



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Spokane, WA	<b>Accident Number:</b>	SEA04FA023
<b>Date &amp; Time:</b>	11/29/2003, 0801 PST	<b>Registration:</b>	N439AF
<b>Aircraft:</b>	Fairchild Swearingen SA227-AT	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 135: Air Taxi & Commuter - Non-scheduled		

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## Analysis

The pilot, who had more than 3,340 hours of pilot-in-command time in the make/model of the accident aircraft, and was very familiar with the destination airport and its ILS approach procedure, departed on a cargo flight in the SA227 turboprop aircraft. The aircraft was dispatched with the primary (NAV 1) ILS receiver having been deferred (out of service) due to unreliable performance the evening before the accident, thus leaving the aircraft with the secondary (NAV 2) ILS receiver for ILS use. The pilot arrived in the destination terminal area and was given vectors to intercept the ILS localizer, and radar data showed the aircraft intercepting and tracking the localizer accurately throughout the approach. Mode C altitude readouts showed the aircraft approaching from below the glideslope at the required intercept altitude of 4,100 feet, passing through and above the glideslope and then initiating a relatively constant descent, the angle of which exceeded the glideslope angle of -3.5 degrees. Weather at the destination airport was 400 foot overcast and the decision height for the ILS/DME runway 21R approach was 270 feet. The aircraft passed through the tops of trees in level flight about 530 feet above the airport elevation and slightly under 3 nautical miles from the runway threshold. The pilot was given a low altitude alert by the tower and acknowledged, reporting that he was descending through 2,800 feet, which was confirmed on the mode C radar readout. At that point the aircraft was well below the ILS glideslope and about 13 seconds from impacting the trees. Post crash examination of information captured from the left and right HSI units and an RMI revealed that the NAV 1 receiver was most likely set on the ILS frequency, and the NAV 2 receiver was most likely set on Spokane VORTAC, a terminal navigation facility located very slightly right of the nose of the aircraft and 14 nautical miles southwest of the destination airport.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot-in-command's failure to maintain proper glidepath alignment during an ILS approach in poor weather resulting in collision with trees and terrain. Contributing factors were the unreliable status of the primary (NAV 1) ILS receiver (leaving the pilot with only the secondary (NAV 2) ILS receiver), the low ceilings and trees.

## Findings

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Occurrence #1: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: APPROACH - FAF/OUTER MARKER TO THRESHOLD (IFR)

### Findings

1. (F) COMM/NAV EQUIPMENT, INSTRUMENT LANDING SYS (ILS) - UNRELIABLE
2. (C) PROPER GLIDEPATH - NOT MAINTAINED - PILOT IN COMMAND
3. (F) WEATHER CONDITION - LOW CEILING
4. OPERATION WITH KNOWN DEFICIENCIES IN EQUIPMENT - DISPATCHED - COMPANY/OPERATOR MANAGEMENT
5. (F) OBJECT - TREE(S)

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Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

### Findings

6. TERRAIN CONDITION - GROUND

## Factual Information

### HISTORY OF FLIGHT

On November 29, 2003, at 0801:26 Pacific standard time, a Fairchild-Swearingen SA227-AT, N439AF, registered to Ameriflight, Inc., being operated as Ameriflight flight 1996, and being flown by an airline transport rated pilot, was destroyed during collision with trees and terrain while on final approach to Felts Field, Spokane, Washington. The pilot was fatally injured and a post crash fire consumed much of the aircraft. Instrument meteorological conditions existed at the crash site and an Instrument Flight Rules (IFR) flight plan was in effect at the time. The flight, a weekly (Saturday only) cargo trip, departed Boeing Field, Seattle, Washington, at 0707 PST, and was operated under 14 CFR 135.

Upon its arrival in the Spokane area, the aircraft was cleared for the ILS/DME runway 21R approach to Felts Field (SFF) and a radar track showed it turning right to intercept the localizer and track inbound. Approximately 0801 the local controller at Felts Field issued a low altitude alert to the pilot who immediately responded acknowledging a descent through 2,800 feet above mean sea level (MSL). The last radar target showed the aircraft tracking 217 degrees magnetic at 131 knots and with a transponder altitude of 2,400 feet. At that time the target was approximately 250 feet east of a north/south tree line.

