



# Aviation Investigation Final Report

<b>Location:</b>	North Las Vegas, Nevada	<b>Accident Number:</b>	ERA22FA318
<b>Date &amp; Time:</b>	July 17, 2022, 12:03 Local	<b>Registration:</b>	N97CX (A1); N160RA (A2)
<b>Aircraft:</b>	Piper PA-46-350P (A1); Cessna 172N (A2)	<b>Aircraft Damage:</b>	Destroyed (A1); Destroyed (A2)
<b>Defining Event:</b>	Midair collision	<b>Injuries:</b>	2 Fatal (A1); 2 Fatal (A2)
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal (A1); Part 91: General aviation - Instructional (A2)		

## Analysis

The commercial pilot and private-rated copilot on board the low-wing airplane were performing a visual approach to their home airport at the end of an instrument-flight-rules flight. They were instructed by the approach controller to cross the destination airport over midfield and enter the left downwind leg of the traffic pattern for landing on runway 30L. Meanwhile, the flight instructor and student pilot on board the high-wing airplane were conducting takeoffs and landings in the right traffic pattern for runway 30R and were cleared to conduct a short approach for landing on runway 30R.

Upon contacting the airport tower controller, the crew of the low-wing airplane was instructed to proceed to runway 30L, and the copilot acknowledged. The controller subsequently confirmed the landing approach to runway 30L, and the copilot again acknowledged with a correct readback of the landing clearance.

Automatic Dependent Surveillance-Broadcast (ADS-B) flight track data indicated that, after crossing over the runway, the low-wing airplane performed a continuous, descending turn through the final approach path for runway 30L and rolled out aligned with the final approach path for runway 30R. The airplanes collided about ¼ nautical mile from the approach end of the runway.

Although day visual meteorological conditions prevailed at the airport at the time of the accident, a visibility study determined that it would have been difficult for the pilots of the two airplanes to see and avoid one another given the size of each airplane in the other's

windscreen and the complex backgrounds against which they would have appeared. The pilot of the low-wing airplane would likely have had to move his head position in the cockpit (e.g., by leaning forward) in order to see the approach ends of the runways during most of the turn. If looking in the direction of the runways, he would have been looking away from the direction of the oncoming high-wing airplane, which was also obscured from view by aircraft structure during a portion of the turn, likely including the final seconds before the collision. The visibility study indicated that sun glare was not likely a factor.

The high-wing airplane was not equipped with a cockpit display of traffic information (CDTI). The low-wing airplane was equipped with a CDTI, which may have generated a visual and aural traffic alert concerning the high-wing airplane before the collision; however, this may not have provoked concern from the flight crew, since other aircraft are to be expected while operating in the airport traffic pattern environment. The circumstances of this accident underscored the difficulty in seeing airborne traffic (the foundation of the "see and avoid" concept in visual meteorological conditions), even when pilots might be alerted to traffic in the vicinity by equipment such as CDTI.

Given the low-wing airplane pilots' familiarity with the airport, it is unlikely that they misidentified the intended landing runway; however, it is possible that they were unfamiliar with their issued instructions to overfly the airport and join the traffic pattern, as this was a fairly new air traffic control procedure for routing inbound traffic to the airport that had been implemented on a test basis, for a period of about one week, about two months before the accident. Their lack of familiarity with the maneuver may have resulted in a miscalculation that resulted in the airplane rolling out of turn farther to the right of runway 30L than expected. A performance study indicated that, during the turn to final approach, the airplane was between 38 knots (kts) and 21 kts faster than its nominal landing approach speed of 85 kts. This excess speed may have contributed to the pilots' alignment with runway 30R instead of runway 30L. Analysis of the turn radius required to align the airplane with runway 30L indicated a required roll angle of between 32° and 37° at the speeds flown; at 85 kts. While the wrong runway line up by the low-wing airplane may have been the crew's misidentification of the runway to which they were cleared to land, it may also have been a miscalculation in performing a maneuver that was relatively new and that they may have never conducted before. Thus, resulting in a fast, short, and tight continuous descending turn to final that rolled them out farther right than expected. The high-wing configuration of the Cessna in a right turn to final, and the low-wing configuration of the Piper in a left turn to final, only exacerbated the conflict by reducing the ability of the pilots to see the other aircraft.

The pilot of the low-wing airplane had cardiovascular disease that increased his risk of experiencing an impairing or incapacitating medical event, such as arrhythmia or stroke. Although such an event does not leave reliable autopsy evidence if it occurs just before death, given that the airplane was in controlled flight until the collision, and had two pilots on board, one of whom was communicating with air traffic control, it is unlikely that an incapacitating medical event occurred. The pilot also had advanced hearing impairment, which may have

made it more difficult for him to discern speech; however, the circumstances of the accident are not consistent with a pilot comprehension problem; the crew correctly read back the instruction to land on runway 30L. Whether the pilot's hearing loss impacted his ability to detect cues such as the high-wing airplane's landing clearance to the parallel runway or a possible CDTI aural alert could not be determined based on the available information. Although both the pilot and copilot's ages and medical conditions were risk factors for cognitive impairment, there was no specific evidence available to suggest that either of the pilots on board the low-wing airplane had cognitive impairment that contributed to the accident.

