Aviation Investigation Final Report

Location:	Marana, Arizona	**Accident Number:**	WPR22FA073
Date & Time:	December 31, 2021, 13:30 Local	**Registration:**	N6796N
Aircraft:	Mooney M20C	**Aircraft Damage:**	Substantial
Defining Event:	Loss of visual reference	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The non-instrument-rated pilot departed into visual meteorological conditions (VMC) on a day cross-country flight. Concerned family members contacted flight service when the pilot was overdue at the destination airport. The wreckage was located 4 days later in dessert terrain about 56 miles from the departure airport.

Flight track data indicated that after departure the airplane proceeded northwest toward the destination airport before it turned to the southwest. The airplane continued to the southwest, where it made a series of turns until radar contact was lost.

Review of weather information near the accident location at the time of the accident indicated instrument meteorological conditions (IMC), including low ceilings and visibility, were most likely present at the time of the accident. It is unknown if the pilot obtained a preflight weather briefing.

All major structural components of the airplane were located within the wreckage path. Postaccident examination of the airframe and engine revealed no evidence of any preexisting anomalies that would have precluded normal operation.

Postmortem toxicology testing revealed varying levels of methamphetamine in the pilot's liver and muscle tissue. The methamphetamine levels detected are consistent with the pilot's use of methamphetamine before the flight. It is likely that the psychoactive effects from the pilot's use of methamphetamine contributed to his decision to fly into conditions that he was not trained for.

The non-instrument-rated pilot's flight into IMC would have made airplane control by visual references difficult, especially while maneuvering. When there were no outside visual

references, pilots must rely on use of flight instruments to understand their position in space. Based on the postaccident flight track data, the pilot made a series of turns that were inconsistent with his intended flight path and were likely the result of the pilot experiencing spatial disorientation. It is likely the pilot did not reference the flight instruments or was experiencing an increase in workload because of spatial disorientation, and did not recover the airplane from its descent.

Probable Cause and Findings

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

The pilot's loss of airplane control due to spatial disorientation after entering instrument meteorological conditions. Contributing to the accident was the pilot's impairment due to use of methamphetamine before the flight.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Illicit drug - Pilot
Environmental issues	(general) - Effect on equipment

Factual Information

History of Flight

Enroute	Loss of visual reference (Defining event)
Enroute	Loss of control in flight

On December 31, 2021, about 1330 mountain standard time, a Mooney M20C, N6796N, was destroyed when it was involved in an accident near Marana, Arizona. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot's family reported that he had departed Marana Regional Airport (AVQ), Marana, Arizona, on December 31, 2021, with an intended destination of French Valley Airport (F70), Murrieta/Temecula, California. Flight Service was notified by concerned family that the pilot had not arrived at the French Valley Airport and was 5 hours overdue. The Federal Aviation Administration (FAA) issued an Alert Notice shortly after. The airplane wreckage was located by a search and rescue (SAR) air unit the morning of January 4, 2022. There are no known witnesses to the accident sequence.

The flight track data provided by SAR started about 2 ½ miles northwest of AVQ at 1929:38. The flight track data showed the accident airplane on a northwest heading; however, the data contained only general headings with no altitudes. About 1943:43, the flight track data showed the airplane made a left turn and continued on a southwest heading. The data showed that at 1952:40 the airplane started a series of turns until radar contact was lost at 2004:52.

An animation of the flight track data with a weather overlay was also provided by SAR. The animation showed the airplane enter an area of weather, then enter into several turns before contact was lost.

Pilot Information

Certificate:	Private	**Age:**	67,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	BasicMed With waivers/limitations	**Last FAA Medical Exam:**	April 28, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 18, 2017
Flight Time:	(Estimated) 542.73 hours (Total, all aircraft)		

At the time of the accident, the pilot had accumulated about 540 total hours of flight experience, of which 4.5 hours were in simulated instrument conditions.

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N6796N
Model/Series:	M20C	**Aircraft Category:**	Airplane
Year of Manufacture:	1968	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	680099
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	September 28, 2017 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	5586.4 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Installed	**Engine Model/Series:**	O-360-A1D
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KAVQ,2031 ft msl	**Distance from Accident Site:**	56 Nautical Miles
Observation Time:	13:35 Local	**Direction from Accident Site:**	111°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 3800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / None	**Turbulence Type Forecast/Actual:**	Convective / Unknown
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	Moderate / Unknown
Altimeter Setting:	29.54 inches Hg	**Temperature/Dew Point:**	19°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Marana, AZ (AVQ)	**Type of Flight Plan Filed:**	None
Destination:	Temecula, CA (F70)	**Type of Clearance:**	None
Departure Time:	13:00 Local	**Type of Airspace:**	Class G

The AVQ airport's automated weather observation station reported that, at 1335 mountain standard time, the wind was from 080° at 8 knots, visibility of 10 statute miles, ceiling broken at 3,800 ft agl, overcast at 9,000 ft agl, temperature of 19°C, dew point of 10°C, and altimeter setting of 29.54 inches of mercury.