There were no eyewitnesses to the accident. A number of individuals who lived near or were in the vicinity of the accident site reported hearing the aircraft. One individual reported that "...the engine seemed to run smoothly, but it sounded way too low...." Another individual reported that "...he looked up toward where he heard the plane, but could not see it because the fog was so thick..." and that "...the engine sounded strong...." He heard the aircraft come into contact with several trees slightly west of his location and found aircraft debris on the roadway where his driveway intersects Lehman Road (refer to Attachment WAR-I).

The on scene investigation was conducted November 29 through December 01. Parties to the investigation were the Federal Aviation Administration, Honeywell, M7 Aerospace, and Ameriflight, Inc.

### PERSONNEL INFORMATION

The pilot possessed an airline transport pilot certificate (including an instrument rating) with a rating in multi-engine land aircraft. He was also rated in single-engine land for commercial privileges. He also held a current flight instructor's certificate with airplane single-engine and instrument ratings. His most recent FAA medical examination was conducted on March 26, 2003, at which time he received a First Class medical with the restriction that he "must wear corrective lenses."

The pilot's flight experience was constructed from a copy of his most recent personal logbook (log number 4), which opened with an entry on July 10, 2002, and contained a last entry on August 14, 2003, along with records maintained by the operator. The pilot's total flight experience was 6,253 hours of which 5,619 hours were in multi-engine aircraft and 4,406 hours were in the SA227 aircraft. He had a total of 5,187 hours as pilot-in-command of which 3,340 hours were in the SA227 aircraft. The pilot had also logged 956 hours of actual instrument flight experience. His flight time, all of which was logged in the SA227 as pilot-in-command,

for the previous 90 and 30 days was 116 and 36 hours respectively.

The pilot was hired by Ameriflight on December 9, 1999, and began flying the SA227 exclusively for the company. He was based out of Seattle, Washington, and was designated an SA227 training captain on August 1, 2001. His most recent fully documented check ride was successfully accomplished in the SA227 on June 16, 2003, and served as a 14CFR135.293(a) & (b), .297 and .299 check. He had flown a similar check ride successfully on November 26, 2003, however, that flight had not been signed off as completed.

A review of the pilot's flight activities for the 72 hours previous to the accident revealed that prior to the accident flight he had flown a single roundtrip from Seattle, Washington, (Boeing Field) to Kennewick, Washington (Vista Field) and return on November 26, 2003. He logged a total of 2 hours and 32 minutes of flight time that fell within an 8.5 hour duty day. He was off duty on November 27th and worked a nine hour (non-flying) duty day on November 28th.

#### AIRCRAFT INFORMATION

N439AF, a Fairchild-Swearingen SA227-AT, was equipped with two Honeywell (Garrett) TPE-331 turboprop engines and had been configured for cargo operations. The aircraft had been issued a standard airworthiness certificate for normal operations. The aircraft was certified for single pilot IFR operations.

According to records provided by the operator the aircraft's basic operating weight (i.e., total weight minus fuel and cargo) was 9,019 pounds and the aircraft was dispatched with 2,000 pounds of jet A fuel and 967 pounds of cargo. The aircraft's maximum gross takeoff weight was 16,000.

The aircraft was being maintained in accordance with an approved aircraft inspection program and, according to the Operator; the most recent (A) inspection was completed on November 3, 2003, at a total airframe time of 15,125.7 hours. The aircraft was reported to have flown 53 hours between that time and the time of the accident.

The aircraft was equipped with dual navigation (NAV) receivers capable of receiving VOR and ILS signals. Additionally, the aircraft was equipped with marker beacons, and an ADF and DME receiver. NAV 1 was hard wired to the captain's (left) horizontal situation indicator (HSI) while NAV 2 was hard wired to the copilot's (right) horizontal situation indicator (HSI). NAV 1 signals could not be displayed on the right HSI nor could NAV 2 signals be displayed on the left HSI. In order to provide the flying (left seat) pilot with redundancy, an independent course deviation indicator (CDI), which provided both localizer and glide slope information, was hard wired to the NAV 2 system and physically located directly beneath the captain's HSI (refer to graphic images 1 and 2). The NAV 1 and 2 units each consisted of a Glideslope/VOR/Localizer/marker beacon receiver unit, a control head and a display (HSI/CDI). Both NAV 1 and 2 were also connected to separate glideslope and VOR/Localizer antennas.

