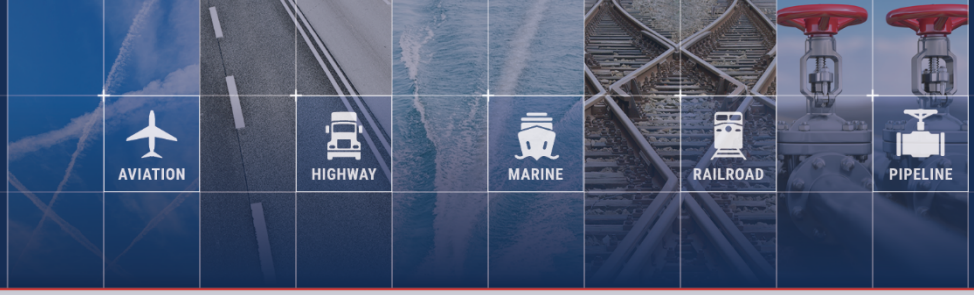

Aviation Investigation Final Report

Location:	Gaithersburg, Maryland	**Accident Number:**	ERA23LA071
Date & Time:	November 27, 2022, 17:29 Local	**Registration:**	N201RF
Aircraft:	Mooney M20J	**Aircraft Damage:**	Substantial
Defining Event:	Collision during takeoff/land	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was operating on an instrument flight rules (IFR) flight plan in dark night instrument meteorological conditions (IMC). As the pilot approached the destination airport, the air traffic controller attempted to vector him onto his requested GPS instrument approach procedure. The pilot was provided course corrections and heading changes from the controller, and was advised that the airplane before him had performed the missed approach procedure and diverted due to low cloud ceilings (200 ft above ground level [agl]).

Flight track data revealed that the airplane was consistently below published minimum altitudes throughout the approach and was 500 ft below the minimum altitude prescribed at the final approach fix. The pilot continued the descent below the lowest minimums prescribed by the approach procedure, and about 1.25 miles from the runway and left of the runway centerline, the airplane impacted and became suspended in a power line tower at an elevation about 600 ft mean sea level (msl) and 100 ft above ground level. The airport was located at an elevation of 539 ft msl.

Examination of the airplane revealed that there were no pre-impact mechanical anomalies that would have prevented normal operation.

In an interview following the accident, the pilot stated that his course diversions during the flight were the result of a mis-programmed GPS. Throughout the interview, he could not articulate the features of his IFR-certified GPS, and stated that, in many situations, he used his handheld, VFR-only GPS to avoid the “complex keystrokes needed” to operate the IFR GPS.

The pilot stated that he was not receiving vertical guidance on his GPS after intercepting the final approach course. He set an “alarm” to sound when the airplane had descended to 800 ft on the approach, but at 1,200 ft, he sighted the ground, and became focused on “keeping

contact with the ground through the side window" and "pulling the airport out of the soup." The pilot stated that he was familiar with the powerlines that he impacted and believed that he was beyond them.

The lowest altitude allowed by the approach procedure was 789 ft msl, or 269 ft agl. However, this altitude was for an approach category that provided both lateral and vertical course guidance, and the pilot stated that he was not receiving vertical guidance. Whether the lack of vertical guidance was the result of the pilot's mis-programming of the approach procedure or because he was referring to his VFR-only GPS for guidance was not determined. The lowest altitude allowed for an approach with only lateral guidance was 980 ft msl, or 460 ft agl.

Based on the available information, the pilot became preoccupied with attempting to visually locate the runway and failed to maintain an effective scan of his instruments, which resulted in his descent below minimums, lateral deviation off the approach course, and collision with powerlines.

Probable Cause and Findings

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

The pilot's visual flight below published altitude minimums, which resulted in collision with a powerline tower structure.

