction and feature one large trailing edge tab each. The tabs are used for pitch trim. The two ventral fins, constructed of carbon fiber, are mounted on either side of the fuselage. The ventral fins provide attach points for the Yaw Stability Augmentation System (Yaw SAS) flight surfaces.

The cabin, featuring two crew seats in side-by-side configuration, is accessible through the large cabin door on the pilot's side. The seats are adjustable and feature conventional seat belts and shoulder harness. Both crew seats are mounted on rails and are capable of moving each crew member independently back to the cabin door for emergency egress. Dual controls consisting of side stick controller and rudder pedals with brake pedals are installed at each crew seat.

The Vision SF50 features a mechanical control system for pitch, roll, and yaw. All systems are fully reversible featuring mechanical connections between the cockpit controls and all aerodynamic surfaces. The V-tail configuration uses common aerodynamic surfaces for pitch and yaw control (ruddervators). Pitch and yaw are mechanically mixed. Pitch, roll, and yaw axis are controlled from each crew seat in the aircraft using a side stick and rudder pedals. For pitch control, both ruddervators deflect symmetrically in the up and down direction. For roll control, ailerons deflect in opposite directions. For yaw control, both ruddervators deflect in opposite directions. There is a roll centering spring, a

yaw-centering spring cartridge, and a pitch down spring. Trim tabs are attached to the trailing edge of the left aileron and left and right ruddervator. Pitch trim is provided using an electrical servomotor or a manual trim wheel. Roll trim is provided using an electrical servomotor. All movements and forces are transmitted using control cables, pulleys, bellcranks, and push rods.

Flight displays (GDUs) consist of: Primary Flight Display (PFD), Multifunction Display (MFD) and three Touch-Screen Controllers (GTCs). The PFD, installed directly in front of the pilot, is intended to be the primary display of flight parameter information (attitude, airspeed, heading, and altitude). The MFD, installed to the right of the PFD, provides engine instrumentation and supplemental situational and navigation information to the pilot. The Touch Screen Controllers are pilot select-able to be either the PFD Controller, MFD Controller, or Radio Management Controller. The left-most GTC reverts to the Standby Flight Display (SFD) when in display revisionary or backup mode.

The airplane was equipped with Garmin GWX 7X weather radar, GDL 69A SiriusXM Satellite Weather & Radio Data Link receiver, and GSR 56 Iridium Transceiver. The weather radar displayed real-time information on the "flight displays", the SiriusXM Weather Data Link receiver received and transmitted real-time weather information on the PFD and MFD. The GSR 56 Iridium Transceiver received and transmitted real-time weather information to the PFD and MFD, including NEXRAD Radar on the MFD.

The airplane was equipped with a Cirrus Airframe Parachute System (CAPS) designed to lower the aircraft and its passengers to the ground in the event of a life-threatening emergency.

1.2 Airplane Certification, Flight Test, Airworthiness, and Maintenance Information

The SF50 airplane received Federal Aviation Administration Type Certification on October 28, 2016. The certification basis was 14 *CFR* Part 23 effective February 1, 1965, as amended by Amendments 23-1 through 23-62, 14 *CFR* Part 34 effective September 10, 1990, as amended by Amendments 34-1 through 34-5A, and 14 *CFR* Part 36 effective December 1, 1969 as amended by Amendments 36-1 through 36-28.

The SF50 airplane, serial number 0088, was manufactured in 2018. A Production Flight Test was accomplished on November 26, 2018, and a U.S. Standard Airworthiness Certificate was issued on November 28, 2018.

DATE OF INSPECTION	AIRCRAFT TIME IN SERVICE	DETAILS OF INSPECTION STATUS, RESULTS AND RETURN TO SERVICE NOTES
26/NOV/2018	4.8	Production Flight Test accomplished in accordance with Cirrus Procedure #90506 Name: Daniel Ryan Date 26 NOV 18 Signature: [REDACTED] Title: Production Flight Test Pilot
28/NOV/2018	4.8	I find that the aircraft meets the requirements for the certification requested and have issued an U.S. Standard Airworthiness Certificate dated 28 / NOV / 2018. The next inspection is due 30 / NOV / 2018. [REDACTED] Kelly Bergstedt [REDACTED] DMIR

Figure 1: View of the Production Flight Test and Airworthiness Certificate Entries.