The Ak-Chin Regional Airport (A39), Maricopa, Arizona, Automated Weather Observing System (AWOS), located about 19 miles north-northeast of the accident location, reported that, 1355 mountain standard time, the wind was from 350° at 11 knots, visibility of 2 statute miles, moderate rain, mist, scattered clouds at 600 feet agl, ceiling broken at 2,300 feet agl, overcast clouds at 2,900 feet agl, temperature 12° C, dew point of 12°C, and altimeter setting of 29.63 inches of mercury.

The area forecast discussion information for the accident time indicated marginal visual flight rules (MVFR) and localized instrument flight rules (IFR) weather, with a slight chance of thunderstorms, rain, and gusty wind conditions.

An Airmen's Meteorological Information (AIRMET) SIERRA advisory for instrument flight rule (IFR) conditions called for mountain obscuration, moderate turbulence between flight level (FL) 180 and FL390 and moderate icing between the freezing level and FL200 were active for the accident location at the accident time.

A High-Resolution Rapid Refresh (HRRR) model sounding near the accident site at 1300 identified cloudy conditions from about 3,700 to 11,200 ft msl.

There were no air traffic control services provided to the pilot during the accident flight. It is unknown if the pilot obtained a preflight weather briefing.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	32.691664,-112.12789(est)

Examination of the accident site revealed that the airplane impacted open desert terrain about 56 miles northwest of the Marana Regional Airport at an elevation of 2,162 ft msl. The wreckage debris path was about 960 ft in length, and oriented on a heading of about 308°. All major structural components were observed throughout the debris path.