Findings

Personnel issues	Decision making/judgment - Pilot
Aircraft	Altitude - Incorrect use/operation
Environmental issues	Tower/antenna (incl guy wires) - Decision related to condition

Factual Information

History of Flight

Approach-IFR final approach	Collision during takeoff/land (Defining event)

On November 27, 2022, at 1729 eastern standard time, a Mooney M20J, N201RF, was substantially damaged when it was involved in an accident near Gaithersburg, Maryland. The private pilot and passenger were seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* (*CFR*) Part 91 personal flight.

Automatic dependent surveillance - broadcast (ADS-B) data revealed that the airplane departed Montgomery County Airpark (GAI), Gaithersburg, Maryland, on the morning of the accident and flew to Westchester County Airport (HPN), White Plains, New York. The accident occurred on the return flight to GAI while the airplane was operating on an instrument flight rules (IFR) flight plan.

Dark night instrument meteorological conditions prevailed in the area of GAI at the time of the accident. The reported weather at GAI included variable wind at 4 knots, an overcast ceiling at 200 ft agl, and 1.25 statute miles visibility in fog. A convective SIGMET was valid for the accident time.

Federal Aviation Administration (FAA) air traffic control communication information revealed that the pilot was advised to expect the RNAV/GPS A instrument approach procedure at GAI, but the pilot expressed a preference for the RNAV (GPS) RWY 14 approach procedure because the reported weather at GAI was below minimums for the GPS A approach procedure.

The controller cleared the pilot to fly directly to the BEGKA intermediate fix, which was approximately southwest and ahead of the airplane's position, but instead the pilot turned about 100° to the right. The controller provided heading changes and direct clearances to waypoints on the RNAV (GPS) RWY 14 approach procedure; however, the pilot made a series of left and right turns, near course reversals, or continued established headings as the controller repeatedly requested that the pilot turn to a different heading.

At one point, the controller requested that the pilot confirm he had the BEGKA waypoint and spelled it for him. The pilot responded that he had entered the information incorrectly and was making the correction. About that time, another airplane on approach to GAI announced that visibility was below minima and requested a diversion to another airport. The pilot of that airplane thought a successful completion of the approach by the next airplane was "doubtful." When asked by the accident pilot, the controller confirmed the airplane ahead of his had performed the missed approach procedure at GAI due to "poor visibility."

At 1717, 8 miles northeast of BEGKA, the pilot announced the “cloud deck at 2,800 feet and clear above.”

The controller instructed the accident pilot to proceed direct to BEGKA and cleared him for the RNAV (GPS) RWY 14 approach. The minimum altitude at BEGKA, 11.3 nautical miles (nm) from the runway, was 3,000 ft mean sea level (msl). The airplane crossed BEGKA about 2,775 ft GPS altitude as it aligned with the final approach course and continued its descent. The minimum altitude at the final approach fix (TIMBE), 5.2 nm from the runway, was 2,200 ft msl; the airplane crossed TIMBE at 1,500 ft msl. The minimum altitude at JOXOX waypoint, about 2.3 nm from the runway, was 1,280 ft msl; the airplane crossed JOXOX at 750 ft. The final point on the approach procedure, the visual descent point (VDP), was located 1.4 nm from the runway 14 threshold. The airplane crossed the VDP at 587 ft. (See Figure 1.)

