



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Tooele, Utah	Accident Number:	DEN03LA017
Date & Time:	November 20, 2002, 16:00 Local	Registration:	N850FS
Aircraft:	Piper PA-28R-201	Aircraft Damage:	Substantial
Defining Event:		Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

According to the instructor, the purpose of the flight was to prepare the student for dual cross-country flights and to familiarize him with the Piper PA-28R-201. Prior to this flight, the student pilot had been flying a Diamond Alarus, a training type airplane. They flew to a nearby airport, where they made three touch and go landings. On the fourth touch and go landing, the student pilot "assertively retracted the gear without warning" instead of the flaps. The right main and nose landing gear retracted and the airplane veered off the right side of the runway. The right wing struck a taxiway light, spinning the airplane around, and the left side of the fuselage struck a taxiway sign. The right wing was wrinkled and there was a gash from the leading edge back to the spar. The prop blade was bent. The left side of the fuselage was also wrinkled and buckled. According to FAA inspectors who examined the airplane, the squat switch on the landing gear had been rigged incorrectly. The squat switch actuated at .625 inches, exceeding the airplane's service manual requirement by .375 inches, or 150 percent. There were no entries in the maintenance records entries involving the squat switch. The torque seal on the squat switch mounting screws showed no signs of being disturbed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the inadvertent retraction of the landing gear during landing roll by the dual student. Contributing factors included the dual student's lack of familiarity with the aircraft, inadequate supervision by the flight instructor, and improper rigging of the landing gear squat switch.

Findings

Occurrence #1: GEAR RETRACTION ON GROUND

Phase of Operation: LANDING - ROLL

Findings

1. (C) GEAR RETRACTION - INADVERTENT - DUAL STUDENT
 2. (F) LACK OF FAMILIARITY WITH AIRCRAFT - DUAL STUDENT
 3. (F) SUPERVISION - INADEQUATE - PILOT IN COMMAND(CFI)
 4. (F) LANDING GEAR,NORMAL RETRACTION/EXTENSION ASSEMBLY - INCORRECT
 5. (F) MAINTENANCE,ADJUSTMENT - IMPROPER - MANUFACTURER
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Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT

Phase of Operation: LANDING - ROLL

Findings

6. OBJECT - TAXIWAY LIGHT
7. OBJECT - AIRPORT SIGN/MARKER

Factual Information

On November 20, 2002, approximately 1600 mountain standard time, a Piper PA-28R-201, N850FS, registered to and operated by Salt Lake Community College, Salt Lake City, Utah, was substantially damaged when it collided with terrain after the landing gear retracted during touch and go landings at Bolinder Field-Tooele Valley Airport, Tooele, Utah. The commercial certificated flight instructor and student pilot were not injured. Visual meteorological conditions prevailed, and no flight plan had been filed for the instructional flight being conducted under Title 14 CFR Part 91. The local flight originated at Salt Lake City International Airport approximately 1445.

According to the instructor, the purpose of the flight was to prepare the student for dual cross-country flights and to familiarize him with the Piper PA-28R-201. Prior to this flight, the student pilot had been flying Diamond Alarus, a training type airplane. After departing Salt Lake City International Airport, the airplane flew to a practice area west of Provo, Utah, then proceeded to Tooele, where three touch and go landings were made on runway 17. On the fourth touch and go landing, the student pilot "assertively retracted the gear without warning" instead of the flaps. The right main and nose landing gear retracted and the airplane veered off the right side of the runway. The right wing struck a taxiway light, spinning the airplane around, and the left side of the fuselage struck a taxiway sign. The right wing was wrinkled and there was a gash from the leading edge back to the spar. The prop blade was bent. The left side of the fuselage was also wrinkled and buckled.

In his narrative, the instructor wrote, "An article I had read from 'Flight Training' magazine about 'instructor complacency' just 2 days before suddenly came up in the back of my mind. As it did, my right hand was ready at the controls within inches. I became very alert and felt I was ready for anything, even the 'unexpected', ...or so I thought! Unfortunately, this is a case of human factors, and I should have been more attuned to that! The flap switch in the Alarus is an electric toggle, which does not look remotely close to the gear switch, but is very close to the same proximity. I believe that as my student relaxed and became more comfortable with the plane (after a few landings under his belt), he slipped into 'Alarus mode' and acted impulsively on what he's used to."