The airplane was last inspected in accordance with (IAW) the Cirrus SF50 Airplane Maintenance Manual (AMM) on January 31, 2022. The airplane total time at the time of the inspection was recorded to be 506.5 hours.



UAC
University Air Center

01/31/2022
GAINESVILLE, FL

N77VJ
MAKE: CIRRUS
MODEL: SF50
S/N: 0088
TACH: 392.3 EFT: 389.39
HOBBS: 506.5 ERT: 500.12
Cycles: 330

1. Performed Annual inspection of aircraft IAW Cirrus SF50 AMM.
2. Removed Flap actuator P/N: 32537-001 S/N: 81 and installed new flap actuator P/N: 32537-001 S/N: 389 IAW Cirrus SF50 AMM. Ops checked good at this time.
3. Removed and installed new Pilot seat R/H rear flight range cable IAW Cirrus SF50 AMM. Ops checked good at this time.
4. Removed and installed new R/H and L/H brake pads IAW Cirrus SF50 AMM.
5. Removed and installed new radome lightning diverter strip IAW SF50 AMM.
6. Removed and installed new R/H Wheel P/N: RF-010(B) S/N: 907 IAW Berringer maintenance manual and SF50 AMM.
7. Removed #1 Battery P/N: RG-325 S/N: 4103894; and installed new #1 Battery with P/N: RG-325 S/N: 41137274. IAW Cirrus SF50 AMM and Concorde CMM Ops check good at this time.
8. Complied with SB5X-11-02 Take off trim placard installation.
9. Complied with SB5X-90-07 Caps tape removal and replacement.
10. Complied with SB5X-25-14 Cabin interior adhesion.
11. Performed ELT inspection per 14 CFR 91.207 ELT battery **Due June, 2024**.
12. Performed aircraft log research and found all applicable mandatory service bulletins per Cirrus and Williams Int. complied with at this time.
13. All applicable AD's have been complied with at this time.

I certify this Aircraft has been inspected in accordance with an **Annual** inspection per 14 CFR and is determined to be in an airworthy condition.

Tyler Ake A&P LA [Redacted Signature]

Figure 2: Last Annual Inspection of Airframe.

2.0. General Engine Information

2.1 Engine Description

The Vision SF50 is powered by a single Williams FJ33-5A turbofan engine, which is a twin-spool, turbofan engine with a single-stage fan and a three-stage axial compressor direct driven by a two-stage turbine, a single-stage centrifugal compressor driven by a single-stage turbine, an annular combustor, a full length bypass duct, and an exhaust mixer.

The FJ33-5A engine produces a minimum of 1846 lbs of takeoff thrust, uninstalled at sea level, at an ambient temperature of 60 °F. Thrust is managed by translating the Thrust Lever Angle (TLA) into an electrical input to the airframe-mounted FADEC ECU.

2.2 Engine Maintenance Information

The FJ33-5A engine, serial number 233692, was last inspected on January 31, 2022, IAW an annual inspection including pre, post, and operational checks IAW SF 50 AMM, with, "no discrepancies noted at this time.



UAC
University Air Center

01/31/2022
GAINESVILLE, FL

N77VJ
MAKE: Williams
MODEL: FJ-33-5A
S/N: 233692
TACH: 392.3 EFT: 389.39
HOBBS: 506.5 ERT: 500.12
Cycles: 330

1. Performed Annual inspection of aircraft performed pre and post inspection, and operational checks IAW SF50 AMM, no discrepancies noted at this time.
2. Performed download of FADEC system trend data using the EMT and sent files to FADEC@williams-int.com IAW FJ33-5A LMM
3. Performed engine rinse IAW William FJ33-5A LMM 71-00-03-170-801.
4. Performed aircraft log research and found all applicable mandatory service bulletins per Cirrus and Williams Int. complied with at this time.
5. All applicable AD's have been complied with at this time

I certify this Aircraft has been inspected in accordance with an **Annual** inspection per 14 CFR and is determined to be in an airworthy condition.

