Aviation Investigation Final Report

Location:	Sterling, Kansas	**Accident Number:**	DEN08FA058
Date & Time:	February 13, 2008, 12:55 Local	**Registration:**	N62793
Aircraft:	Piper PA-23-250	**Aircraft Damage:**	Destroyed
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The airplane was in cruise flight at 6,000 feet mean sea level when it entered an uncontrolled descent and impacted terrain in a right wing low attitude. The airplane cartwheeled, impacted a cow, and scattered components and debris over a distance of 668 feet. Examination of both stabilators revealed extensive aft streaking, initiating along the forward rivet line, consistent with working or "smoking" rivets. Examination of the stabilator trim tab fittings exhibited little deformation and the inboard rivet faces had been knocked off. The stabilator trim pushrod was not attached. The securing nut and cotter pin, used to secure the pushrod to the tab was missing. The lack of deformation to the trim pushrod is indicative that the securing nut backed out during flight. The stabilator trim bellcrank, left side, was loose within its attach point and exhibited significant freeplay. Disassembly revealed elongation of the attach hole. These observations indicate prolonged inadequate maintenance. A review of the pilot's training, experience, and qualifications revealed no issues.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of pitch control during cruise flight resulting from the separation of the stabilator trim actuator due to inadequate maintenenace.

Findings

Aircraft	Stabilizer control system - Failure
Aircraft	Pitch control - Attain/maintain not possible
Aircraft	(general) - Inadequate inspection

Factual Information

History of Flight

Enroute-cruise	Flight control sys malf/fail (Defining event)
Enroute-cruise	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On February 13, 2008, approximately 1255 central standard time, a Piper PA-23-250, N62793, owned and operated by Storm Flying Service, Inc., was destroyed when it impacted terrain 7.5 mile southwest of Sterling, Kansas. Visual meteorological conditions prevailed at the time of the accident. The positioning flight was being conducted under the provisions of Title 14 Code of Federal Regulations Part 91 on an instrument flight rules flight plan. The airline transport certificated pilot was fatally injured. The cross-country flight departed Wichita, Kansas, approximately 1230 and was en route to Hays, Kansas.

According to Storm Flying Service, Inc., of Webster City, Iowa, the flight was repositioning from Wichita to Hays for a daily cancelled check run. The route of flight continued from Hays to Great Bend to Salina to Kansas City and back to Wichita.

At 1249:30, a Kansas City Air Route Traffic Control Center (ARTCC) controller directed the pilot to turn to a heading of 280 to avoid the BISON military operations area (MOA) which was active. The pilot acknowledged this transmission and altered his course accordingly. At 1252:47 the controller called for a radio check and the pilot responded "loud and clear." No further radio transmissions were recorded from the accident airplane.

National Track Analysis Program (NTAP) radar data depicted the airplane on a northwesterly track at 1252:52 at an encoded altitude of 6,000 feet mean sea level (msl) and a groundspeed of 190 knots. At 1253:40 the flight altitude was recorded as 6,100 feet msl and at 1254:28 the altitude was recorded as 6,200 feet msl. The groundspeed slowed to approximately 170 knots. Three primary targets were recorded depicting the airplane in a right turn, with the last target being recorded at 1254:52. No altitude data was associated with these three targets. The last target was recorded 50 feet from the main wreckage.

Several ranchers in the area heard an airplane flying overhead around the time of the accident. One rancher commented that it sounded "choppy like a helicopter." Another commented that he heard a loud rumble, silence, and then a soft rumble. One of the ranchers observed the airplane in flight. He stated that the airplane was "quite a bit lower" than other aircraft that fly in the area. He stated the airplane was straight and level but he did not watch the airplane after that. Shortly thereafter it was reported to them that an airplane had crashed in the field where

they kept their cattle.

PERSONNEL INFORMATION

The pilot, age 27, held an airline transport pilot certificate with a multiengine land rating, and a commercial pilot certificate with single-engine land and instrument ratings, last issued on August 14, 2006. In addition, he held a flight instructor certificate with airplane single-engine, multiengine, and instrument airplane ratings. He was issued a second class airman medical certificate on October 12, 2007. The certificate contained the limitation "must wear corrective lenses." At the time of application for medical certification, the pilot estimated a total pilot time of 2,700 hours; 500 hours of which were in the previous six months.