According to the captain who flew the aircraft the evening before the accident, the localizer and glideslope needles for the HSI associated with NAV 1 moved to the neutral position and the warning flags for both appeared on two separate occasions while flying the ILS approach into Boeing Field, Seattle, Washington. The captain set the ILS frequency on NAV 2 as a backup/replacement to NAV 1 and completed the ILS approach without difficulty utilizing the

CDI associated with NAV 2 (refer to Attachment PS-1).

Operator maintenance personnel based in Seattle attempted to troubleshoot the NAV 1 malfunction but were unsuccessful and the aircraft was dispatched the following morning with the NAV 1 system deferred and, according to the Operator, placarded out of service (refer to Attachment MR-1). The captain who wrote up the gripe on the NAV 1 on the previous evening advised the captain on the accident flight of the malfunction prior to his departure from Boeing Field.

The NAV 1 and NAV 2 VOR/LOC/GS/MB receiver boxes (VIR-30's) were recovered from the accident in relatively good condition. The NAV 1 box was marked with serial number 28676 and the NAV 2 box was marked with serial number 16848. A review of maintenance records maintained by the Operator confirmed VIR-30 (NAV 1) as serial number 28676. However, the records showed that the VIR-30 unit installed as NAV 2 should have been serialized as 11495.

A physical search and record review by the Operator revealed that VIR-30, serial number 11495 had been removed from N439AF in November of 2003 and was shelved as a replacement in Phoenix, Arizona, at the time of the accident. The Operator reported that the aircraft was acquired in 1998 with NAV 1 serial number 16848 and NAV 2 serial number 15943 and that in December 1999 NAV 2 was replaced with serial number 11495. Records indicated that on November 19, 2003, NAV 1, serial number 11495 was removed and replaced with serial number 28676. The Operator reported that at some time between December 1999 and November 2003, NAV 1 (serial number 16848) was swapped with NAV 2 (serial number 11495).

Discussions with the Operator revealed that both the left and right Radio Magnetic Indicators (RMI) were hard wired such that the single barrel (#1) needle could derive a signal from either the ADF (automatic direction finding) receiver or the NAV 1 receiver selectable through either a rotating or a push-button selector switch at the bottom left corner of the RMI. Likewise, the double barrel (#2) needle could derive a signal from either the same ADF receiver or the NAV 2 receiver selectable through either a rotating or a push-button selector switch at the bottom right corner of the RMI.

## METEOROLOGICAL INFORMATION

The aviation surface weather observation taken at Felts Field (1,953 feet MSL) at 0753 on the morning of the accident reported the following conditions:

Wind from 230 degrees magnetic at 5 knots, visibility 10 statute miles, ceiling 400 foot overcast, temperature and dew point both 6 degrees Celsius, altimeter 29.83 inches of Mercury.

A pilot who flew the ILS/DME Runway 21R approach in a Pilatus PC-12 turboprop aircraft less than 30 minutes prior to the accident reported no unusual wind conditions during the approach and broke out at a radar altimeter reading of 310 feet above ground (pressure altimeter reading was not known) and before reaching the decision height on the approach.

Fire fighter and rescue personnel, including an FAA inspector who responded to the accident immediately following the crash reported obscuration and visibilities less than 1/4 mile at the site as well a no evident ice on the wreckage. Refer to Attachments PS-2 through PS-4 and attached Meteorology Factual Report.

## AIDS TO NAVIGATION

Runway 21R was provided with a single instrument approach designated as the ILS/DME RWY 21R approach. The approach procedure is provided with three different sets of minima depending on whether a full ILS is being flown, a localizer only approach is being flown or a circling approach to another runway is being executed.

The ILS approach can be initiated either as a full approach from the holding pattern, a direct intercept to the final approach course from Coeur d'Alene VOR at 6,100 feet MSL or above or, as in the case of the accident flight, a radar vector intercept to the final approach course at 6,100 feet MSL or above if outside of AZTEM intersection, the initial approach fix (4,100 feet MSL or above if outside of HANSN intersection, the final approach fix).

