Aviation Investigation Final Report

Location:	Warrenton, Virginia	**Accident Number:**	ERA14LA235
Date & Time:	May 9, 2014, 14:00 Local	**Registration:**	N750SS
Aircraft:	PACIFIC AEROSPACE CORP LTD 750XL	**Aircraft Damage:**	Substantial
Defining Event:	Hard landing	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Skydiving		

Analysis

According to the commercial pilot, following a skydiving operation, he returned to the airport. During the landing attempt and as the airplane was about 15 ft above ground level, the airplane banked left and the left main landing gear (MLG) then contacted the turf runway, so he immediately performed a go-around. Ground personnel subsequently contacted the pilot via radio to inform him that the left MLG had separated from the airplane. The pilot then performed an emergency landing, and, during the landing roll, the left wing contacted the runway, which resulted in substantial damage to the left wing spar.

Examination of the left MLG revealed that three of the lower clamp's bolts were fractured, and an aft outboard bending moment was noted on the clamp piece. Fretting marks indicative of clamp movement were also noted. Although it could not be determined when the fretting occurred, it likely resulted from the initial hard landing. Further, several pieces of a polyurethane-based material were found within the left fuel tank. The fracture surfaces on these materials and on the left MLG bolts exhibited overstress damage consistent with a hard landing. Therefore, it is likely that the pilot improperly flared the airplane, which resulted in a hard landing and the subsequent separation of the left MLG.

Probable Cause and Findings

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

The pilot's improper landing flare, which resulted in a hard landing and separation of the left main landing gear.

Findings

Personnel issues	Aircraft control - Pilot
Personnel issues	Decision making/judgment - Pilot
Aircraft	Landing flare - Not attained/maintained

Factual Information

History of Flight

Landing-flare/touchdown	Hard landing (Defining event)
Landing-flare/touchdown	Part(s) separation from AC

On May 9, 2014, about 1400 eastern daylight time, a Pacific Aerospace Corp 750XL, N750SS, experienced a left main landing gear separation following a hard landing and subsequent go-around at Warrenton Air Park (7VG0), Warrenton, Virginia. The pilot subsequently performed a precautionary landing at the airport and the airplane sustained substantial damage to the left wing. The commercial pilot and one passenger were not injured. The airplane was registered to Maxim Aviation LLC and was operated by DC Skydiving under the provisions of Title 14 Code of Federal Regulations Part 91 as a skydiving flight. Visual meteorological conditions prevailed and no flight plan was filed for the local flight that departed about 1330.

According to the pilot, the airplane had 70 gallons of fuel on board prior to departure with the skydivers. While on final approach to runway 22, about 15 feet above ground level, the airplane "broke from straight and level flight," the left main landing gear contacted the turf runway, and he immediately performed a go-around. Personnel on the ground contacted the pilot via radio and informed him that the left main landing gear had detached from the airplane. He elected to perform a precautionary landing on runway 4. Once the landing was assured, he initiated an emergency shutdown procedure for the engine and landed on the right main landing gear, subsequently the left wing settled to the ground, and the airplane slid off the side of the runway.

According to the passenger, after the skydivers exited the airplane they began their descent to land. While on final approach, the airplane appeared to be above the approach path. The pilot performed a go-around maneuver and subsequent tear-drop entry to land the opposite direction on the runway. During the final approach, after clearing the edge of the tree line, the airplane descended toward the runway and the pilot pulled back on the stick to level the airplane. The passenger reported no change in pitch attitude. The airplane contacted the turf runway, bounced, and the pilot performed an aborted landing. The pilot attempted a third landing attempt. Upon touchdown the pilot pulled the stick back and pushed on the rudder in order to minimize the speed in which the left wing would make contact. The pilot kept the airplane straight on the runway until the left wing made contact and subsequently the airplane came to a stop.