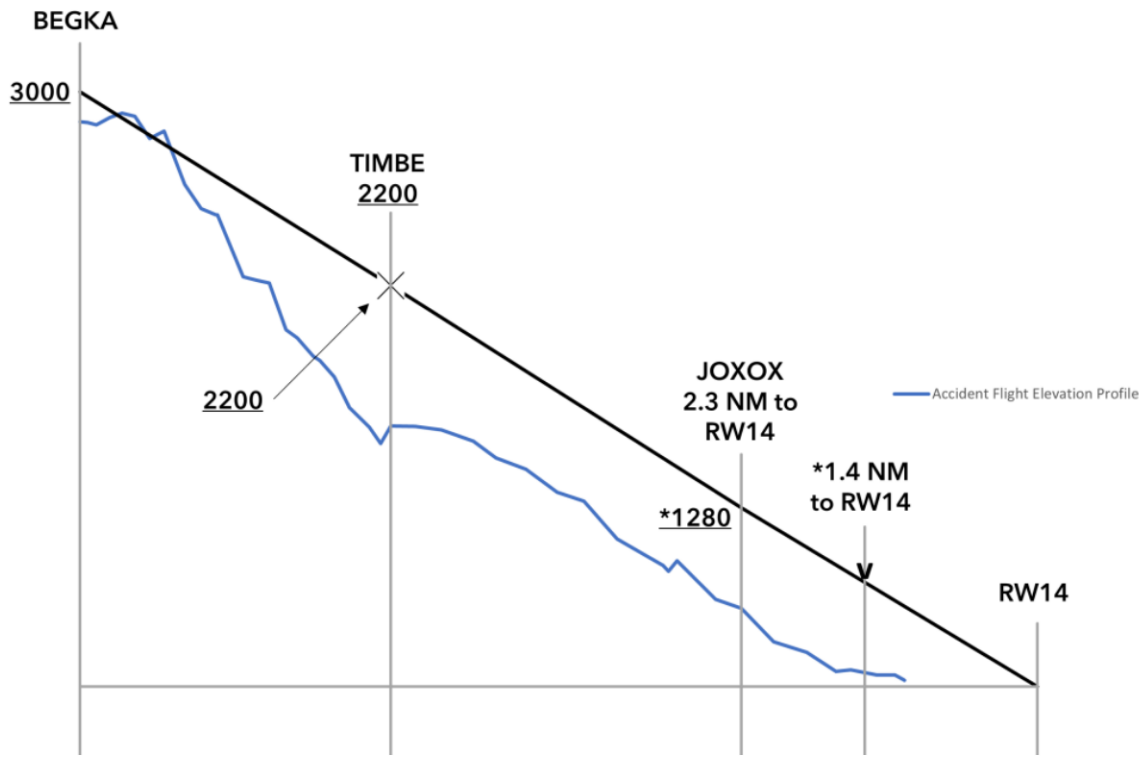

Figure 1. RNAV RWY14 GPS approach profile with the airplane’s altitude depicted in blue

About 1.25 miles from the runway and left of the runway centerline, the airplane impacted and became suspended in a power line tower at an elevation about 600 ft msl and 100 ft above ground level. Between JOXOX and the collision with the tower, the airplane descended as low as 475 ft. The published field elevation at GAI was 539 ft msl.

Figure 2 shows flight track information in relation to the runway 14 final approach course, with minimum altitudes for each segment of the approach shown in orange, and the airplane’s altitude at those locations shown in white.