According to the Pilot/Operator Aircraft Accident Report Form submitted by Storm Flying Service, the pilot had logged 3,050 hours total flight time; 1,320 hours of which were in the make and model of the accident airplane and 1,450 hours of which were in multiengine airplanes. They reported that his last flight review and Part 135 check flight took place on September 30, 2007, in a Piper PA-23 with satisfactory results.

A copy of the pilot's personal flight log was provided by the family. The last record of flight was recorded on February 2, 2008, in a Piper PA-23-250 (not the accident airplane). According to the flight log, the pilot had logged no less than 3,011 hours total flight time, 1,265 hours of which were in the make and model of the accident airplane, 340.8 hours in the accident airplane, and 1,411 hours of which were in multiengine airplanes. Neither the flight review nor the Part 135 check flight were recorded in the pilot's personal flight log.

AIRCRAFT INFORMATION

The accident airplane, a Piper PA-23-250 (serial number 27-7754030), was manufactured in 1977. It was registered with the FAA on a standard airworthiness certificate for normal operations. The airplane was powered by two Lycoming IO-540-C4B5 engines rated at 250 horsepower at 2,575 rpm. Each engine was equipped with a 2-blade, controllable pitch, Hartzell propeller.

The airplane was registered to and operated by Storm Flying Service, Inc., and was maintained under a 100 hour/annual inspection program. A review of the maintenance records indicated that a 100 hour inspection had been completed on January 18, 2008, at an airframe total time of 10,852 hours (tach 2,254). The last annual inspection was completed on August 1, 2007, at an airframe total time of 10,653 hours (tach 2,055). The airplane had flown approximately 73 hours between the last inspection and the accident and had an estimated total airframe time of 10,924 hours at the time of the accident. The operator reported that all maintenance was conducted by Hinman Aviation of Webster City, Iowa.

On May 16, 2002, the rod end and bolt on the upper stabilator trim actuator was replaced. According to the director of maintenance at Hinman Aviation, Piper had provided the parts for

this replacement, as Piper had received notice of one rod that exhibited corrosion and needed an additional sample from the field for evaluation. No corrosion was noted on the part returned to Piper.

METEOROLOGICAL INFORMATION

The closest official weather observation station was Hutchinson Municipal Airport (HUT), Hutchinson, Kansas, located 26 nautical miles (nm) southeast of the accident site. The elevation of the weather observation station was 1,543 feet msl. The routine aviation weather report (METAR) for HUT, issued at 1252, reported winds, 200 degrees at 14 knots, visibility, 10 miles; sky condition, clear; temperature 12 degrees Celsius (C); dewpoint, minus 02 degrees C; altimeter, 29.87 inches.

WRECKAGE AND IMPACT INFORMATION

The accident site was located in an open, dormant wheat field at an elevation of 1,707 feet msl. Debris extended from the initial impact point, along a magnetic heading of 050 degrees, for 668 feet. The initial impact point was characterized by a long, narrow ground scar with red and white paint chips and small slivers of fiberglass in the southern most point of the ground scar.

Multiple ground scars and debris proceeded for 465 feet from the initial impact point to the main wreckage. A large swath of ground, 35 feet long and 5 feet at its widest point, was discolored and the vegetation exhibited exposure to heat, consistent with a flash fire.

Torn metal, fiberglass insulation, Plexiglass, engine hoses, various engine accessories, portions of the engine cowling, and cabin instruments were located within the debris path. Both ailerons and several wing segments were located throughout the debris field. Several of the wing segments were charred, and partially consumed by fire.

The left stabilator separated from the empennage and was located to the left of the debris field. The underside of the stabilator exhibited aft streaking dark in color, originating from the leading edge rivets. The stabilator was crushed aft and inboard at the outboard tip. The leading edge was partially separated partially along the rivet line and was bent aft.