Autopsy of the flight instructor on board the high-wing airplane identified some dilation of his heart ventricles; while this may have been associated with increased risk of an impairing or incapacitating cardiovascular event, given the circumstances of the accident, it is unlikely that such an event occurred. The instructor also had hydronephrosis of the left kidney, with stones in the left renal pelvis. This may have been asymptomatic (kidney stone pain typically is associated with passage of a stone through the ureter, not with stones in the renal pelvis). The instructor's vitreous creatinine and potassium elevation cannot be clearly attributed to hydronephrosis of a single kidney. Additionally, the instructor was producing urine and had no elevation of vitreous urea nitrogen. The vitreous chemistry results should be interpreted cautiously given the extent of thermal injury. The instructor's heart and kidney issues are unlikely to have affected his ability to see and avoid the other airplane.

The student pilot on board the high-wing airplane also had heart disease identified at autopsy, including moderate coronary artery disease and an enlarged heart with dilated ventricles. While his heart disease was associated with increased risk of an impairing or incapacitating cardiovascular event, given the circumstances of the accident, it is unlikely that such an event occurred. The student pilot's vitreous chemistry test indicated hyponatremic dehydration; however, it is unlikely that dehydration contributed to the accident.

The controller did not issue traffic advisory information to either of the airplanes involved in the collision at any time during their respective approaches for landing, even though the low-wing airplane crossed about 500 ft over the high-wing airplane as it descended over the airport toward the downwind leg of the traffic pattern. His reasoning for not providing advisories to the airplanes as they entered opposing base legs was that he expected the high-wing airplane to be over the runway numbers before the low-wing airplane would be able to visually acquire it; however, this was a flawed expectation that did not account for the differences in airplane performance characteristics. After clearing both airplanes for landing, he communicated with two uninvolved aircraft and did not monitor the progress of the accident airplanes to the two closely-spaced parallel runways. This showed poor judgement, particularly given that in the months before the accident, there had been a series of events at the airport in which pilots had mistakenly aligned with, landed on, or taken off from an incorrect runway.

Interviews with personnel at the air traffic control tower indicated that staffing was deficient, and most staff were required to work mandatory overtime shifts, reaching an annual average

of 400 to 500 hours of overtime per controller. According to the air traffic manager (ATM), the inadequate staffing had resulted in reduced training discussions, and the management team was unable to appropriately monitor employee performance. The ATM stated that everyone on the team was exhausted, and that work/life balance was non-existent. It is likely that the cumulative effects of continued deficient staffing, excessive overtime, reduced training, and inadequate recovery time between shifts took a considerable toll on the control tower workforce.

## **Probable Cause and Findings**

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

The low-wing airplane pilot's failure to ensure that the airplane was aligned with the correct runway, which resulted in a collision with the high-wing airplane on final approach. Contributing to the accident was the controller's failure to provide timely and adequate traffic information to either airplane and his failure to recognize the developing conflict and to act in a timely manner. Also contributing was the Federal Aviation Administration's insufficient staffing of the facility, which required excessive overtime that did not allow for proper controller training or adequate recovery time between shifts.

## Findings

<b>Environmental issues (A1)</b>	(general) - Contributed to outcome
<b>Personnel issues (A1)</b>	Monitoring other aircraft - ATC personnel
<b>Personnel issues (A1)</b>	Lack of communication - ATC personnel
<b>Personnel issues (A1)</b>	Understanding/comprehension - ATC personnel
<b>Personnel issues (A1)</b>	Aircraft control - Not specified
<b>Personnel issues (A1)</b>	Use of equip/system - Pilot
<b>Personnel issues (A1)</b>	Identification/recognition - Pilot
<b>Personnel issues (A1)</b>	Monitoring other aircraft - Pilot
<b>Aircraft (A1)</b>	Descent/approach/glide path - Incorrect use/operation
<b>Aircraft (A1)</b>	Airspeed - Not attained/maintained
<b>Environmental issues (A2)</b>	(general) - Contributed to outcome
<b>Personnel issues (A2)</b>	Monitoring other aircraft - ATC personnel
<b>Personnel issues (A2)</b>	Aircraft control - Pilot of other aircraft
<b>Personnel issues (A2)</b>	Lack of communication - ATC personnel
<b>Personnel issues (A2)</b>	Understanding/comprehension - ATC personnel
<b>Personnel issues (A2)</b>	Aircraft control - Pilot of other aircraft
<b>Personnel issues (A2)</b>	Use of equip/system - Pilot of other aircraft
<b>Personnel issues (A2)</b>	Identification/recognition - Pilot of other aircraft
<b>Personnel issues (A2)</b>	Monitoring other aircraft - Pilot of other aircraft

## Factual Information

### History of Flight

Approach (A1)	Air traffic event
Approach (A1)	Wrong surface or wrong airport
Approach (A1)	Midair collision (Defining event)
Approach (A2)	Midair collision

On July 17, 2022, about 1203 Pacific daylight time, a Piper PA-46-350P, N97CX (the low-wing airplane), and a Cessna 172N, N160RA (the high-wing airplane), were destroyed when they were involved in an inflight collision while maneuvering to land at North Las Vegas Airport (VGT), North Las Vegas, Nevada. The pilot and copilot in the low-wing airplane and the flight instructor and student pilot in the high-wing airplane were fatally injured. The low-wing airplane was operated as a Title 14 *Code of Federal Regulations (CFR)* Part 91 personal flight and the high-wing airplane was operated as a 14 *CFR* Part 91 instructional flight.

The commercial pilot and private pilot-rated copilot in the low-wing airplane were approaching VGT, their home airport, from the north at the conclusion of an instrument-flight-rules (IFR) flight that originated from Coeur d'Alene Airport - Pappy Boyington Field (COE), Coeur d'Alene, Idaho, about 0943.