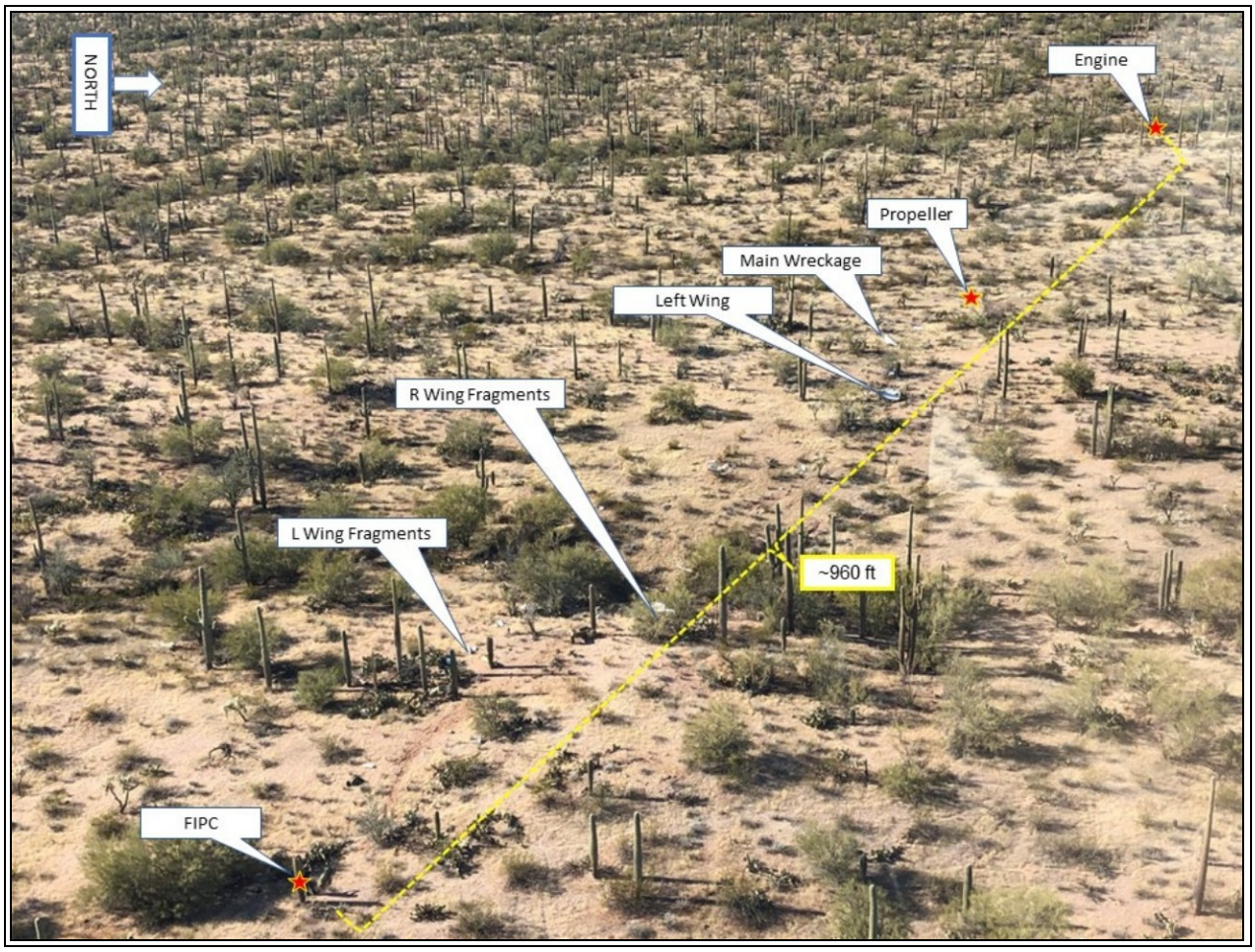

Figure 1: Aerial view of accident site.

Flight control continuity was not established due to impact damage and multiple separations of the flight control cables throughout the entire airplane. Examination of the engine revealed no evidence of any preexisting anomalies that would have precluded normal operation.

Medical and Pathological Information

An autopsy of the pilot was performed by the Pinal County Sheriff's Office in Florence, Arizona. The cause of death was multiple blunt force trauma.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory detected 1150 ng/g of methamphetamine in liver and 113 ng/g muscle. In addition, 150 ng/g of amphetamine (the

primary metabolite of methamphetamine) was found in liver. Amphetamine was also identified in muscle.

Methamphetamine is a Schedule II controlled substance and is available in low doses by prescription to treat ADHD, ADD, obesity, and narcolepsy. It is also readily available as a street drug. Symptoms of street use of methamphetamine follow a typical pattern. In the early phase, users experience euphoria, excitation, exhilaration, rapid flight of ideas, increased libido, rapid speech, motor restlessness, hallucinations, delusions, psychosis, insomnia, reduced fatigue or drowsiness, increased alertness, a heightened sense of well-being, stereotypes behavior, feelings of increased physical strength, and poor impulse control. In addition, the heart rate, blood pressure, and respiratory rate increase and they may have palpitations, dry mouth, abdominal cramps, twitching, dilated pupils, faster reaction times, and increased strength. As the initial effects wear off users commonly experience dysphoria, restlessness, agitation, and nervousness; they may experience paranoia, violence, aggression, a lack of coordination, delusions, psychosis, and drug craving.

Title 14 CFR Section 91.17 (a) states, in part, that

> No person may act or attempt to act as a crewmember of a civil aircraft (1) Within 8 hours after the consumption of any alcoholic beverage; (2) While under the influence of alcohol; (3) While using any drug that affects the person's faculties in any way contrary to safety; or (4) while having an alcohol concentration of 0.040 gm/dL or greater in a blood or breath specimen.

Additional Information

The National Library of Medicine provides information and guidance in an article titled, “Physiology Of Spatial Orientation,” which states spatial disorientation, as described by Benson, occurs when “the pilot fails to sense correctly the position, motion, or attitude of his aircraft or of himself within the fixed coordinate system provided by the surface of the Earth and the gravitational vertical.”

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a “loss of proper bearings; state of mental confusion as to position, location, or movement relative to the position of the earth.” Factors contributing to spatial disorientation include changes in acceleration, flight in IFR conditions, frequent transfer between visual flight rules and IFR conditions, and unperceived changes in aircraft attitude.

The FAA's *Airplane Flying Handbook* (FAA-H-8083-3B) describes some hazards associated with flying when the ground or horizon are obscured. The handbook states, in part, the following:

The vestibular sense (motion sensing by the inner ear) in particular can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, nor can they accurately sense attitude changes that occur at a uniform rate over a period of time. On the other hand, false sensations are often generated, leading the pilot to believe the attitude of the airplane has changed when, in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.

Administrative Information

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Additional Participating Persons:	Yasmin Duran; Federal Aviation Administration; Scottsdale, CA Mark W. Platt; Lycoming Engines; Phoenix, AZ
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