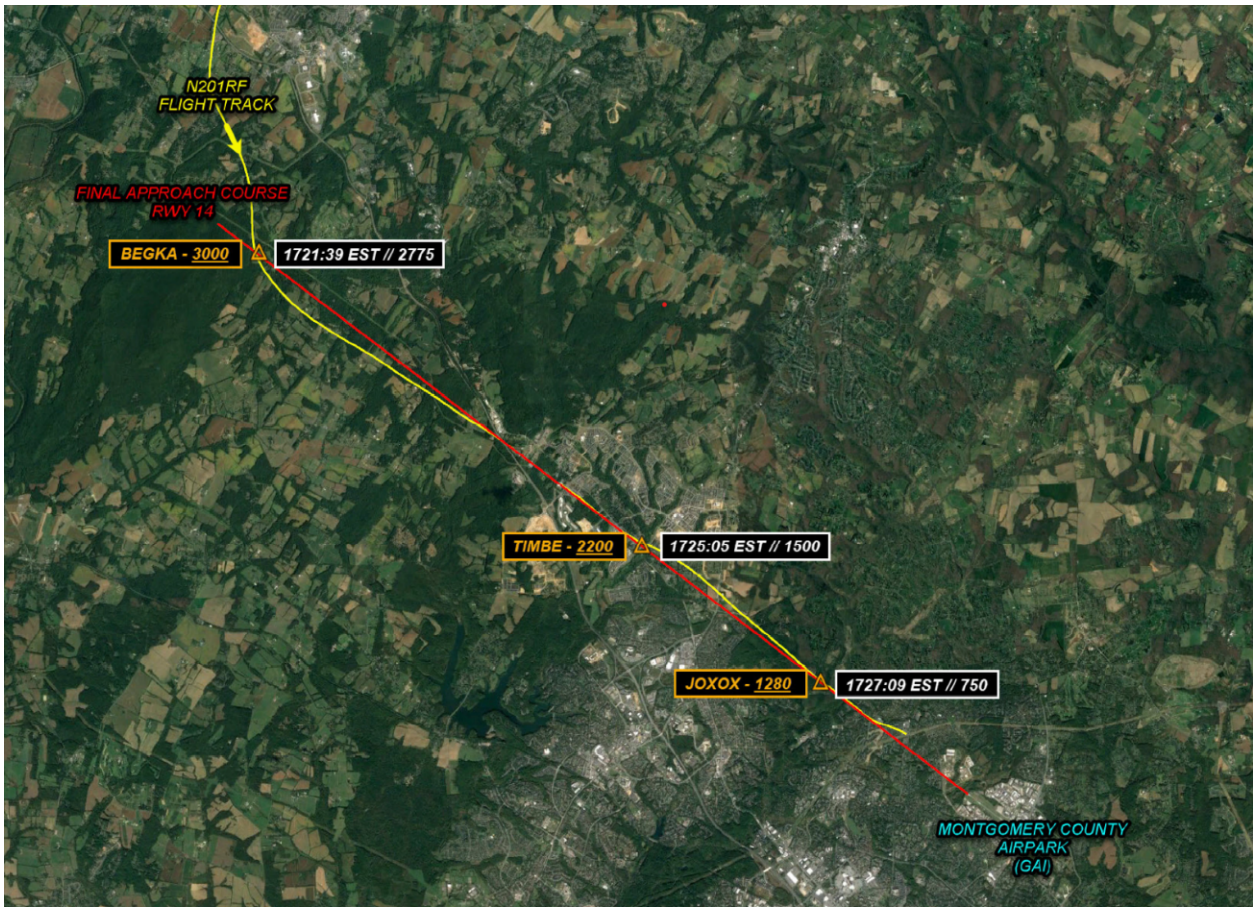

Figure 2. ADS-B flight track information

The airplane was substantially damaged and remained suspended in the tower. During a conversation with 911 call center personnel, the pilot reported, “I got down a little lower than I should have… I thought I was closer to the airport than I was…We could see the ground, but we couldn’t see in front.” After several hours, the occupants safely egressed the airplane with the assistance of rescue and utility personnel.

Pilot Information

Certificate:	Private	**Age:**	66,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	
Medical Certification:	Class 2	**Last FAA Medical Exam:**	August 1, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 1475 hours (Total, all aircraft), 500 hours (Total, this make and model)		

Passenger Information

Certificate:		**Age:**	
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	
Instrument Rating(s):		**Second Pilot Present:**	
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His FAA third-class medical certificate was issued August 1, 2022, and he declared 1,432 total hours of flight experience on that date.

The pilot completed an instrument proficiency check on February 17, 2022. A review of the pilot's logbook revealed he did not tally his total instrument flight experience. Entries during the year before the accident suggested 16 hours of actual instrument flight experience and 5.4 hours of simulated instrument flight experience.