Tyler Ake A&P IA

Figure 3: Last Annual Inspection of Engine.

3.0. On-Scene and Follow-Up Airplane and Engine Documentation

3.1 Accident Site Information

The airplane crashed in a marshy area behind a house. The main wreckage was located at 28.20477° north latitude and -81.372500° west longitude, or approximately 5.6 nautical miles and 146° from the approach end of runway 33.

Cursory examination of the airplane following recovery was performed by representatives of the Federal Aviation Administration and Cirrus Aircraft Corporation.



Figure 4: Right Side View of the Airplane After Being Airlifted from the Accident Site.

3.2 Airframe Examination Following Recovery

Examination of the recovered airplane was performed on October 17, 2023 by personnel from NTSB and Cirrus Aircraft Corporation. The examination revealed both wings, and the right v-tail stabilizer with attached right ruddervator were cut for recovery. The left v-tail stabilizer with attached ruddervator which were damaged in the impact sequence were later cut from the empennage to facilitate recovery. The front pressure bulkhead was substantially damaged in multiple areas.

3.3 Engine Examination Following Recovery

The engine was not inspected.

3.4 Empennage

Examination of the left v-tail stabilizer and ruddervator revealed the forward and aft spars of the stabilizer were fractured. The full span of the left ruddervator with full span of the trim tab remained attached to the stabilizer. The left ruddervator was torn near full chord at the outboard hinge and the torque tube was cut near the root cut for recovery. The counterweight remained attached to the left ruddervator. The left ruddervator outboard hinge and pin of the ruddervator was deformed. The left ruddervator remained attached at the inboard and middle hinges. The trim tab actuator was

extended 1.8125 inches although the reading was unreliable because the trim tab cable/chain could be easily moved because the trim cable had been cut for recovery. The ruddervator actuation arm was bent about 180°.

Examination of the right v-tail stabilizer and ruddervator revealed that the forward and aft spars of the stabilizer and the ruddervator were cut for recovery about 2.5 ft outboard of the root. The full span of the trim tab remained attached to the right ruddervator. The outer 2 ft of the right ruddervator was deformed. The trim tab actuator was extended 1.375 inches, although the reading was unreliable because the trim tab cable/chain could be easily moved because the trim cable had been cut for recovery. The counterweight was in place. The right ruddervator middle hinge was slightly deformed and the pin was bent, while the right ruddervator outboard hinge was attached to the aft spar and the pin was thru the hole in the hinge and the pin was bent.

3.5 Wings

Examination of the left wing revealed the main and aft spars near the wing root, the flap torque tube, and the aileron push/pull rod near the wing root were cut for recovery. The aileron push/pull rods were continuous from the wing root to the bellcrank near the control surface. The main landing gear was extended. The wing spar and aft shear web were fractured at the inboard end of the aileron. The outboard portion of the left wing was fragmented from the aileron outboard. The full span of the separated flap, and aileron with attached aileron trim tab were accounted for. The left aileron counterweight remained attached. The left aileron trim tab actuator was extended 5.875 inches from the housing to the center line of the attach bolt. Visual examination of the left aileron trim tab revealed it appeared to be in the neutral position. Examination of the separated aileron revealed the outboard hinge was pulled from the structure and the outboard pin was bent. The middle aileron hinge and bracket remained attached to the aft spar, and the aft spar was fractured and fragmented in that area; the middle pin was bent. The inboard aileron hinge and bracket remained attached to the aft spar. The inboard aileron hinge attach bolt was bent and exhibited overload failure.