The right stabilator separated from the empennage and was located adjacent to the main wreckage. The underside of the stabilator exhibited aft streaking dark in color, originating from the leading edge rivets.

The main wreckage, consisting of the fuselage, the vertical stabilizer, rudder, and a portion of the left wing, came to rest 468 feet from the initial impact point. The left wing was inverted and remained partially attached to the fuselage. It exhibited exposure to heat and fire in the area of the fuel tank. The fuselage/empennage came to rest on its left side. The cabin and instrument panel were destroyed. The upper cabin skin was crushed aft and wrinkled.

Cabin instruments displayed the following indications:

Artificial Horizon - Destroyed
Airspeed indicator - 230 knots
Altimeter - needles separated
Kollsman Window - 29.79
HSI - needles separated - heading bug set at 295

Both engine assemblies separated from the airframe and came to rest north of the main wreckage. Examination of both engines revealed normal operational signatures and no anomalies.

A section of the right wing, to include the landing gear assembly, came to rest north of the wreckage. The landing gear was down. The wing separated from the fuselage at the wing root. The aft trailing edge skin, near the wing root, was torn up and outboard. The leading edge skin, in the area inboard of the engine nacelle, was torn aft and crushed. The remaining wing structure, outboard of the engine nacelle, exhibited exposure to heat and fire.

The left side of the aileron follow-up cable separated at the aileron bell crank. The aileron cable on the left side was continuous from the aileron bell crank arm, inboard, to the chain and sprocket assembly. The bell crank arm that attached the left aileron cable separated in signs consistent with overload. The roll bridal cable was frayed at the capstan on the autopilot servo.

The right aileron bell crank separated from the wing and was located within the debris path. Both the aileron and follow-up cables remained attached to the bell crank. The right aileron cable was attached to the chain and sprocket assembly in the nose section. The right side of the aileron balance cable was separated from the left side of the aileron balance cable.

The flap actuator was fully extended. According to Piper this is consistent with the flaps in the fully retracted position.

Both rudder cables remained attached to the rudder horn. The cables were continuous from the empennage, forward, to the rudder bar. The rudder trim jackscrew exhibited four threads. According to Piper five to six threads represents a rudder neutral position and zero threads represents a full nose left position.

The stabilator cables were attached at the stabilator horn tube. The cables were continuous from the empennage, forward, to the sprocket and chain assembly at the control column. The pitch servo cable was completely separated from the servo drum. The follow-up cable was found tangled within the stabilator cables. The stabilator trim jackscrew exhibited two threads. According to Piper this is consistent with a slight nose down trim; zero threads being a full nose down trim and five to six threads being neutral.

MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy was performed by the Sedgwick County Regional Forensic Science Center on February 14, 2008, as authorized by the Reno County Coroner's office. The autopsy revealed the cause of death as "multiple blunt impact injuries".

During the autopsy, specimens were collected for toxicological testing to be performed by the FAA's Civil Aerospace Medical Institute, Oklahoma City, Oklahoma (CAMI Reference #200800032001). Results were negative for carbon monoxide, cyanide, ethanol, and screened drugs.

TESTS AND RESEARCH

The wreckage was recovered on February 16, 2008, and relocated to a hangar in Lancaster, Texas, for further examination. The Safety Board IIC and representatives from Piper Aircraft, and Lycoming Engines examined the wreckage on March 25th and 26th, 2008. A structures engineer from the Safety Board assisted with the examination on the 26th.

The stabilators are typical twin spar, eight rib box structures. For ease of description the ribs will be numbered one to eight from inboard to outboard. There is an auxiliary front spar that forms the aft side of the attach point and ties into the forward spar at the mid span between ribs four and five.

The right hand stabilator (part number 15658-23 and serial number 27-0256) had separated from the empennage in one piece. The upper skin exhibited two punctures, one between ribs two and three, and one at rib five. The leading edge was separated from the forward and auxiliary forward spars along the upper spar caps for the entire length. The inboard leading edge was deformed rearward and the forward spars were fractured about six inches outboard of the inboard edge of the stabilator. The fractured portions of the forward and auxiliary forward spars remained attached to the stabilator torque tube fitting. The lower skin was essentially intact except where the forward spars pulled out at the inboard end.