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N201RF
Model/Series:	M20J	**Aircraft Category:**	Airplane
Year of Manufacture:	1977	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-0135
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	September 11, 2022 100 hour	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	47.4 Hrs	**Engines:**	1
Airframe Total Time:	4437 Hrs at time of accident	**Engine Manufacturer:**	
ELT:		**Engine Model/Series:**	
Registered Owner:	MFC CORP	**Rated Power:**	
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA and maintenance records, the airplane was manufactured in 1977 and was powered by a Lycoming IO-360-A3B6D, 200-horsepower engine. The airplane's most recent annual inspection was completed February 1, 2022, at 4,288.5 total aircraft hours. The altimeter static system and altitude reporting equipment were tested in accordance with *CFR* 91.411 on June 22, 2022.

The airplane was equipped with an IFR-certified Garmin 430 panel-mounted GPS, which allowed the pilot to select the desired airport, procedure, and then select from the approaches displayed in the drop-down menu. The correct sequence of menu selections provided all approach waypoints and precluded the need to manually enter an individual waypoint.

In interviews with local media after the accident, the pilot described the fog at the time of the accident as "pea soup," and expressed concern about his altimeter working correctly.

Immediately after recovery of the accident airplane, a calibrated altimeter test instrument was installed by an airframe and powerplant mechanic with inspection authority under the supervision of an NTSB investigator. Functionality testing was performed at the as-found setting of 29.40 in the altimeter's Kollsman window, then 29.92, and finally a Barometric Scale Error Test was performed through a range of 28.10 and 30.99. According to the test report, the altimeter was "well within the test allowable error at all ranges."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KGAI,539 ft msl	**Distance from Accident Site:**	1.25 Nautical Miles
Observation Time:	16:56 Local	**Direction from Accident Site:**	315°
Lowest Cloud Condition:		**Visibility**	1.25 miles
Lowest Ceiling:	Overcast / 200 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.45 inches Hg	**Temperature/Dew Point:**	11°C / 11°C
Precipitation and Obscuration:	Moderate - None - Mist		
Departure Point:	White Plains, NY (HPN)	**Type of Flight Plan Filed:**	IFR
Destination:	Gaithersburg, MD	**Type of Clearance:**	IFR
Departure Time:	15:01 UTC	**Type of Airspace:**	Class E

The 1656 reported weather at GAI included 1 ¼ statute miles (sm) visibility, an overcast cloud ceiling at 200 ft agl, temperature 11°C, dew point temperature 11°C, and an altimeter setting of 29.45 inches of mercury.

The reported conditions at GAI at 1727 included 2 ½ sm visibility, mist, and an overcast ceiling at 200 ft agl.

Frederick Municipal Airport (FDK), Frederick, Maryland, located about 18 nautical miles northwest of GAI, reported 3 sm visibility and an overcast ceiling at 400 agl about the time of the accident.

A High-Resolution Rapid Refresh (HRRR) atmospheric model sounding for near the accident site identified wet fog between the surface and about 600 ft, low-level wind shear and light to moderate turbulence around 1,900 ft, and severe turbulence above 1,900 ft. Cloudy conditions were identified from about 750 ft through 3,650 ft.

Airport Information

Airport:	MONTGOMERY COUNTY AIRPARK GAI	**Runway Surface Type:**	Asphalt
Airport Elevation:	538 ft msl	**Runway Surface Condition:**	Wet
Runway Used:	14	**IFR Approach:**	Global positioning system
Runway Length/Width:	4202 ft / 75 ft	**VFR Approach/Landing:**	Full stop

The RNAV (GPS) Runway 14 approach procedure at GAI provided three categories of instrument approaches; localizer performance with vertical guidance (LPV), with a decision altitude of 789 ft msl (269 ft agl); lateral navigation/vertical navigation (LNAV/VNAV), with a decision altitude (DA) of 919 ft msl (399 ft agl); and lateral navigation (LNAV), with a minimum descent altitude (MDA) of 980 ft msl (460 ft agl).

DA and MDA are defined as altitudes at which the pilot must initiate a missed approach procedure if specified visual references to the runway are not acquired. A pilot is only permitted to continue an approach below the published DA or MDA if the flight visibility is not less than the visibility prescribed in the instrument approach being used, and if the pilot is able to distinctly visually identify runway lights and/or markings associated with the intended runway.