The decision height for the ILS approach was 2,223 feet MSL (270 feet height above touchdown) and was based on flying the full ILS with a fully operational ILS and DME receiver. In the event of non-availability of glide slope information the localizer approach may be flown and with operational DME timing is not required with the minimum descent altitude being specified as 2,860 feet MSL (907 feet height above touchdown) at the 0.7 mile DME fix (refer to Diagram IAP-1).

A non-directional beacon was installed at Felts Field. It was physically located just short of the threshold of runway 21 left and its frequency was 365 kilohertz (refer to Diagram A-1).

The Spokane area was served by a VORTAC (very high frequency omni directional range station and/or tactical air navigation) located southwest of Felts Field and approximately 14 nautical miles distant. Felts Field lay on the 040 degree radial from this (GEG) VORTAC. AZTEM intersection was 26.7 nautical miles from GEG VORTAC and lay on the 037 degree radial (refer to Attachment IAP-1).

## FACILITIES

The FAA conducted a flight check of the facilities serving the instrument approaches into Felts Field on November 30, 2003. No discrepancies were noted and all navigational aids were found to be operating within acceptable limits (refer to Attachment FC-1).

Additionally, the pilot who flew the ILS/DME Runway 21R approach immediately prior to the accident reported no difficulties with the ILS system during the approach.

## COMMUNICATIONS

A re-recording of the radio communications between approach control (East radar) and the pilot of N439AF was obtained and reviewed. All communications were normal and after two separate right turns to 080 and then 150 degrees magnetic the pilot was advised that he was four miles from the final approach fix, was given a final right turn to 190 degrees magnetic to maintain 4,500 feet until intercepting the localizer, and was cleared for the ILS/DME runway 21R approach. Shortly thereafter radar service was terminated and the pilot was advised to contact Felts tower.

A re-recording and transcription of the radio communications between Felts Field tower and

the pilot of N439AF was obtained. The following are significant highlights from that transcript (refer to Attachments TT-I and PS-5 through 7):

At 0753:38 the pilot contacted Felts Field tower advising that he was "ten west" and that he would be "doing an ILS."

At 0759:29 the pilot contacted Felts Field tower reporting, "Felts tower Amflight nineteen ninety-six, ILS/DME two one right."

At 0759:35 the tower cleared the flight to land on runway 21 right and five seconds later the pilot acknowledged the clearance.

At 0759:49 the pilot contacted Felts Field tower requesting, "can you turn those runway lights up on high?" and the controller responded three seconds later that "they're already up on high right now and ah I've ah got the ah approach lights on high."

At 0801:06 the tower advised the aircraft "...ow altitude alert check your altitude ah ILS decision height two-thousand two-hundred twenty three...."

At 0801:13 the pilot responded, "...descending through two-thousand eight-hundred...."

No further radio transmissions were received from the aircraft.

#### AERODROME INFORMATION

Felts Field (SFF) is a general aviation airport equipped with two parallel runways (21 left and right/03 left and right). Runway 21R was served by an ILS/DME precision approach and the runway measured 4,500 feet in length by 150 feet in width and was composed of concrete. The runway was equipped with medium intensity runway lights (MIRL) and a medium intensity approach lighting system (MALSR) that included runway alignment indicator lights (RAIL) and, according to air traffic control specialists working the tower the morning of the accident, both the MALSR and runway lights were set on high intensity (refer to Attachments PS-5 and PS-6). Runway 21R was also equipped with a 4-box VASI system (visual approach slope indicator) which was positioned along the right side of the runway upwind of the threshold. The VASI is set at a 3.5-degree glide slope. The airport is also serviced by a contract air traffic control tower that is operational between 0800 local until 1800 local (refer to Attachment AMR-I).

The airport elevation is 1,953 MSL and lies in a depression with terrain rapidly rising to nearly 2,600 feet MSL north and west of the airport. The terrain north-northeast of the threshold of runway 21R is relatively flat and unobstructed for the first two nautical miles and then rises up to 2,400 feet over the next mile (refer to CHART I).