Commenting on how the accident could have been prevented the instructor wrote, "Hindsight is painfully 20/20, but what I've adopted to my flight training/instruction is this:

"Students (privates, commercial, instrument, etc.) Never touch the gear/flap switch without my confirmation: on takeoff, it's verbally, 'No more useable runway, positive rate, brakes tapped, gear up' (confirmation), then retract. Touch-and-goes, 'flaps up (confirmation), then retract, carb heat in, full power.' The callouts have always been the same, confirm, new."

"No more touch-and-goes in complex [airplanes] with pilots new to the aircraft.

"No more student pilots flying complex airplanes, unless very far along in training and have a thorough knowledge of human factors and we've discussed beforehand."

Three FAA inspectors examined the airplane after it had been retrieved and transported to a storage facility. They found that the squat switch on the landing gear had been rigged incorrectly. The lead inspector wrote, "With the aircraft on jacks and weight off wheels, a measurement was taken between the top of the gear fork and the bottom of the gear housing of the Left Main Landing Gear (LMLG) strut at maximum extension. That dimension was measured and confirmed to be 8.125 inches. A multimeter was then attached to the contacts of the Squat Switch, and the Squat Switch contacts were confirmed closed (electrical continuity established). The strut was then compressed slowly until the contacts of the Squat Switch opened (switch actuated-electrical discontinuity). That process was accomplished twice, producing the same measurement of 7.5 inches between the top of the gear fork and the bottom of the gear housing as the point of switch actuation.

"The Piper Arrow III -- Turbo Arrow III -- Arrow Service Manual, PA-28R-201/201T, Part Number 761-639, Paragraph 7-37 [ADJUSTMENT OF LANDING GEAR SAFETY SWITCH (SQUAT SWITCH)], Paragraph c. states: 'Extend and then compress the strut to ascertain that the switch will actuate within the last quarter of an inch of oleo extension.' The results of our inspection placed the switch actuation at .625 inches, exceeding the Service Manual requirement by .375 inches or 150%.

"Examination of the aircraft Airframe Log Book revealed no maintenance record entries involving the Squat Switch. The torque seal on the squat switch mounting screws showed no signs of being disturbed."

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	29,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	Toxicology Performed:	No
Medical Certification:	Class 3 Invalid Medical for flight	Last FAA Medical Exam:	May 5, 2000
Occupational Pilot:	UNK	Last Flight Review or Equivalent:	April 10, 2002
Flight Time:	669 hours (Total, all aircraft), 65 hours (Total, this make and model), 629 hours (Pilot In Command, all aircraft), 235 hours (Last 90 days, all aircraft), 61 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Student pilot Information

Certificate:	Student	Age:	19,Male
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	July 30, 2002
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	28 hours (Total, all aircraft), 1 hours (Total, this make and model), 1 hours (Pilot In Command, all aircraft), 28 hours (Last 90 days, all aircraft), 5 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N850FS
Model/Series:	PA-28R-201	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	2844080
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	October 25, 2002 100 hour	Certified Max Gross Wt.:	2750 lbs
Time Since Last Inspection:	38 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	194 Hrs at time of accident	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	IO-360-C1C6
Registered Owner:	Salt Lake Community College	Rated Power:	200 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:	SLC, 4227 ft msl	Distance from Accident Site:	20 Nautical Miles
Observation Time:	15:56 Local	Direction from Accident Site:	40°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	7 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	340°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.52 inches Hg	Temperature/Dew Point:	9°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Salt Lake City, UT (SLC)	Type of Flight Plan Filed:	None
Destination:	(SLC)	Type of Clearance:	Unknown
Departure Time:	14:45 Local	Type of Airspace:	Class E

Airport Information

Airport:	Bolinder Field TVY	Runway Surface Type:	Asphalt
Airport Elevation:	4316 ft msl	Runway Surface Condition:	Dry
Runway Used:	35	IFR Approach:	Unknown
Runway Length/Width:	6100 ft / 100 ft	VFR Approach/Landing:	Touch and go;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	40.61222,-112.350555

Administrative Information

Investigator In Charge (IIC):	Scott, Arnold
Additional Participating Persons:	Mark M Rushton; Salt Lake City Flight Standards District Office; Salt Lake City, UT
Original Publish Date:	May 13, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=56123

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