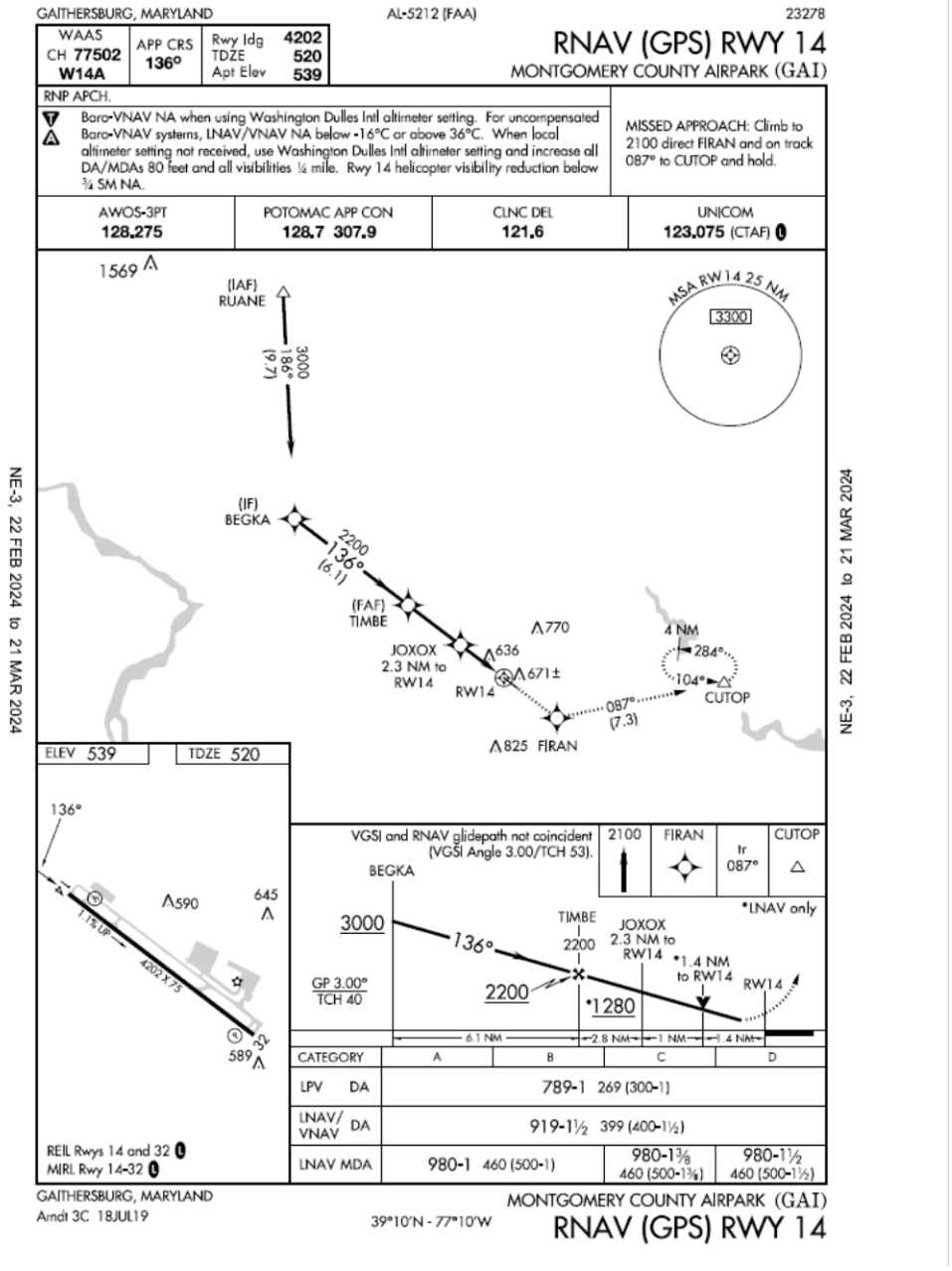

Figure 3. RNAV (GPS) RWY 14 Approach Procedure

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	39.18441,-77.188553(est)