Heavy dark streaking was evident along the inboard eight inches of the lower skin aft of the leading edge-auxiliary forward spar lower cap-lower skin joint that extended aft to the trailing edge. Numerous other rivets along the forward spar, auxiliary forward spar, and rear spar exhibited streaking along the entire chord length in some cases. Two rivets in the auxiliary forward spar outboard of rib three appeared newer than all of the others and had no paint on them.

Examination of the lower skin to spar faying surfaces exhibited very little primer and dark corrosion/fretting products. The interior surface of the lower skin exhibited very little primer. The upper skin to spar faying surfaces and interior surface of the skin exhibited intact primer.

The trim tab was attached to the rear spar and intact with little damage. The inboard end of the

tab was deformed slightly (less than five degrees) downward. The lower leading edge of the trim tab and the lower trailing edge of the stabilator exhibited deformation, scraping, and disturbed paint consistent with the trim tab being deflected trailing edge down into the stabilator. The appearance of the trim tab hinge was significantly different than the surrounding structure; it was much cleaner and exhibited no signs of corrosion. The logbooks did not reflect any maintenance performed on this portion of the stabilator. The trim tab attach bracket was attached to the inboard edge of the tab with no obvious deformation. The inboard face of the tab attach bracket exhibited scratching and scoring and the three forward, lower rivet heads were missing. The button head on the center, lower rivet exhibited significant damage.

The deformation on the spars and skins indicated separation of the stabilator in a forward and down direction. All of the fracture surfaces on the right hand stabilator had a dull, grainy appearance consistent with overload.

The left hand stabilator (part number 15658-22 and serial number 27-0256) had separated from the empennage in one piece. The stabilator tip exhibited crushing damage in an aft and inboard direction extending to rib five. The leading edge was separated from the forward and auxiliary forward spars along the upper spar caps for the entire length and was permanently deformed upwards and aft. The forward spars were fractured about six inches outboard of the inboard edge of the stabilator. The fractured portions of the forward and auxiliary forward spars remained attached to the stabilator torque tube fitting. The stabilator was deformed slightly upwards between ribs two and three. The lower skin was essentially intact except where the forward spars pulled out at the inboard end.

Heavy dark streaking was evident along the inboard eight inches of the lower skin aft of the leading edge-auxiliary forward spar lower cap-lower skin joint that extended aft to the trailing edge. Numerous other rivets along the forward spar and auxiliary forward spar exhibited streaking. Examination of the lower skin to spar faying surfaces exhibited very little primer and dark corrosion/fretting products. The interior surface of the lower skin exhibited very little primer. The upper skin to spar faying surfaces and interior surface of the skin exhibited intact primer.

The trim tab was attached to the rear spar and intact with little damage. The lower leading edge of the trim tab and the lower trailing edge of the stabilator both exhibited deformation, scraping, and disturbed paint consistent with the trim tab being deflected trailing edge down into the stabilator. The appearance of the trim tab hinge was significantly different than the surrounding structure; it was much cleaner and exhibited no signs of corrosion. The logbooks did not reflect any maintenance performed on this portion of the stabilator. The trim tab attach bracket was attached to the inboard edge of the tab with no obvious deformation. The inboard face of the tab attach bracket exhibited scratching and scoring and the two forward, center rivet heads were missing. The button heads on the forward, lower and center, lower rivets exhibited significant damage.

The deformation on the spars and skins indicated separation of the stabilator in a rearward direction. All of the fracture faces on the left hand stabilator had a dull, grainy appearance consistent with overload.

The tailcone of the airplane is manufactured in four pieces; an upper, lower, left, and right. The tailcone separated from the empennage in two pieces. The upper, left, and lower pieces remained attached together with significant deformation. The aft edge of the left piece was deformed in an inboard direction. The right hand piece separated along the fastener lines. The aft edge was deformed in an outboard direction and was centered at a semi-circular deformation of the trailing edge consistent with the diameter of the trim rod.