The high-wing airplane was operating as a visual flight rules (VFR) training flight conducting takeoffs and landings in the right traffic pattern for runway 30R. The flight originated from runway 30L at 1129.

At 1156:08, the Nellis Radar Approach Control controller cleared the low-wing airplane for the visual approach and instructed the pilots to overfly VGT at midfield for left traffic to runway 30L. Air traffic control responsibility for the flight was transferred to the VGT air traffic control tower (ATCT) at 1158:26.

At 1158:43, the copilot in the low-wing airplane contacted the VGT local control (LC) controller and reported that the airplane was descending out of 7,600 ft mean sea level (msl) for landing on runway 30L and crossing the airport mid-field. The controller instructed the airplane to continue to runway 30L, and the copilot in the low-wing airplane acknowledged.

At 1200:03, the high-wing airplane's pilot requested a "short approach," and the controller subsequently cleared the airplane for "the option" for runway 30R.

At 1201:36, the controller cleared the low-wing airplane to land on runway 30L. The copilot responded with a correct readback of the clearance.

At 1201:57, the controller confirmed the landing clearance on runway 30L with the low-wing airplane, and the copilot subsequently replied, “yeah affirmative runway three zero left that’s what I heard nine seven charlie x-ray” at 1202:02.

There were no further transmissions from either airplane. The airplanes collided about 0.25 nautical miles from the approach end of runway 30R. Neither airplane was provided advisory information regarding the other from the controller.

Review of ADS-B data indicated that, after correctly acknowledging their clearance to land on runway 30L, the low-wing airplane flew a close-in downwind leg and performed a continuous left turn through the final approach path to runway 30L, rolling out of the turn aligned with the final approach path to runway 30R. (See Figure 1.)

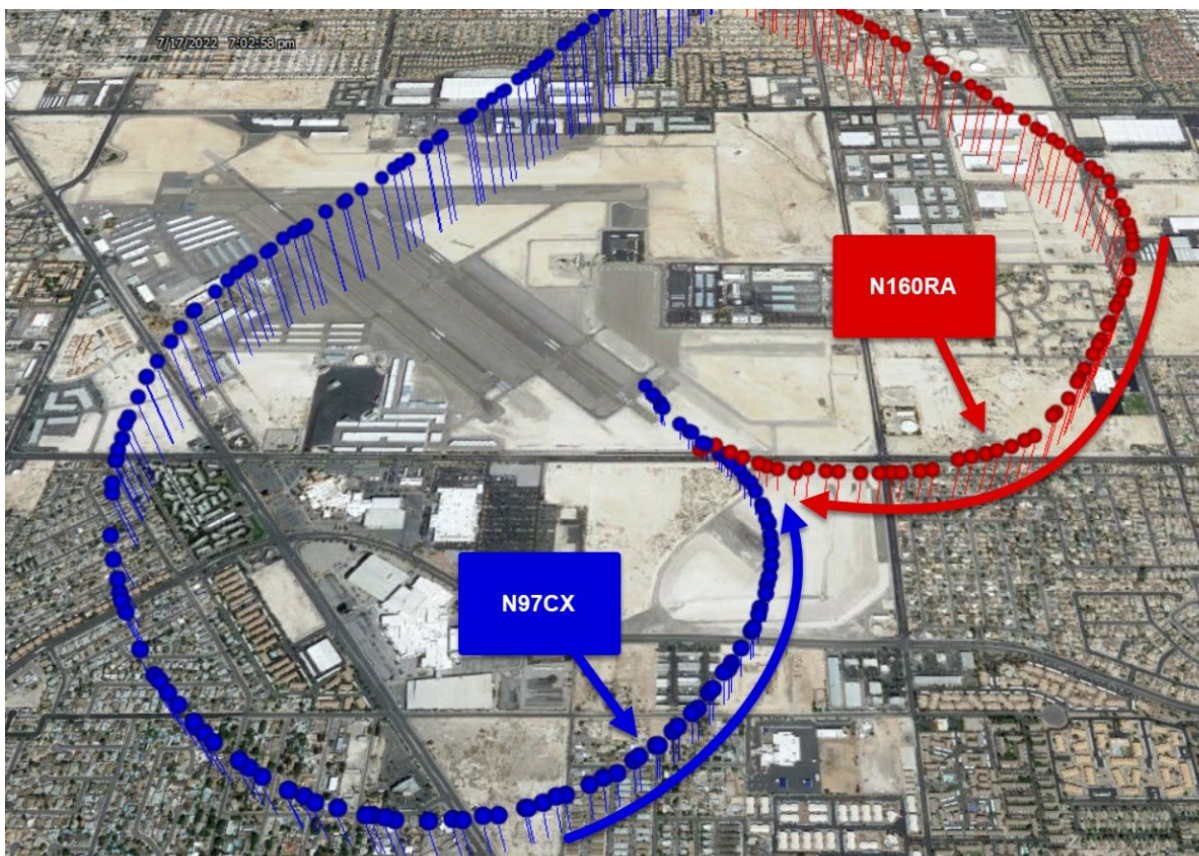


Figure 1. Overhead view of airplanes’ flight tracks overlaid on satellite imagery (N97CX, low-wing airplane, N160RA, high-wing airplane).