Examination of the right wing revealed the main and aft spars, and the flap torque tube and aileron push/pull rod were cut near the wing root for recovery. The aileron push/pull tube was continuous from where cut near the wing root to the bellcrank near the control surface. The full span of the right flap remained connected at all hinges, and it appeared to be in the retracted position. The full span of the right aileron with full span of aileron balance tab remained connected at the inboard hinge position but was separated from the

middle and outboard hinges. The aileron counterweight remained attached to the control surface. The fuel cap was in place.

3.6 Flight Controls and Flaps

Examination of the flight controls for roll, pitch, and yaw revealed control continuity was confirmed for each control surface from the cockpit to each control surface except for controls that exhibited overload failure in the cockpit or where cut for recovery. The vertical pitch/pull rod in the cockpit behind the instrument panel and the co-pilot control joystick pitch push/pull tube both exhibited overload failure with no evidence of preimpact failure or malfunction. The right flap was observed retracted, which coincided with the flap selector position.

3.7 Landing Gear

Both main landing gears remained attached inside each wing, while the nose landing gear was separated.

3.8 Cockpit

Examination of the cockpit revealed the following observations:

- The primary flight display (PFD) and multifunction display (MFD) had been removed from the instrument panel
- Landing Gear Selector - Up
- Electronic avionics removed from the instrument panel
- Hour Meter - 645.22¹
- Flight Hour Meter-501.63²

Pilots side circuit breaker panel-All in except Lt Probe Heat, MFDA, and Nav Lights

- Engine Start/Stop-Off
- Parking Brake-In
- Fuel Control-Right Tank
- Flap Selector-Up
- IFE Switch - On
- Pilot's inboard Seat Track- Deformed to the right
- Instrument Panel-Deformed to the right
- Temp Selector-9 o'clock position
- Fan-Auto

¹ According to Pilot Information Manual (PIM), the hour meter starts recording when the pilot turns the engine knob to run and momentarily presses the engine button. It stops when the pilot turns the engine knob to off and momentarily presses the engine button (which secures the engine).

² According to Pilot Information Manual (PIM), the hour meter labeled "Flight" begins recording when the wheels are off the ground and the weight-on-wheels (WOW) is false, and stops recording when the wheels are on the ground and the WOW is true and the ground fan is on.

- Co-pilots side circuit breaker panel-All in except Wing Stab IPS, Fuel Level, Windshield IPS
- Emergency Gear Handle-In
- Emergency Battery-Off
- Mask Microphone- Off
- Engine Fire Guard-Closed
- Other Mask Microphone-Off
- Pressure Dump-Guard Closed
- CAPS Activation Handle-Out of Holder
- Co-Pilot Mask-Out of Holder
- TV Screen-Closed
- Main Cabin Entry Door-Upper and Lower Ops Check Good
- Convenience Lighting Mode Switch - Off

3.9 Survivability/Seat Inspections

The pilot's seat, which remained connected to the seat tracks was removed to inspect the energy absorbing material for deformation. The following dimensions were noted:

- Left Front Corner- 10.6 cm
- Right Front Corner - 11.35 cm
- Left Rear Corner - 10.4 cm
- Right Rear Corner - 11.6 cm

The co-pilot's seat, which remained connected to the seat tracks was removed to inspect the energy absorbing material for deformation. The following dimensions were noted:

- Measured 11.6 cm all 4 corners.

The right seat, second row (#5) which remained connected to the seat tracks was removed to inspect the energy absorbing material for deformation. The following dimensions were noted:

- Left Rear Corner - 11.4 cm
- All other corners - 11.6 cm

3.10 Fuel/Fuel System

The fuel system was not examined.

4.0. PARTS RETENTION

The NTSB did not retain any parts. The wreckage was released to the insurance adjuster on October 26, 2023.

5.0. PENDING INFORMATION

Investigative Report Review Process.

Submitted by:

Timothy W. Monville
Sr. Air Safety Investigator