The stabilator trim bell crank remained attached to the stabilator fittings. The stabilator trim cables were attached to the drum and the trim was in a full nose down position. The flap-stabilator interconnect trim cables were attached to the drum. Both bolts on the left and right attach points were intact with cotter pins installed in the castellated nuts. The left hand attach point exhibited significant movement and slop while the right was firmly attached. The stabilator trim pushrod forward rod end remained attached to the bell crank and was fractured from the rod in the threaded portion of the rod end. The deformation of the forward rod end indicated separation of the rod as it was deflected significantly to the right. The bell crank was removed from the airframe for further examination. During removal, the bushing fell out of the left attach hole while the right remained firmly seated. The left hole was significantly elongated.

The stabilator trim pushrod had separated from the empennage and exhibited no obvious deformation. There was a 1/4 inch wide band of circumferential scratching and missing paint about 3-1/8 inch forward of the aft end of the rod. The aft rod end remained attached to the rod with no obvious deformation. There was some scratching and scoring on the aft edge of the rod end and on the spherical bearing. The aft rod end jam nut was not seated against the rod and was significantly damaged such that there were no obvious flats on the nut. There was paint missing at the aft end of the rod on the curved portions but not on the flats. There was a longitudinal scratch from the circumferential scratch forward about 3 1/2 inches that progressed towards the left side of the rod. The forward rod end was cleaner than the aft and the brass colored jam nut was securely seated.

The stabilator up and down stops are beneath the left stabilator inboard attach fitting. Both of the stop bolts were straight and did not exhibit any obvious deformation. The head of the down stop bolt exhibited minor impact damage and missing paint while the head of the up stop bolt exhibited moderate impact damage and missing paint. The stop itself exhibited impact damage, missing paint, and bolt head impressions on both the up and down stop sides.

ADDITIONAL INFORMATION

According to several pilots who flew the accident airplane in the weeks prior to the accident, the airplane was fine. Neither pilot noted any mechanical anomalies or abnormalities. The

chief of maintenance with Hinman Aviation could not recall any recent maintenance issues with the airplane.

In the Piper Aztec Service Manual, Chapter 5, Figure 5-6, sketch A, it is illustrated that the nut on the bolt that attaches the stabilator trim control rod to the stabilator should be torqued between 50 and 75 inch pounds.
Airworthiness Directive (AD) 79-26-01 - Piper Model PA-23-250 Airplanes addresses the bonding between the ribs and skin, resulting in a possibility of the loosening of blind rivets and relative motion between the ribs and skin on the underside of the stabilator. Piper Service Bulletin (SB) 606 corresponded with this AD and was applicable to a range of airplane serial numbers, including the accident airplane. The stabilator serial number for both stabilators; however, excluded the accident airplane from a compliance requirement with this AD/SB.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	27,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	October 1, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 1, 2007
Flight Time:	3050 hours (Total, all aircraft), 1320 hours (Total, this make and model), 230 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N62793
Model/Series:	PA-23-250	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	27-7754030
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	January 1, 2008 100 hour	**Certified Max Gross Wt.:**	5200 lbs
Time Since Last Inspection:	73 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	10924 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-540-C4B5
Registered Owner:	Storm Flying Service Inc	**Rated Power:**	250 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HUT,1543 ft msl	**Distance from Accident Site:**	26 Nautical Miles
Observation Time:	12:52 Local	**Direction from Accident Site:**	100°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	200°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	12°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Wichita, KS (ICT)	**Type of Flight Plan Filed:**	IFR
Destination:	Hays, KS (HYS)	**Type of Clearance:**	IFR
Departure Time:	12:30 Local	**Type of Airspace:**	

Airport Information

Airport:	NA	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	38.149444,-98.320274

Administrative Information

Investigator In Charge (IIC):	Kaiser, Jennifer
Additional Participating Persons:	Joseph Gonsalves; FAA Flight Standards District Office; Wichita, KS George Hollingsworth; Piper Aircraft; Stanton, VA Troy R Helgeson; Lycoming; Milliken, CO
Original Publish Date:	December 28, 2008
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=67546