Aviation Investigation Final Report

Location:	Adrian, Oregon	**Accident Number:**	WPR09FA391
Date & Time:	August 7, 2009, 12:00 Local	**Registration:**	N4898K
Aircraft:	Navion NAVION A	**Aircraft Damage:**	Substantial
Defining Event:	Aircraft structural failure	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The non-instrument rated pilot departed on the 530-mile cross-country flight and headed west toward mountainous terrain. Recorded data plots from the pilot's Global Positioning System (GPS) receiver disclosed that after following a river in the valley, he began to fly over mountainous terrain that comprised the western landscape. Shortly thereafter, the pilot made a 180-degree course reversal, which was presumably done in an effort to circumnavigate inclement weather conditions. After continuing northeast for about 13 miles, the pilot began to head west again over the mountains. The flight continued for 26 miles and the airplane made a steep right turn, creating a "hook" type flight path. The last radar plots show a sudden increase in elevation, which is likely where the airplane began to breakup in flight. The wreckage was located about 2,000 feet in front of the last radar hit and about 3,700 feet below the last recorded altitude; it was inside the hook-shaped flight path. A weather facility located about 13 miles from the accident site, reported overcast cloud conditions at 2,900 feet above ground level (agl) about 20 minutes prior to the accident. Satellite imagery depicted an extensive area of nimbostratus clouds over the accident site and the observations surrounding indicated light rain and mist were present. The wreckage debris was scattered over an estimated 1,000-foot area of hilly terrain. At the beginning of the debris field were large sections of the right wing, with the far north area containing the engine, in indication that the right wing likely departed the airplane first. A post accident examination revealed that the wings and tail section showed evidence of a positive overload deformation pattern, with indications of upward bending of the wings and downward bending of the horizontal stabilizer. There was no evidence of mechanical malfunction or failure with the engine or airframe.

Probable Cause and Findings

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

The pilot’s failure to maintain aircraft control while in cruise flight due to spatial disorientation, which resulted in an exceedence of the design stress limits of the aircraft and led to an in-flight structural failure.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Capability exceeded
Aircraft	Directional control - Not attained/maintained

Factual Information

History of Flight

Enroute	Loss of control in flight
Enroute-cruise	Loss of visual reference
Enroute-cruise	Aircraft structural failure (Defining event)

HISTORY OF FLIGHT

On August 07, 2009, about 1200 Pacific daylight time, a Navion A, N4898K, was substantially damaged during an in-flight breakup near Adrian, Oregon. The pilot, who had recently purchased the airplane, was operating it under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. The private pilot and two passengers were killed. The cross-country personal flight departed the Jerome Country Airport, Jerome, Idaho, about 1030, with a planned final destination of Ilwaco, Washington. Instrument meteorological conditions prevailed in the area surrounding the accident site; no flight plan was filed.

During a telephone conversation with a Safety Board investigator, the pilot's uncle stated that the pilot was flying himself and his brother and father to Ilwaco for a weekend fishing trip. The flight departed from a private landing strip in Idaho, to Jerome, where they added 35.6 gallon of fuel.

Recorded radar data covering the area of the accident was supplied by the Federal Aviation Administration (FAA). The radar data was analyzed for the time frame and proximity to the anticipated flight track of the airplane en route from Jerome.

The radar data consisted of approximately equidistant primary radar returns from Jerome heading west to Murphy, Idaho. The returns continued west for several miles followed by a 180-degree course reversal. The track then diverted northeast, and then continued in the westerly direction for about 10 miles until temporarily disappearing. The returns resumed after about 4 miles and made a right 360-degree turn. The accident site was located within that radar return circle.

Investigators found a Magellan 315, battery-powered portable Global Positioning System (GPS) receiver within the wreckage. Recorded data plots were recovered from the non-volatile memory, and although the time hack is thought to be erroneous, it is used throughout this report to show duration. The track begins at 1614:48 from a private airstrip and continues to Jerome Airport, where the time lapses from 1633:24 to 1708:31, about 35 minutes. After leaving the airport, the flight path goes northwest and continues along the Snake River. The path begins to head west over the mountains and then at 1812:36, it makes a 180-degree course reversal to the east-northeast for about 13 miles.