## Pilot Information (A1)

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	82, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	BasicMed With waivers/limitations	<b>Last FAA Medical Exam:</b>	May 16, 2022
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	June 20, 2022
<b>Flight Time:</b>	(Estimated) 6643 hours (Total, all aircraft)		

## Co-pilot Information (A1)

<b>Certificate:</b>	Private	<b>Age:</b>	76, Female
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	BasicMed With waivers/limitations	<b>Last FAA Medical Exam:</b>	June 3, 2020
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	October 2, 2021
<b>Flight Time:</b>	(Estimated) 1536 hours (Total, all aircraft), 280 hours (Total, this make and model), 1125 hours (Pilot In Command, all aircraft)		

## Flight instructor Information (A2)

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	40, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	August 6, 2021
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	January 11, 2022
<b>Flight Time:</b>	(Estimated) 850 hours (Total, all aircraft), 775 hours (Pilot In Command, all aircraft), 130 hours (Last 90 days, all aircraft), 62 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		



## Student pilot Information (A2)

<b>Certificate:</b>	Student	<b>Age:</b>	47, Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	October 16, 2020
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	57 hours (Total, all aircraft), 57 hours (Total, this make and model), 7 hours (Pilot In Command, all aircraft), 3 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

### Low-Wing Airplane

According to Federal Aviation Administration (FAA) and pilot records, the pilot held a commercial pilot certificate with ratings for airplane single-engine land, airplane multi-engine land, and instrument airplane. He also held a flight instructor certificate with ratings for airplane single- and multi-engine, and instrument airplane. His FAA BasicMed course and Comprehensive Medical Examination Checklist (CMEC) were completed on May 16, 2022. He had accrued about 6,643 total flight hours.

The copilot held a private pilot certificate with ratings for airplane single-engine land and sea, airplane multi-engine land, and instrument airplane. Her FAA BasicMed course was completed on June 1, 2022, and her BasicMed CMEC was completed on June 3, 2020. She had accrued about 1,536 total flight hours, of which about 280 hours were in the accident airplane make and model.

The pilot and the copilot were married and flew the airplane together regularly. Review of flight plans indicated that the pilot would file as the pilot-in-command. Review of the pilot's most current logbook indicated that he had been providing instruction in the airplane on multiple occasions to the copilot. Review of the copilot's most recent logbook indicated that the 280 or so hours she had in the airplane had been logged in most cases as "Dual Received" or "Second-In-Command."

After the accident, the pilot was recovered from the left front seat, the copilot was recovered from the right front seat. Review of ATC audio indicated that the copilot was communicating with ATC during the accident flight.

It could not be determined which of the pilots was manipulating the controls during the accident flight.

## High-Wing Airplane

According to FAA and pilot records, the flight instructor held a commercial pilot certificate with ratings for airplane single-engine land, airplane multi-engine land, and instrument airplane. He also held a flight instructor certificate with ratings for airplane single- and multi-engine, and instrument airplane. His most recent FAA first-class medical certificate was issued on August 6, 2021. He had accrued about 850 total flight hours, 775 of which were as pilot-in-command.

According to FAA and pilot records, the student pilot held a student pilot certificate. His most recent FAA third-class medical certificate was issued on October 16, 2020. He had accrued about 57 total flight hours, all of which were in the accident airplane make and model.

It could not be determined who was manipulating the controls at the time of the accident.

### Aircraft and Owner/Operator Information (A1)

<b>Aircraft Make:</b>	Piper	<b>Registration:</b>	N97CX
<b>Model/Series:</b>	PA-46-350P	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1997	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	4636128
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	July 1, 2022 Annual	<b>Certified Max Gross Wt.:</b>	4300 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo prop
<b>Airframe Total Time:</b>	3212.1 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	PT6A-34
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	560 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Aircraft and Owner/Operator Information (A2)

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N160RA
<b>Model/Series:</b>	172N	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1977	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal; Utility	<b>Serial Number:</b>	17268851
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	July 1, 2022 100 hour	<b>Certified Max Gross Wt.:</b>	2400 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	10655.5 Hrs as of last inspection	<b>Engine Manufacturer:</b>	LYCOMING
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	O-360-A4M
<b>Registered Owner:</b>	BINNER ENTERPRISES LLC	<b>Rated Power:</b>	180 Horsepower
<b>Operator:</b>	Airwork Las Vegas	<b>Operating Certificate(s) Held:</b>	None

The low-wing airplane was a Piper JetProp DLX, which was an aftermarket turbine engine conversion by Rocket Engineering of Spokane, Washington, of a single-engine, pressurized, Piper PA-46-350P, also called a Malibu Mirage.

The high-wing airplane was a Cessna 172N.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KVGT, 2190 ft msl	<b>Distance from Accident Site:</b>	0 Nautical Miles
<b>Observation Time:</b>	11:53 Local	<b>Direction from Accident Site:</b>	15°
<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>	4 knots / None	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	320°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.91 inches Hg	<b>Temperature/Dew Point:</b>	38°C / 12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Coeur d'Alene, ID (COE) (A1); Las Vegas, NV (VGT) (A2)	<b>Type of Flight Plan Filed:</b>	IFR (A1); None (A2)
<b>Destination:</b>	Las Vegas, NV (VGT) (A1); Las Vegas, NV (VGT) (A2)	<b>Type of Clearance:</b>	IFR (A1); VFR (A2)
<b>Departure Time:</b>	09:43 Local (A1); 11:25 Local (A2)	<b>Type of Airspace:</b>	Class D (A1); Class D (A2)

The recorded weather at VGT at 1153, about 10 minutes before the accident, included wind from 320° at 4 knots, 10 miles visibility, clear skies, temperature 38°C, dew point 12°C, and an altimeter setting of 29.91 inches of mercury.

