National Transportation Safety Board
Aviation Accident Final Report

Location:	Anchorage, AK	**Accident Number:**	ANC14FA050
Date & Time:	07/02/2014, 0820 AKD	**Registration:**	N3512M
Aircraft:	PIPER PA 12	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The accident flight was the airplane's first flight after undergoing maintenance and modification over the course of several years. A witness reported that, during the takeoff, the airplane climbed steeply in an extreme, nose-high attitude until it "pivoted" at the apex of the climb and then entered a descent straight to the ground. The airplane's described motions are consistent with the airplane exceeding its critical angle of attack and entering an aerodynamic stall; crush damage to the nose of the airplane and the leading edges of the wings was consistent with a nearly vertical flight path at the time of impact. Examination of the wreckage revealed that the airplane's elevator control cables were misrigged, such that they were attached to the incorrect (opposite) locations on the upper and lower elevator control horn, resulting in a reversal of elevator control inputs. Maintenance logs for the airplane contained no entries more recent than 2007. Several people reported that the pilot often performed maintenance on the airplane; however, none indicated knowledge of who performed maintenance on the elevator controls. A "BEFORE TAKEOFF" checklist for the airplane included the item, "CONTROLS – FREE AND CORRECT." If the pilot had checked the elevator for correct motion before takeoff, he likely would have discovered that it was misrigged.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The incorrect (reverse) rigging of the elevator control cables, and the pilot's inadequate preflight inspection, which failed to detect the misrigging.

Findings

Aircraft	Elevator control system - Incorrect service/maintenance (Cause)
Personnel issues	Preflight inspection - Pilot (Cause) Installation - Other/unknown (Cause)

Factual Information

HISTORY OF FLIGHT

On July 2, 2014, at 0820 Alaska daylight time, a Piper PA-12 airplane, N3512M, climbed steeply then descended vertically and collided with the ground shortly after takeoff from Merrill Field Airport, Anchorage, Alaska. The private pilot was fatally injured, and the airplane sustained substantial damage. The flight was operated by the pilot under the provisions of 14 Code of Federal Regulations (CFR) Part 91 with no flight plan filed. Visual meteorological conditions prevailed. The flight was originating at the time of the accident.

According to air traffic control (ATC) audio information, the pilot received a takeoff clearance for runway 25 that contained departure and altitude instructions. The pilot acknowledge the clearance, and no further radio communication was identified from the pilot.

A pilot who was standing on the ramp on the south side of runway 25 saw the airplane climb after takeoff. He said that, once the airplane became airborne, its climb kept getting steeper, and the airplane did not level off like he expected it would. He said that the airplane "wasn't pitching quickly or violently but slowly" and "as if the pilot had no ability to stop it." He said that the airplane then pitched down, and he heard the engine power reduce as if the pilot had pulled it to idle, and the airplane descended vertically to the ground. A second witness who was also on the south side of runway 25 described that the "airplane's angle of attack was so steep" that he knew "something was not right." He said that the airplane climbed straight up then "pivoted" to a nose-down position and descended straight to the ground. The witness said that he heard the engine go quiet about the time that the airplane pivoted, but he was not sure if the engine noise changed before or after the airplane transitioned to the nose-down attitude. A witness described that, after the airplane collided into the ground nose-first, it slowly tipped over inverted. Several witnesses from both sides of the airport ran to the site, which was in the grass beside the runway, to try to help. Witnesses reported that fuel was leaking from the airplane and that some witnesses sprayed it with a fire extinguisher.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate for lighter-than-air balloons and had private pilot privileges for single-engine land and single-engine sea airplanes. He was issued a second-class airman medical certificate on April 29, 2014, with the limitation, "must wear corrective lenses." On his medical application, he reported 400 total flight hours with 3 hours in the 6 months preceding the examination.

The pilot's logbooks were not located for review. According to a Federal Aviation Administration (FAA) inspector, a certified flight instructor (CFI) stated that the pilot had his logbooks with him when she performed a flight review with him in a Cessna 172 airplane 10 days before the accident. According to the FAA inspector, the CFI stated that the pilot had not flown in nearly 2 years before the review but that the pilot handled the flying tasks well. The CFI recalled that the pilot mentioned rebuilding the airplane and said that he was looking forward to flying in a few days.