Thereafter, the flight track again heads west for 26 miles and starts over the mountains maintaining about the same altitude of about 7,300 feet mean sea level (msl). As the path approaches the Succor Creek Canyon it begins a right turn, creating a "hook" type shape as it ends (about 1.5 miles in diameter). This hook encompassed the last nine hits of the flight track, and occurred over 2 minutes 33 seconds from 1831:43 and 1834:16. The plot indicated there was about a 275-foot increase in elevation between the last two hits. The wreckage was located about 2,000 feet in front of the last hit (a bearing of about 290 degrees) at an elevation of 3,900 feet; it was inside the hook-shaped flight path.

PERSONNEL INFORMATION

A review of the airmen records maintained by the FAA disclosed that the 32-year-old pilot received his private pilot certificate with an airplane rating for single-engine land in September 2000; he did not hold an instrument rating. His most recent third-class medical certificate was issued on July 20, 2006, with no limitations.

The pilot's personal flight records were not recovered. On his last application for a medical certificate, he reported a total flight time of 57 hours.

AIRCRAFT INFORMATION

The Navion A, serial number NAV-4-1898, was manufactured in 1949. A review of the logbooks revealed that the most recent annual inspection was performed on December 08, 2008, at a total time of 1,490.2 hours.

The powerplant, a Teledyne Continental Motors E225-4, serial number 35064-D-2-4, was last overhauled at 970 hours. The only maintenance records found listed the last maintenance as occurring in April 2005, where the airplane underwent an annual inspection at 1,327.6 hours.

METEOROLOGICAL INFORMATION

The closest weather facility was near Owyhee Ridge, Oregon, about 13 miles from the accident site. At 1141, it recorded a temperature of 49 degrees Fahrenheit and a dew point of 49 degrees Fahrenheit. The temperature and dew point both lowered to 48 degrees Fahrenheit at 1211. Overcast cloud conditions at 2,900 feet agl were also reported.

A review of available weather data revealed an upper level disturbance over the Pacific northwest, which resulted an extensive area of clouds and precipitation over the area. The Geostationary Operational Environmental Satellite (GOES)-11 satellite imagery at 1045 depicted an extensive area of nimbostratus clouds over the accident site. The observations surrounding the accident site indicated light rain and mist. Measureable precipitation was recorded as 0.05 inches per hour, with ceilings overcast in the range of 2,000 to 2,900 feet above ground level (agl) in the vicinity of the accident site. The cloud tops were recorded in a

Boise, Idaho, sounding as being 20,000 feet msl. The freezing level was at 9,250 feet msl and supported light to moderate rime to mixed icing conditions in clouds and precipitation.

The closest WSR-88D from Boise detected echoes near 20 dBZ or “light” intensity echoes over the accident site at 1057, and confirmed nimbostratus type clouds. The National Weather Service had advisories for Instrument Flight Rules (IFR) conditions, mountain obscuration, icing between 9,000 and 22,000 feet, and moderate turbulence below 15,000 feet over the region.

WRECKAGE AND IMPACT

The accident site was located in the eastern canyon of Succor Creek, about 25 nautical miles (nm) south of Adrian. The main wreckage was located at an estimated 43 degrees 26.389 minutes north latitude and 117 degrees 05.158 minutes west longitude, at an elevation of about 3,900 feet mean sea level (msl). The distance from Jerome (departure city) and Ilwaco (destination city) is about 530 miles on a bearing of about 300 degrees. The accident site was about 25 miles south of the direct flight path between the two cities and about 140 miles from Jerome on a bearing of 290 degrees.

The accident site was about 17 miles west of the Owyhee Valley, which has an elevation around 2,700 feet. From the floor the terrain rises to the west with mountains peaking over 5,000 feet that continue for over 275 miles until reaching mid Oregon (about 100 miles from the coast). The Succor Creek Canyon is oriented north-south and stretches 2-3 miles in width and continues over 30 miles through the mountains. The canyon was located just west of the accident site, where the debris came to rest on a west facing slope.

The wreckage debris was scattered over an estimated 1,000-foot area of hilly terrain. At the far south parameter of the debris field were large sections of the right wing, with the far north area containing the engine and nose landing wheel. The complete pictorial wreckage documentation is contained in the public docket for this accident.

MEDICAL AND PATHOLOGICAL INFORMATION

The FAA Civil Aeromedical Institute (CAMI) performed toxicological screenings on the pilot. According to CAMI's report (#200900191001) evidence of putrefaction was found in the specimens received.

TESTS AND RESEARCH

Investigators from the Safety Board and Navion examined the wreckage on May 05 and 06, 2010, at the facilities of SP Aircraft in Boise.