## Airport Information

<b>Airport:</b>	NORTH LAS VEGAS VGT	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	2205 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	30R	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	4199 ft / 75 ft	<b>VFR Approach/Landing:</b>	Full stop; Traffic pattern

VGT was a medium sized, primarily general aviation airport located in the City of North Las Vegas, just northwest of the Las Vegas strip. The larger Harry Reid International Airport (LAS) was located eight miles south, and Nellis Air Force Base (LSV) was seven miles east. VGT had its own Class D airspace underlying the larger LAS Class B airspace. The airport was equipped with two closely spaced, offset parallel runways (12L/30R and 12R/30L) and an intersecting runway (7/25).

The runway 30L and runway 30R centerlines were about 700 ft apart. The runway 30L threshold was located about 900 ft past the runway 30R threshold.

### Wreckage and Impact Information (A1)

<b>Crew Injuries:</b>	2 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Fatal	<b>Latitude, Longitude:</b>	36.210703,-115.19444

### Wreckage and Impact Information (A2)

<b>Crew Injuries:</b>	2 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Fatal	<b>Latitude, Longitude:</b>	36.210703,-115.19444

### Low-Wing Airplane

Examination of the airplane and engine did not reveal any preimpact failures or malfunctions that would have precluded normal operation.

The landing gear was down, and the right main landing gear was displaced outboard. The right wing displayed an impact separation around wing station (WS) 93. The inboard wing section remained attached to the fuselage but was canted aft. The right flap was fractured in two about midspan; the inboard section remained attached to the wing and was found in the extended position. The outboard half of the flap was found about 10 ft forward of the right wing.

The right wing's leading edge displayed a series of crush impressions to the leading edge about 2.5 ft outboard of the wing root. The impressions contained flakes of green primer and cuts to the de-ice boot.

The outboard right wing section remained attached to the inboard wing by the aileron control cables. The aileron remained attached to the outboard wing section but was impact damaged. The outboard leading edge was crushed up and aft. The right wingtip fairing and pitot tube

were also impact separated. Longitudinal scratches were visible along the right upper side of the fuselage.

### High-Wing Airplane

Examination of the airplane and engine did not reveal any preimpact failures or malfunctions that would have precluded normal operation.

The airplane impacted terrain in a left-wing-down, nose-low attitude before coming to rest inverted on a 304° magnetic heading.

Blue paint transfer was observed on the lower surface of the separated outboard left wing and the lower surface of the left wing flap. Black de-ice boot material transfer was observed on the lower surface of the separated outboard left wing, the lower surface of the attached portion of the left wing at approximately WS 100, and along the lower leading edge for about 5 ft outboard from the strut attach point.

About 4 ft of the left wing, which included the left aileron, was separated from the rest of the left wing, and was found on the edge of a culvert just south of the main wreckage. The left outboard wing section aft of the forward spar was separated near the aileron/flap junction. The left flap was separated from the wing. Both inboard portions of the wings sustained thermal damage in the areas surrounding the fuel tanks. The cabin and fuselage, except for the cabin roof, were consumed by a post-impact fire.

### Impact Mark Comparison

The left flap of the high-wing airplane displayed a concave crush impression along its trailing edge and upper surface. Within the concave area, scrapes and black rubbery material transfers were observed. The impact mark correlated to an approximate 45° angle relative to the trailing edge of the flap.

The right wing of the low-wing airplane displayed aft crushing to the leading edge about 2.5 feet outboard of the wing root. Flakes of paint primer and scrapes were noted within the crush area.

The right inboard wing of the low-wing airplane was placed on stands. The left flap from the high-wing airplane was positioned adjacent to the leading edge of the low-wing airplane. The impact marks and transfers correlated to an approximate 50° angle relative to the wing leading edge of the low-wing airplane.

The left wing of the high-wing airplane displayed deformation to the trailing edge with a roughly 3-inch diameter crush impression present. The impact mark correlated to an impact with the right horizontal stabilizer of the low-wing airplane.

## Flight recorders

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The low-wing airplane was equipped with a Garmin G500 multifunction display unit that could be configured to show performance and control instrumentation, as well as instrument approach plates and other navigation data.

Five electronic flight information system (EFIS) data cards were recovered after the accident. Four of the data cards were Garmin system cards, which only store firmware for the EFIS operations; a SanDisk SD card was identified as the one possibly storing flight data. When read out, the SD card showed numerous folders and files, but did not have a “data log” folder that would have contained the flight data. Thus, no data pertinent to the accident were recovered from the five data cards. In some instances, newer versions of Garmin G500 can store some data internally in addition to logging data onto SD cards; however, the Garmin G500 installed in the low-wing airplane was not one of the newer versions and did not store flight data internally.

The high-wing airplane was not equipped with any type of data recording device.

## Medical and Pathological Information

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### Low-Wing Airplane

The 82-year-old male pilot’s medical history included hypertension, hyperlipidemia, aortic valve replacement with a bioprosthetic valve in 2014, ministroke around 2014, chronic right carotid artery occlusion, atrial flutter controlled without the need for anticoagulation following cardiac ablation and pacemaker placement in December 2017, chronic left mastoiditis treated with mastoidectomy, marked hearing loss affecting both ears, cataracts, and recurrent urinary tract infections. His medical records documented the use of multiple medications that are not generally considered impairing.