AIRPLANE INFORMATION

The accident airplane, serial number 12-2664, was manufactured in 1947 as a Piper PA-12. (The type certificate A-780 for the Piper PA-12 model was transferred in 2000 from The New

Piper Aircraft, Inc., and reissued in 2001 to FS 2003 Corporation, Bellingham, Washington.) The accident airplane was equipped with a Lycoming O-320-A2A engine, SN 4134-27, and other modifications. Weight and balance records dated October 23, 2013, listed many equipment modifications, including PA-18 horizontal stabilizers, elevators, and elevator controls. These modifications are consistent with the M L Borer Aircraft Service supplemental type certificate (STC) SA190AL, which was also referenced on the weight and balance records.

Maintenance logbooks for the airplane documented that the airplane received an annual inspection on August 10, 2007, at an airframe total time of 3237.0 hours and an engine time since overhaul of 232.8 hours. The logbooks contained no entries more recent than the 2007 annual inspection. The airplane's tachometer read 243.9 at the accident site.

A friend of the pilot who located the maintenance records at the pilot's home stated that he was unsure if the pilot had started a more recent set of log books. A review of Major Repair and Alteration Records on file with the FAA revealed no records more recent than 2005. A search of the pilot's vehicle at the airport yielded no maintenance records or pilot logs. A pad of lined paper in the vehicle contained a hand-written list of airplane equipment items; the final three items on the list were, "plugs," "5 gal gas," and "elevator torq tube routing."

The airplane had been kept parked at a tie-down at the airport, and persons interviewed who were familiar with the pilot and/or the airplane stated that the airplane had been undergoing rebuild and modifications during the past several years and that the pilot performed work on the airplane himself, such as fabric covering and interior panels. The airplane's co-owner described the pilot as safety-conscious person who would not perform any work of which he was not capable. A friend of the pilot stated that the pilot's work was supervised by an airframe and powerplant (A&P) mechanic with an inspection authorization (IA). According to an FAA inspector, the A&P IA who had performed annual inspections of the airplane in the past said that he last inspected the airplane about 3 years ago. None of the persons interviewed indicated any knowledge of who performed maintenance on the elevator control system or of the airplane having been flown in recent years before the accident flight.

A multipage paper checklist for the airplane was found at the accident site. The checklist included a "BEFORE TAKEOFF" section, which contained the item: "CONTROLS – FREE AND CORRECT."

METEOROLOGICAL INFORMATION

An airport weather observation at 0753 reported calm wind, 10 miles visibility, scattered clouds at 8,000 feet above mean sea level (msl), temperature 15 degrees C, dew point 9 degrees C, and an altimeter setting of 29.92 inches of mercury (Hg). An observation at 0848 reported wind from 320 degrees at 4 knots, visibility 10 miles, and clear skies.

AIRPORT INFORMATION

Merrill Field Airport, field elevation 137 feet msl, has an air traffic control tower and multiple runways. Runway 7/25 is asphalt and 4,000 feet long and 100 feet wide, runway 16/34 is asphalt and 2,640 feet long and 75 feet wide, and runway 5/23 is primarily gravel and 2,000 feet long and 60 feet wide.

WRECKAGE AND IMPACT INFORMATION

The airplane came to rest inverted in the grass just north of runway 25 and west of taxiway J. The nose of the airplane was crushed aft. The propeller was attached to the engine and showed

chordwise scoring and tip curling, and it was located adjacent to a linear ground crater. The engine was displaced aft into the cockpit and front seat, and the front seat was displaced aft such that it impinged into the rear seat. The instrument panel was displaced aft. Both wings sustained crush damage from the leading edge aft. All flight control surfaces (ailerons, flaps, rudder, elevators, and trimmable horizontal stabilizer) were attached to their respective attach points.

The airplane was righted and towed from the accident site for an examination. At the request of and in the presence of the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), an A&P mechanic assisted with the examination of the airplane. The engine was removed to enable access to the cockpit. The forward control stick and the aft control sticks were deformed aft and found attached to their respective mounts by their respective bolts. The forward control stick was displaced aft and embedded into the bottom of the front seat. Damage precluded establishing control cable continuity for the front control stick. The front control stick and front and rear seats were removed during the examination to allow for free movement of the flight controls.