Local emergency services and utility personnel, along with an aircraft recovery specialist, separated the airframe from the engine and cut two of the three propeller blades to disentangle the engine from the tower structure; one blade was separated during impact. Examination of the airplane was conducted and supervised by an FAA aviation safety inspector, who confirmed continuity from the cockpit flight controls to all flight control surfaces. The propeller blades displayed similar twisting, bending, leading edge and tip gouging, and chordwise scratching.

Visual examination of the engine revealed only minor impact damage to intake and exhaust stacks, ignition P-leads, and a fuel pump drain port fitting. The engine rocker box covers were removed to facilitate the examination. The propeller was rotated by hand and continuity was established through the powertrain to the valvetrain and the accessory section. Compression was confirmed on all cylinders using the thumb method. The dual magneto was removed and produced spark at all terminal leads when rotated.

Fuel lines and fuel system components throughout engine contained fuel. The oil suction screen and oil filter screens were clean, unobstructed, and absent of debris. The vacuum pump was removed and pumped air when rotated by hand. The engine exam revealed no preimpact mechanical anomalies that would have prevented normal operation.

Additional Information

In an on-camera interview with local media, the pilot was asked what “ultimately led to the plane crash” and the pilot stated, “Quite obviously I was flying too low.” He was then asked why he didn’t divert to another airport, to which he replied, “The possibility of diverting the flight to another airport always exists… it’s extremely inconvenient to everybody on the ground.” When

asked if he wished he had diverted to another airport the pilot said, “Of course. There were airplanes ahead of us who diverted.”

When asked by the reporter as to why he chose to fly “knowing the weather was going to be bad” he replied, “Well, I’ve been trained to fly in bad weather.” He went on to explain his risk assessment for the flight and determined the risk was “manageable and marginal… people need to know this kind of stuff does happen. I seem to be a lightning rod for more of it than others…” referencing his previous plane crash in 1992, in which the NTSB cited his “poor inflight decision” (NTSB case number SEA92LA173).

Pilot’s Interview with FAA

The pilot did not respond to requests for interview from the NTSB, nor did he submit an NTSB Form 6120.1, Pilot/Operator Accident Report Form. He did provide interviews to several media outlets, and after several postponements, appeared for an interview with FAA inspectors 10 days after the accident.

The pilot said that he filed an IFR flight plan to HPN after he consulted two flight service websites and called flight service by telephone. The flight was routine, and he completed the final portion under visual flight rules. He obtained a weather briefing and filed a flight plan before departing on the return flight to GAI. According to the pilot, he had to refile his flight plan after departure from HPN. However, FAA records revealed the pilot’s flight plan was on file when he requested his IFR clearance from clearance delivery.

The pilot stated that his intention was to fly the RNAV GPS-A approach at GAI, but that he was switched to the RNAV GPS RWY 14 approach. However, recorded air traffic control communications revealed that it was the pilot who requested the approach change because of the weather conditions and the lower minimums allowed by the latter approach procedure.

According to the interview summary, the pilot “made a significant diversion from his course” because he mis-programmed the panel-mounted Garmin 430 GPS. He also could not articulate the features of the GPS, its course and glideslope guidance features, and when asked if the GPS had transitioned to approach mode, “he did not appear to really understand the question.” The pilot explained that, in a lot of situations he would use his handheld, VFR-only GPS to avoid the “complex keystrokes needed” to operate the panel-mounted GPS. Photos provided by the pilot to the media showed him flying the airplane with a yoke-mounted iPad.