His most recent aviation medical examination was October 17, 2017. At that time, he reported his remote history of mastoidectomy and tympanic membrane reconstruction procedures on the left side. He answered “no” to a question about whether he had ever had heart or vascular trouble. The aviation medical examiner (AME) noted a right-sided hearing aid and a systolic heart murmur on physical examination. The AME documented that the pilot passed a conversational voice hearing test at 6 feet, and that the heart murmur was asymptomatic. The AME issued the pilot a third-class medical certificate limited by a requirement to wear lenses for distant vision and have glasses for near vision. That medical certificate expired in 2019.

The pilot completed the requirements for operation under BasicMed on May 16, 2022. On the Comprehensive Medical Examination Checklist (CMEC) form, the pilot answered “yes” to a question about whether he had ever had heart or vascular trouble. His cardiologist signed the CMEC form and did not identify any condition that, in the cardiologist’s opinion, could interfere with the pilot’s ability to safely operate an aircraft. The pilot had not obtained an Authorization for Special Issuance for his heart valve replacement, and therefore was not eligible to fly as pilot-in-command or as a required flight crewmember under the provisions of BasicMed.

According to the pilot’s autopsy report, his cause of death was blunt trauma, and his manner of death was accident. The pilot’s heart weight was elevated, with dilation of both cardiac ventricles. A prosthetic aortic valve was present, as was an implantable medical device with wiring extending to the heart. Mild coronary artery disease was also present, as was moderate aortic atherosclerosis. The remainder of the autopsy, including the heart, did not identify other significant natural disease.

Postmortem toxicological testing of specimens from the pilot did not detect any tested-for substances that are generally considered impairing, and a postmortem vitreous chemistry test was generally unremarkable.

The 76-year-old female copilot’s last aviation medical examination was June 10, 2020. At that time, she reported a history of 2016 bilateral cataract surgery, as well as a history of Graves’ disease treated with thyroid ablation, resulting in low thyroid hormone, for which she reported using thyroid hormone replacement medication. She had been granted an FAA Authorization for Special Issuance of medical certification for low thyroid hormone and use of medication in 2010 and subsequently received an FAA Letter of Eligibility in 2014 for low thyroid hormone, Graves’ disease, and bilateral exophthalmos. At her last aviation medical examination, the copilot reported using the medications rosuvastatin, celecoxib, glucosamine, and a multivitamin. No significant issues were identified, and the copilot was issued a third-class medical certificate limited by a requirement to wear corrective lenses. That medical certificate expired at the end of June 2022. The copilot completed a BasicMed education course in June 2022 and reported completing a BasicMed CMEC most recently in June 2020.

According to the copilot’s autopsy report, her cause of death was blunt trauma, and her manner of death was accident. Her autopsy did not identify evidence of significant natural disease.

Postmortem toxicological testing of specimens from the copilot did not detect any tested-for substances that are generally considered impairing, and a postmortem vitreous chemistry test was generally unremarkable.

#### High-Wing Airplane

The 40-year-old male flight instructor’s last aviation medical examination was August 6, 2021. At that time, he reported no medication use or active medical conditions. No significant issues



were identified, and he was issued a first-class medical certificate limited by a requirement to wear corrective lenses.

According to the flight instructor's autopsy report, his cause of death was blunt trauma, and his manner of death was accident. Diffuse thermal injury was present. Both ventricles of the heart were described as dilated. The remainder of the heart examination, including the coronary arteries, did not identify other evidence of natural disease. Hydronephrosis of the left kidney was present, with stones in the renal pelvis of the left kidney; the right kidney and bladder were unremarkable, and the bladder contained abundant urine. The remainder of the autopsy did not identify other significant natural disease.

Postmortem toxicological testing of specimens from the flight instructor did not detect any tested-for substances that are generally considered impairing. A vitreous chemistry test showed an elevated vitreous creatinine and vitreous potassium, with normal vitreous urea nitrogen.

The 47-year-old male student pilot's only aviation medical examination was October 16, 2020. At that time, he reported using a testosterone replacement injection. He reported a history of a 2011 driving under the influence (DUI) arrest without a conviction. No significant issues were identified, and he was issued a third-class medical certificate without limitation. In June 2021, the FAA issued him a Letter of Eligibility for his 2011 DUI arrest.

According to the student pilot's autopsy report, his cause of death was blunt trauma, and his manner of death was accident. Diffuse thermal injury was present and structural evaluation of the brain was limited. The left anterior descending coronary artery was 50% narrowed by plaque. The heart weight was elevated, and the ventricles of the heart were described as dilated. The remainder of the autopsy, including visual examination of the heart, was without other evidence of significant natural disease.

Postmortem toxicological testing of specimens from the student pilot did not detect any tested-for substances that are generally considered impairing. A vitreous chemistry test was interpreted by the medical examiner to indicate hyponatremic dehydration.

## Tests and Research

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### Aircraft Performance and Cockpit Visibility Study

Due to the nature of the accident, an aircraft performance and cockpit visibility study was conducted by the NTSB's Office of Research and Engineering's Vehicle Performance Division.

An NTSB simulation indicated that if a cockpit display of traffic information (CDTI) had been available on the high-wing airplane, it might have generated a visual and aural alert concerning the low-wing airplane about 30 seconds before the collision. An NTSB simulation of the Garmin 500/GDL88 combination installed on the low-wing airplane indicated that this system may have generated a visual and aural traffic advisory alert concerning the high-wing airplane about 22 seconds before the collision.