#### FLIGHT AND COCKPIT VOICE RECORDERS

There were no flight or cockpit voice recorders installed in the aircraft and none were required.

#### AIR TRAFFIC CONTROL INFORMATION

An NTSB Air Traffic Specialist reviewed the Spokane TRACON ARTS computer data to examine the functioning of the Minimum Safe Altitude Warning (MSAW) system. Continuous

Data Recording (CDR) extractions of Track and MSAW were examined. In accordance with the adapted minimum altitudes, and FAA document NAS-MD-644, a general terrain warning MSAW was generated at approximately the same time the airplane joined the final approach course, outside HANSN. This alert could be safely disregarded, as the airplane was established on a published portion of the instrument approach procedure, with a minimum altitude below that of the minimum vectoring altitude for that area.

At 1600:57.7, the first track return eligible for a predictive warning was received. Predictive functioning processes approximately 15 seconds forward in position and altitude to determine if a track may violate minimum altitudes. At 1601:02, a predictive warning was generated in the ARTS system. Four seconds later, the controller issued a low altitude alert to the pilot. The pilot responded that he was at 2,800 feet, which is within 100 feet of the received mode C altitude of the track at 1601:07, concurrent with his reply.

Nine seconds later, the warning changed to a current alert, indicating the track has passed below the glideslope altitude. At 1601:20, a return was received with no mode C altitude data. Five seconds later the last return was received indicating 2,400.

#### WRECKAGE AND IMPACT INFORMATION

The aircraft crashed in a moderately wooded drainage approximately three nautical miles northeast of the Felts Field airport, Spokane, Washington. The accident site coordinates (where the aircraft came to rest) were determined using a hand held GPS unit and were found to be 47 degrees 42.577 minutes north latitude and 117 degrees 15.885 minutes west longitude. The elevation of the accident site was approximately 2,300 feet above mean sea level (MSL) (refer to CHART 2 and graphic images 3 through 6).

The first evidence of impact was with a line of conifer trees oriented along a north/south axis on the west side of Lehman Road, a two lane rural paved road. The paved surface was approximately 2,390 feet MSL at this impact site and the trees were approximately 100 feet in height with their trunks about 10 feet below the height of the road (tops 90 feet above the height of the road or 2,480 feet MSL) (refer to graphic image 7). Two conifer trees approximately 56 feet apart displayed prominent horizontal scrape marks on the east side of their trunks, each at an elevation of 61 feet above the road surface. Two additional conifer trees were observed to have their tops broken off slightly below the horizontal line between the two previously described tree impacts (refer to graphic image 8). The latitude and longitude of the midpoint between these 4 trees was 47 degrees 42.633 minutes north and 117 degrees 15.717 minutes west.

A number of outboard wing fragments were located in the vicinity of the initial tree strikes from the area of Lehman Road and slightly west of the tree strikes. The five major wing fragments were re-assembled on site. Three fragments mated to make an approximate continuous 8 foot section of left wing from the tip cap inboard with chord wise tears from leading to trailing edge approximately 2 and 4 feet from the wingtip (refer to graphic image 9). The remaining two fragments mated to make an approximate continuous 2 foot section of left wing from the tip cap inboard with chord wise tears from leading to trailing edge



approximately two feet from the tip cap and at the cap to wing seam (refer to graphic image 10). The center section from the left wing sections and the inboard section from the right wing sections both displayed significant leading edge deformation along the chord line with extensive accordion-like aft ward compressive folding of the leading edge skin. Fragments of woody material were noted at the leading edge crush areas and the axis of both crash impressions were measured to be very nearly perpendicular to both the aircraft's longitudinal and lateral axis.

The initial ground impact point of the aircraft was 47 degrees 42.590 minutes north and 117 degrees 15.843 minutes west approximately 2,350 feet MSL (refer to graphic image 11). The flight path angle between the initial tree impacts and the initial ground impact was approximately -13 degrees and was consistent with angular measurements taken along successive broken tree tops between the two points. The magnetic bearing line from the initial tree strikes and the initial ground impact point was approximately 222 degrees and the wreckage distribution path between these two points covered approximately 575 feet (refer to graphic image 12). The aircraft impacted up sloping terrain at the initial ground impact point coming to rest approximately 200 feet beyond and on the same 222 degree magnetic bearing.