The pilot stated that when he turned onto the final approach course, he noted that he was not receiving vertical guidance on his GPS. The pilot said that he set an “alarm” to sound when the airplane had descended to 800 ft on the approach, but that at 1,200 ft he sighted the ground and couldn’t recall his altitudes from that point until the crash. He said he had no recollection of hearing the altitude alert as he was focused on “keeping contact with the ground through the side window” and “pulling the airport out of the soup.” The pilot stated that he was familiar

with the powerlines that he struck and believed that he was “on the airport side of them,” and therefore beyond them.

FAA Guidance

According to the FAA Instrument Procedures Handbook, (FAA-H-8083-16B); Chapter 4, 4-39:

The transition from instrument flight to visual flight during an instrument approach can be very challenging, especially during low visibility operations. Aircrews should use caution when transitioning to a visual approach at times of shallow fog. Adequate visibility may not exist to allow flaring of the aircraft. Aircrews must always be prepared to execute a missed approach/go-around. Additionally, single-pilot operations make the transition even more challenging. Approaches with vertical guidance add to the safety of the transition to visual because the approach is already stabilized upon visually acquiring the required references for the runway. 100 to 200 feet prior to reaching the DA, DH, or MDA, most of the PM’s (pilot monitoring) attention should be outside of the aircraft in order to visually acquire at least one visual reference for the runway, as required by the regulations. The PF (pilot flying) should stay focused on the instruments until the PM calls out any visual aids that can be seen, or states “runway in sight.” The PF should then begin the transition to visual flight. It is common practice for the PM to call out the V/S during the transition to confirm to the PF that the instruments are being monitored, thus allowing more of the PF’s attention to be focused on the visual portion of the approach and landing. Any deviations from the stabilized approach criteria should also be announced by the PM.

Single-pilot operations can be much more challenging because the pilot must continue to fly by the instruments while attempting to acquire a visual reference for the runway. While it is important for both pilots of a two-pilot aircraft to divide their attention between the instruments and visual references, it is even more critical for the single- pilot operation. The flight visibility must also be at least the visibility minimum stated on the instrument approach chart, or as required by regulations.

Preventing Similar Accidents

Stabilized Approaches Lead to Safe Landings (SA-077)

The Problem

Failing to establish and maintain a stabilized approach, or continuing an unstabilized approach, could lead to landing too fast or too far down the runway, potentially resulting in a runway excursion, loss of control, or collision with terrain. Regardless of the type of aircraft, the level of pilot experience, or whether the flight is being conducted under instrument flight rules or visual flight rules, a stabilized approach is key to maintaining control of the aircraft and ensuring a safe landing.

What can you do?

- Follow SOPs and industry best practices for stabilized approach criteria, including a normal glidepath, specified airspeed and descent rate, landing configuration (flaps, gear, etc.), appropriate power setting, landing checklists, and a heading that ensures only small changes are necessary to maintain runway alignment. Guidance and tips (see the "Interested in more information?" section) indicate that, in most cases, the approach should be stabilized by 1,000 ft in instrument conditions or 500 ft in visual conditions. If the approach becomes unstabilized at any time after that, go around.
- Practice go-arounds and missed approaches so that you are comfortable with the procedures when needed. Remember to establish personal minimums for all types of operations, including go-arounds and missed approaches.
- Use effective single-pilot resource management or crew resource management. A stabilized approach begins with an effective approach briefing. Ensure that you understand critical aspects of the approach, such as the minimum safe altitude, hazards, approach conditions, and missed approach procedures.
- Do not allow perceived operational pressures (for example, from air traffic controllers, passengers, etc.), continuation bias, or last-minute runway changes to influence your decision to execute a go-around; if your approach is not stabilized, go around.
- Never attempt to "save" an unstabilized approach. If the approach becomes unstabilized, conduct an immediate go-around. Remember, when two pilots are on duty, either crewmember may call for a go-around at any time.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-077.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Michael Bevan; FAA/FSDO; Baltimore, MD Ryan Enders; Lycoming Engines; Williamsport, PA
Original Publish Date:	June 20, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=106368

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.