During the minute before the collision, the high-wing airplane would have been in the low-wing airplane pilot's field of view for only 15 seconds (between 1202:28 and 1202:43). During most of this time, the high-wing airplane would have appeared as a small object (spanning less than 1° of azimuth and elevation) in the low-wing airplane's windshield. Critically, the high-wing airplane would have been obscured behind the low-wing airplane's center window post during the last 8 seconds before the collision as it grew in size in the field of view. In addition, the high-wing airplane (when visible) would have appeared on or slightly below the horizon and against a complex background, which would have made it more difficult to identify. During the same minute, the low-wing airplane would have been visible in the high-wing airplane pilot's field of view from 1202:06 until the collision, except for two 3-second periods from 1202:20 until 1202:23, and again between 1202:37 and 1202:40. The low-wing airplane would have appeared on or slightly below the horizon and against a complex background, which would have made it more difficult to identify. The low-wing airplane would have passed behind the high-wing airplane pilot's left shoulder at 1202:44.5, 6.5 seconds before the collision, making it less likely that the high-wing airplane pilot would have become aware of the low-wing airplane approaching from his left aft quarter as both airplanes maneuvered onto the final approach for runway 30R.

Calculations of the position of the sun at the time of the accident indicated that in both pilots' fields of view, the sun would have appeared sufficiently high in the sky so as to be always shielded by the cockpit structure above the windows. Hence, it is not likely that sun glare would have affected either pilot's ability to see the other airplane.

After overflying the field from northeast to southwest, the low-wing airplane entered a continuous left turn through the downwind and base legs of the traffic pattern, through the extended centerline of runway 30L, and onto the extended centerline of runway 30R. During this turn, the low-wing airplane was flying 21 to 38 kts faster than its nominal approach speed. Even though the low-wing airplane achieved a roll angle as high as 40° during the left turn, on average, the roll angle remained consistently below that required to align with runway 30L at the airspeeds the airplane was flying. At the nominal approach speed of 85 kts, the required turn could have been accomplished with a roll angle less than 20°. At 100 kts, the required roll angle would have been only 23°. At the actual speeds flown, the required roll angle would have been between 32° and 37°.

## Additional Information

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### LC Controller Interview

The LC controller reported that he was assigned to the VGT ATCT in 2009. He was certified on all control positions, as well as controller-in-charge. On the day of the accident, he was working both local control positions (LC1 and LC2) and local assist (LA) combined.

His normal work schedule consisted of four 10-hour shifts, 1200-2200 on Friday and Saturday, 0700-1700 on Sunday, and 0600-1600 on Monday, with his regular days off on Tuesday, Wednesday, and Thursday. He stated that, although he indicated a preference not to work overtime, he was regularly scheduled for six-day work weeks and had been since the COVID-19 pandemic. He estimated his overtime at approximately 300 hours for the year.

When asked if he was fatigued on the day of the accident, he said, "yes." He reported experiencing both fatigue while on position and long-term, cumulative fatigue, which he described as being jaded and not seeing an end in sight to the extra workload. He recalled periodic conversations about fatigue in the tower cab at various times, but felt that fatigue had not affected his work on the day of the accident.

On the day of the accident, he was assigned a 0700 shift start time with the option to start as early as 0630. Since he preferred to leave work a little earlier, he chose to begin his shift at 0630.

After signing into a control position, he typically "decluttered," then adjusted the tower display workstation (TDW), which is a color monitor that displays radar data and flight plan data, to his preferred settings. His typical scan technique was to look at the TDW, then at the "puck board" (a board containing flight progress information used by controllers to maintain awareness of aircraft in the airport operating area), then at the runway, and repeating that cycle. He stated that if he recognized an aircraft or pilot, his services provided included "babysitting them less."

When asked about the conflict alert (CA) function on the TDW, he described it as "white noise" because of how frequently it alarmed. He explained that, since the TDW also received information from the Las Vegas Terminal Radar Approach Control facility, they received all CAs that that facility received as well. He did not recall hearing the CA alarm before the accident.

He stated that he did not provide traffic advisories to the accident airplanes because he expected that the high-wing airplane would already be "over the numbers" before the low-wing airplane could visually acquire it. He reported that he often worked opposing base traffic for closely spaced parallel runways, and that he would issue traffic advisories if, in his opinion, the

aircraft could see each other and may be worried about proximity. He said that he felt that too many traffic advisories could distract pilots from flying the airplane by diverting their attention. He further explained that traffic advisories for VFR aircraft were an “additional duty” as defined by FAA Order JO 7110.65, and was not clear about when they were required.

When asked to describe his recollection of the accident, he recalled that the weather had cleared following some morning thunderstorms and that the high-wing airplane was conducting traffic pattern work. An IFR arrival would come in every 10 minutes or so. He described the traffic as light and not complex. The high-wing airplane began requesting short approaches, which was fairly common. He then recalled that the low-wing airplane contacted him about 15 miles from the airport with instructions to overfly the airport and enter a left downwind for runway 30L. He instructed the airplane to continue for runway 30L, and when the airplane was about one mile north of the airport, he cleared the airplane to land on runway 30L. He recalled that, as the low-wing airplane entered the downwind, he again cleared the airplane to land on runway 30L to confirm that he had cleared the airplane for the correct runway. He then recalled communicating with two other aircraft. When he looked back to the low-wing airplane, he noted that their position “seemed off,” but before he could make a radio transmission, the collision occurred.

#### Air Traffic Manager Interview

The VGT air traffic manager (ATM) reported that she was not working on the day of the accident, and that an operations supervisor (OS) had been assigned as acting ATM that day.

At the time of the accident, there were four controllers on duty; two of the controllers were working positions in the tower, one controller was available on break, and one controller was performing other duties. According to the ATM, this did not meet facility expectations of having three controllers on position in the tower for the given time of day; however, given the already limited staffing and an OS that had to leave earlier in the shift for personal reasons, it was necessary to combine the positions down to two controllers with the preferred standalone controller-in-charge position, combined at ground control.