The initial ground impact point was characterized by 3 impact impressions associated with the aircraft. Abeam and to the north of these impacts a single conifer tree was observed to be topped and the angle between the first impact impression progressing southwest and the broken tree top was measured at +44 degrees.

The aircraft was observed at its final resting place in an inverted attitude. Both wings had separated with the left wing completely detached and lying with its engine slightly north-northwest of the fuselage. The right wing and engine remained in close proximity to the fuselage and all major control surfaces were found at the accident site (refer to graphic images 13 through 17). A post crash fire had consumed most of the fuselage from the upper window line circumferentially through to the belly of the aircraft. The cockpit area was extensively fire damaged from the instrument panel aft with the fire damage gradually decreasing in severity in the area of the empennage.

## MEDICAL AND PATHOLOGICAL INFORMATION

Sally Aiken, M.D., conducted post-mortem examination of the pilot at the facilities of the forensic institute at Holy Family Hospital, Spokane, Washington, on December 1, 2003, (case number 03-0538). The post mortem examination identified contact lenses in each of the pilot's eyes. Additionally, the examiner reported no evidence of remarkable findings with respect to the pilot's heart and brain.

The FAA's Toxicology Accident and Research Laboratory, Oklahoma City, Oklahoma, conducted toxicological evaluation of samples from the pilot. The following findings were reported (refer to attached TOX report):

- 57% Carbon Monoxide detected in blood
- 1.28 (ug/ml) Cyanide detected in blood

## TESTS AND RESEARCH

Both TPE331-11U-61G engines were disassembled and examined at the facilities of Honeywell in Phoenix, Arizona, on February 5, 2004. The examination revealed no evidence of mechanical malfunction within either engine, and both engine's combustor sections contained small fragments of wood and earthen material. Additionally, light metal spray was observed adhering to the suction side of turbine stator blades within both engines.

Both NAV 1 and NAV 2 VIR-30 units, both left and right HSI indicators, the ILS glideslope antenna, the ADF receiver and 5 of the 6 radio control heads from the aircraft (the 6th (absent) control head could not be identified within the wreckage) were shipped to the facilities of Rockwell-Collins Inc. for testing, disassembly and examination under the oversight of locally assigned FAA inspectors.

Of the 5 control heads only one unit provided usable information. This control head was a CTL-20 VHF communication control head and when its frequency chip was powered up two frequencies were recovered from the chip's memory: 132.50 megahertz (the frequency of the Felts Field air traffic control tower), and 121.70 megahertz (the frequency of the Felts Field ground control).

A test of the ADF receiver revealed a malfunctioning A6A2 synchro driver as well as a shorted transistor. VIR-30 serial number 28676 (left NAV 1) functioned normally during its test. VIR-30 serial number 16843 (right NAV 2) displayed deformation to its case and when tested the glideslope was found to be very weak but did not result in a warning flag display. Further examination revealed several damaged crystals associated with frequency setup for the local oscillator. When the crystals were replaced the unit successfully functioned.

The left and right HSI indicators were examined and, although heavily fire damaged, provided the following information: Both indicators were showing a magnetic heading of 225 degrees. The course selector for the left HSI was set at 214 degrees and the course selector for the right HSI was set at 140 degrees. The heading bug for the left HSI was set at 218 degrees and the heading bug for the right HSI was set at 120 degrees. The course deviation bar for both left and right HSI indicators was approximately centered (i.e., 0 deviation). The glide slope pointers from both indicators were at the bottom of their respective deviation scales however; their respective meter movements had been subjected to sustained fire. The glide slope flag for the left HSI was out of view. The glide slope flag for the right HSI could not be determined nor could the NAV and HDG (heading) flags for both indicators.

One identifiable RMI was recovered at the accident site and examined (refer to graphic 18X). The unit was heavily fire damaged and the push-button selector switches were burned away. Although the compass card was heavily fire damaged both the #1 and #2 needles were in place. The #1 needle was observed in the 12 o'clock position directly centered under the RMI lubber line at the top of the instrument. The #2 needle was pointing approximately 10 degrees to the right. The lubber line (12 o'clock position coincident with the #1 needle) was positioned about 220 degrees magnetic.