The fuselage was separated into four major sections encompassing the following: the aft shear web (station 273.118) to mid fuselage area, the forward fuselage area, the canopy, and

cockpit floor with seat tracks. The aft shear web attach-point, where a rivet line connected the empennage to the fuselage was deformed with elongation noted in the webbing in indication that the fittings were pulled outward. The forward-fuselage section contained the compromised cockpit area.

The left wing fuselage attach fitting was ripped upward. The left lower longeron, just aft of station 93 was twisted and fractured to station 106. At the lower longeron attach point there was evidence of rivet hole elongation forward and inboard, with the fitting deformed, but remaining attached to the fuselage. The left wing attach point displayed a torsional deformation to the longeron; the rivets along the skin were deformed forward and inboard.

The forward spar at station 93 had rivets sheared at the attach fitting. The spar appeared to be curved upward, making a slight "v" shape with the attach fitting being the lowest point in indication of a positive deformation event. The left wing was intact with a crease oriented diagonally from the outboard leading edge to the inboard trailing edge stretching from station 138 to 160. The left flap contained a crease similar to that on the wing, with the center section deflected downward.

The right wing was separated in several pieces and found scattered throughout the debris field, primarily at the most southern part. The main sections consisted of an inboard section which was splayed opened, revealing numerous ribs; the outboard section which spanned the length of the aileron and was still attached; the inboard aft area, where the wheel was still attached; a large area of upper skin that had the appearance of being "peeled" away; and a section of tangled skin with the right flap attach point imbedded.

The inboard section of the bottom spar cord exhibited a 45-dgree fracture and the upper cord had various fracture surfaces. Station 50 on the right wing showed upward bending. The middle aileron fitting was down and outward. The outboard section appeared to have the paint stripped away with mostly bare aluminum on the greatly deformed surface.

The left horizontal stabilizer was intact, with the majority of the deformation noted near the aft inboard section. It was found dispersed from any other wreckage and at the beginning of the debris field. The beam assembly (serves as an aft spar) was not attached to the skin and found with the aft rivets sheared. The root attach plate was intact with no deformation noted and the fasters remained secured. The left portion of the beam assembly was observed to have aft torsional twisting. The elevator was not attached, although it was one of the closer pieces of wreckage found by the left horizontal stabilizer. The control surface was bent in an upward peak, with the apex occurring about mid-span. The leading edge was twisted upward.

The right horizontal stabilizer remained attached to the beam assembly and was entangled in the vertical stabilizer and tail cone section. The elevator was affixed to the stabilizer by its respective attach points. This portion of wreckage was found mid field in the debris, near the left wing. The skin was deformed with creases oriented on a diagonal plane from the forward inboard (about station 40.5) to the aft outboard section. A crease similar in size and deflection

was additionally found on the elevator.

The vertical stabilizer was intact and the rudder remained attached at its receptive fittings. The stops were intact and did not show any evidence of abnormal contact.

The engine case was broken open and numerous accessories were located in the general vicinity of the engine wreckage. The propeller remained affixed to the engine. Both blades were curled forward and one was missing a tip. There was no evidence of mechanical malfunction or failure with the engine or airframe. A detailed examination report with accompanying pictures is contained in the public docket for this accident.

Pilot Information

Certificate:	Private	**Age:**	32,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	July 21, 2006
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	57 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Navion	**Registration:**	N4898K
Model/Series:	NAVION A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	NAV-4-1898
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	December 8, 2008 Annual	**Certified Max Gross Wt.:**	2850 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	1490 Hrs	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, not activated	**Engine Model/Series:**	E225 SERIES
Registered Owner:	On file	**Rated Power:**	225 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:	EUL,2432 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	11:55 Local	**Direction from Accident Site:**	30°
Lowest Cloud Condition:	Scattered / 2200 ft AGL	**Visibility**	
Lowest Ceiling:	Overcast / 2900 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	13°C / 9°C
Precipitation and Obscuration:	In the vicinity - None - Rain		
Departure Point:	Jerome, ID (JER)	**Type of Flight Plan Filed:**	None
Destination:	Ilwaco, WA (7W1)	**Type of Clearance:**	None
Departure Time:	10:30 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	43.439167,-117.085281

Administrative Information

Investigator In Charge (IIC):	Keliher, Zoe
Additional Participating Persons:	Pat Darling; Federal Aviation Administration; Boise, ID Andrew Swick; Teledyne Continental Motors; Sacramento, CA
Original Publish Date:	December 20, 2010
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74502