The ATM recalled a previous event involving the accident LC controller in which he admitted that he had not been paying attention. This resulted in an aircraft departing from VGT that entered the adjacent LSV class B airspace and a subsequent conflict with other aircraft that were inbound to LSV. Following that event, the LC controller had undergone a performance discussion, but the ATM had not worked side-by-side in the tower with him since then, and she had not received any updates from his supervisors regarding performance.

The ATM stated that, at the time of the accident, the total facility staffing for the VGT ATCT consisted of 11 controllers, 2 operations supervisors, and 1 air traffic manager. The ATM stated that this staffing level was considered “fully staffed,” but was deficient. Although the facility had been upgraded in 2017, authorized staffing was not increased despite repeated requests, and the lack of adequate staffing resulted in an annual average overtime of around

400 to 500 hours per controller. She felt that their lack of adequate staffing did not allow her team to do what was required of them, nor meet management expectations. She stated that the impact of inadequate staffing had resulted in reduced training discussions, and that the management team was unable to appropriately monitor employee performance. She stated that everyone on her team was exhausted, and that work/life balance was non-existent. She stated that fatigue was “definitely a top five concern” for the facility.

VGT Order 7110.1G, Standard Operating Procedures (SOP) Handbook, Chapter 8, Section 8-1-1, Duties and Responsibilities, paragraph k-3-c, stated in part:

*c. Ensure to the extent staffing resources permit that the Local Assist (LA 1) / Local Control 2 position is staffed. The LA1 position is considered essential to the operational integrity and safety levels required to minimize the potential for surface errors and land-over incidents.*

#### ATC Delivery Test Period

The ATM stated they had recently undergone a Nellis Air Traffic Control Facility (NATCF) delivery test period, during which the NATCF routed IFR aircraft inbound from the north, northeast, or east and landing runway 30L or 30R at VGT, over midfield to a left downwind traffic pattern entry for landing. This differed from the routing as published in their letter of agreement (LOA) with the Nellis Airport Traffic Control Tower (LSV ATCT), which had received feedback from pilots indicating confusion regarding instructions that required them to transition from the east side of the airport to the west side of the airport in order to enter a left traffic pattern for runways 30L/30R.

The test period was conducted from May 23 through May 29, 2022, and it was agreed that after the test period was complete, the facilities would “return to the LOA routing, until or unless a new agreement is reached.” In postaccident interviews, the ATM stated that the test period had gone well, and that they had agreed to include the test procedure into an updated LOA; however, the facility was unable to produce any documentation that the new procedure had been approved or incorporated into an updated LOA.

The only documentation provided by the facility regarding the test period routing was a Powerpoint presentation that described the routing and test duration and was used by the ATM to brief the controller workforce.

#### Traffic Advisories

As the low-wing airplane was approaching VGT from the north-northwest, cleared for the visual approach to runway 30L with instructions to cross midfield for left traffic, the airplane crossed about 500 ft above the high-wing airplane as the pilots continued the descent to the pattern altitude and a left downwind entry. No traffic advisories were provided to either airplane by the LC controller.

Audio recordings provided by VGT ATCT indicated that the controller working the LC position before the accident LC controller could be heard providing regular and clear traffic advisory and sequencing information to the aircraft under their control.

FAA Order JO 7110.65Z, Chapter 2, Section 1, General Control, paragraph 2-1-21, Traffic Advisories, stated in part:

*Unless an aircraft is operating within Class A airspace or omission is requested by the pilot, issue traffic advisories to all aircraft (IFR or VFR) on your frequency when, in your judgment, their proximity may diminish to less than the applicable separation minima. Where no separation minima apply, such as for VFR aircraft outside of Class B/Class C airspace, or a TRSA, issue traffic advisories to those aircraft on your frequency when in your judgment their proximity warrants it.*

FAA Order JO 7110.65Z, Pilot/Controller Glossary, defined positive control as, "The separation of all air traffic within designated airspace by air traffic control."

FAA Order JO 7110.65Z, Chapter 3, Section 8, Spacing and Sequencing, paragraph 3-8-1, Sequence / Spacing Application, stated in part:

*Establish the sequence of arriving and departing aircraft by requiring them to adjust flight or ground operation, as necessary, to achieve proper spacing.*

#### Previous Wrong Surface Events and Implemented Mitigations

Between January and April 2022, VGT ATCT had experienced and documented several wrong surface related events. After the series of repeated wrong surface events, the issue was identified as a systemic safety concern and beyond the SSR, was also documented in a Systemic Issue Review Report (SYSIR) dated April 9, 2022.

After the accident, the FAA implemented several mitigations to reduce the risk of wrong surface related events at VGT, including mandating traffic advisories to aircraft operating on opposing base legs to parallel runways; publishing information for pilots to consider when operating to parallel runways; updated controller recurrent training information; and a special notice to alert pilots operating at VGT that the runway 30L threshold is approximately 900 feet further away and much harder to see than the runway 30R threshold.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Gunther, Todd
<b>Additional Participating Persons:</b>	Carey Atnip; FAA / FSDO; Las Vegas, NV Beverley Harvey; TSBC; Ottawa Robert Duma; Pratt & Whitney Canada; St. Hubert Jennifer Barclay; Textron Aviation; Wichita, KS Brandon Johnson; NATCA; Washington, DC Robert Martellotti; Piper Aircraft; Vero Beach , FL
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