The glide slope antenna, a dual element unit, was examined and tested and it was noted that one of the "C" jacks was missing along with its pin insert. Matching of the antenna brackets with structure within the aircraft revealed the "C" jack that was missing was from the right side connector of the antenna. The left "C" jack was found in place, tight and could not be moved when rotated by hand. A wear pattern consistent with the diameter of the "C" jack was noted

on the mounting plate and the lock washer and jam nut from the antenna side of the mounting plate were observed in place. The lock washer displayed no deformation and the jam nut displayed no evidence of stripped threads. Testing of the antenna resulted in failure of both the phase test and the single element minimum specifications (refer to Attachment RC-I which discusses in greater detail the examination and testing of the above noted components).

## PERFORMANCE

A review of the aircraft's performance was conducted by the Safety Board's Office of Research and Engineering, Vehicle Performance Division based on radar data provided by the Spokane Approach Control facility located at Geiger Field, Spokane, Washington (refer to Attachments P-1 and RD-1).

## ADDITIONAL INFORMATION

On-site examination of the wreckage was conducted on November 29/30, after which the wreckage was verbally released to the insurance representative and salvage operator for the purpose of removal and storage. Written wreckage release was accomplished on September 28, 2004, and is documented on NTSB form 6120.15. (attached)

### Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Instructor; Commercial	<b>Age:</b>	32, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	03/26/2003
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	06/16/2003
<b>Flight Time:</b>	6253 hours (Total, all aircraft), 4406 hours (Total, this make and model), 5187 hours (Pilot In Command, all aircraft), 116 hours (Last 90 days, all aircraft), 36 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Fairchild Swearingen	<b>Registration:</b>	N439AF
<b>Model/Series:</b>	SA227-AT	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	AT-439B
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	11/03/2003, AAIP	<b>Certified Max Gross Wt.:</b>	16000 lbs
<b>Time Since Last Inspection:</b>	53 Hours	<b>Engines:</b>	2 Turbo Prop
<b>Airframe Total Time:</b>	15126 Hours at time of accident	<b>Engine Manufacturer:</b>	Garrett-AiResearch
<b>ELT:</b>	Installed, activated, did not aid in locating accident	<b>Engine Model/Series:</b>	TPE331-11U
<b>Registered Owner:</b>	Ameriflight, Inc.	<b>Rated Power:</b>	1000 hp
<b>Operator:</b>	Ameriflight, Inc.	<b>Operating Certificate(s) Held:</b>	On-demand Air Taxi (135)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	JIKA

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Instrument Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	SFF, 1953 ft msl	<b>Distance from Accident Site:</b>	3 Nautical Miles
<b>Observation Time:</b>	0753 PST	<b>Direction from Accident Site:</b>	219°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 Miles
<b>Lowest Ceiling:</b>	Overcast / 400 ft agl	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	230°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.83 inches Hg	<b>Temperature/Dew Point:</b>	6°C / 6°C
<b>Precipitation and Obscuration:</b>			
<b>Departure Point:</b>	Seattle, WA (BFI)	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Spokane, WA (SFF)	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	0707 PST	<b>Type of Airspace:</b>	Class D

## Airport Information

<b>Airport:</b>	Felts Field (SFF)	<b>Runway Surface Type:</b>	Concrete
<b>Airport Elevation:</b>	1953 ft	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	21R	<b>IFR Approach:</b>	ILS
<b>Runway Length/Width:</b>	4500 ft / 150 ft	<b>VFR Approach/Landing:</b>	Full Stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 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>	
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	47.710833, -117.260556

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Steven A McCreary	<b>Report Date:</b>	12/03/2004
<b>Additional Participating Persons:</b>	John H Phillips; FAA FSDO; Spokane, WA Jim Allen; Honeywell; Phoenix, AZ John Hazlet; Ameriflight, Inc.; Burbank, CA Jack D Morgan; M7 Aerospace; San Antonio, TX		
<b>Publish Date:</b>			
<b>Investigation Docket:</b>	NTSB accident and incident docket serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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