The elevator control cables were found attached to the upper and lower ends of the elevator control horn in the tail of the airplane. Elevator control cable continuity was established from the control horn to the rear control stick. Manipulating the rear control stick aft (to command airplane nose-up) resulted in cable movement corresponding with a downward deflection of the elevator (which would result in airplane-nose-down flight). The airframe and powerplant mechanic assisting with the examination confirmed that the elevator control cables were misrigged, such that they were attached to the incorrect (opposite) locations on the upper and lower elevator control horn, resulting in a reversal of elevator control inputs.

Manipulating the ailerons resulted in correct directional movement of the rear control stick. Manipulating the rudder resulted in correct directional movement of the cables for each rudder pedal. The airplane's emergency locator transmitter was not installed and was found underneath the rear seat.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the pilot was performed by the State of Alaska Medical Examiner's Office in Anchorage. The cause of death was reported as blunt force injuries. Toxicology performed on specimens from the pilot detected no carbon monoxide or ethanol. A quantity of salicylate, an over-the-counter analgesic used for the treatment of mild pain, was detected in the urine.

ADDITIONAL INFORMATION

During a before takeoff check of the PA-12, a pilot can view the elevator from the pilot seat by turning around and looking back. A friend of the pilot stated that he was unaware of the pilot having any physical limitation that would have prevented him from turning around in the seat to look back at the elevator. During preflight inspection of a PA-12 on the ground (before engine start), a pilot can see the elevator's corresponding movements when the control stick is manipulated (either when standing by the open cockpit door or when seated in the front seat); likewise, a pilot standing on the ground and manipulating the elevator by hand can look forward and see the corresponding control stick movement.

As a result of this accident and others, the NTSB issued Safety Alerts SA-041, "Pilots: Perform Advanced Preflight after Maintenance," and SA-042, "Mechanics: Prevent Misrigging Mistakes," in March 2015. That same month, the NTSB also released a Video Safety Alert,

"Airplane Misrigging: Lessons Learned from a Close Call." The NTSB Safety Alerts and video, which inform general aviation pilots and mechanics about the circumstances of this accident and others and provide information to help prevent such accidents, can be accessed from the NTSB's web site at www.ntsb.gov.

History of Flight

Prior to flight	Aircraft maintenance event
Takeoff	Flight control sys malf/fail (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Commercial; Private	**Age:**	61
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	Balloon	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With Waivers/Limitations	**Last Medical Exam:**	04/29/2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	06/21/2014
Flight Time:	(Estimated) 400 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	PIPER	**Registration:**	N3512M
Model/Series:	PA 12	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	12-2664
Landing Gear Type:	Tailwheel	**Seats:**	
Date/Type of Last Inspection:	08/10/2007, Annual	**Certified Max Gross Wt.:**	1935 lbs
Time Since Last Inspection:	11.1 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	3248.1 Hours	**Engine Manufacturer:**	LYCOMING
ELT:	Not installed	**Engine Model/Series:**	O-320-A2A
Registered Owner:	CHARLES E. HANCOCK AND DONALD J. REED	**Rated Power:**	150 hp
Operator:	On file	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	MRI, 124 ft msl	**Observation Time:**	0753 AKD
Distance from Accident Site:	0 Nautical Miles	**Condition of Light:**	Day
Direction from Accident Site:		**Conditions at Accident Site:**	Visual Conditions
Lowest Cloud Condition:	Scattered / 8000 ft agl	**Temperature/Dew Point:**	/ 9°C
Lowest Ceiling:	None	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	Calm	**Visibility (RVR):**	
Altimeter Setting:	29.92 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:			
Departure Point:	Anchorage, AK (MRI)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	0820 AKD	**Type of Airspace:**	Class D

Airport Information

Airport:	Merrill Field Airport (MRI)	**Runway Surface Type:**	Asphalt
Airport Elevation:	137 ft	**Runway Surface Condition:**	Dry
Runway Used:	25	**IFR Approach:**	None
Runway Length/Width:	4000 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal		

Administrative Information

Investigator In Charge (IIC):	Catherine Gagne	**Adopted Date:**	09/23/2015
Additional Participating Persons:	James M Howery; FAA - FSDO; Anchorage, AK		
Publish Date:	09/23/2015		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=89591		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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