Pilot Information

Certificate:	Commercial	**Age:**	39
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	April 16, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	1405 hours (Total, all aircraft), 50 hours (Total, this make and model), 1300 hours (Pilot In Command, all aircraft), 50 hours (Last 30 days, all aircraft)		

The pilot, age 39, held a commercial pilot certificate with ratings for airplane single and multiengine land, and instrument airplane which was issued on January 13, 2008, and a second-class airman medical certificate issued April 16, 2014, with no limitation. The pilot reported 1,405 total hours of flight experience, and of those, 50 hours were in the accident aircraft make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	PACIFIC AEROSPACE CORP LTD	**Registration:**	N750SS
Model/Series:	750XL	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	115
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	7500 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo prop
Airframe Total Time:		**Engine Manufacturer:**	Pratt & Whitney
ELT:		**Engine Model/Series:**	PT6A-34
Registered Owner:	MAXIM AVIATION LLC	**Rated Power:**	
Operator:	DC Skydiving	**Operating Certificate(s) Held:**	None

The low-wing, fixed-gear, all metal monoplane design was manufactured in 2005. It was powered by a Pratt & Whitney Canada PT6A-34, 750-hp turboprop engine and equipped with a MT-Propeller model

MTV 16-1-E-C-F-R(P) controllable pitch propeller. A review of copies of maintenance logbook records revealed a progressive inspection was completed on December 12, 2013, at a recorded tachometer reading of 3,576.0 hours and an airframe total time of 3,914.4 hours.

According to a maintenance entry dated March 9, 2012, at an airframe total time of 3,199.8 hours, all of the airplane's landing gear were removed. The entry further listed that the left main landing gear was replaced with a "heavy left" that would accommodate "large tires." The entry further stated that all gear attach bolts were torqued after the paint was stripped from the clamp area to minimize fastener "untorqueing."

The aircraft was designed for a variety of utility roles, including freight, agricultural application, passenger operations, and parachuting operations. The accident airplane was being utilized, at the time of the accident, in parachuting, or skydiving, operations.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHWY,338 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	13:35 Local	**Direction from Accident Site:**	139°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	27°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Warrenton, VA (7VG0)	**Type of Flight Plan Filed:**	None
Destination:	Warrenton, VA (7VG0)	**Type of Clearance:**	VFR
Departure Time:	13:30 Local	**Type of Airspace:**	

The 1335 recorded weather observation at Warrenton-Fauquier Airport (HWY), Warrenton, Virginia, located 5 miles to the southwest of the accident location, included calm wind, visibility 10 miles, clear skies, temperature 27 degrees C, dew point 22 degrees C, and barometric altimeter 30.05 inches of mercury.

Airport Information

Airport:	WARRENTON AIR PARK 7VG0	**Runway Surface Type:**	Grass/turf
Airport Elevation:	442 ft msl	**Runway Surface Condition:**	Dry;Vegetation
Runway Used:	22	**IFR Approach:**	None
Runway Length/Width:	2215 ft / 70 ft	**VFR Approach/Landing:**	Full stop;Straight-in

The airport was a privately owned airport and at the time of the accident and did not have an Federal Aviation Administration (FAA) operating control tower. The airport was equipped with two turf runways designated as runway 4/22, and 15/33 and both were listed "in good condition." Runway 4/22 was 2,215-foot-long by 70-foot-wide, and runway 15/33 was 2,000-foot-long by 70-foot-wide. The airport was surveyed at 442 feet above mean sea level.

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	38.655555,-77.787223(est)

The airplane was removed from the runway and examined by an FAA inspector. Substantial damage was noted to the left main landing gear attachment point and left wing spar. Examination inside the left wing fuel tank revealed several pieces of a white polymeric-like material and a small amount of a gel-like substance loose within the fuel tanks. According to the pilot, 70 gallons of fuel were removed, following the accident, from the left wing tanks; however, the pilot did not report if any fuel was removed from the right wing tanks.

Tests and Research

The left main landing gear attach bolts and lower clamp were sent to the NTSB Materials Laboratory for examination. The bolts were 3/8 inch diameter bolts. Three of the bolts were fractured through the shank and a portion of the lower clamp's aft bolt remained trapped within the clamp. The fourth bolt, which was the lower clamp forward bolt, was cut to facilitate removal of the hardware from the airplane. The lower cylinder clamp consisted of a two-piece cast clamp, with an inboard and outboard component. The "as received" clamp consisted of three pieces, the outboard component was intact, but deformed, and the inboard component was fractured between the forward and aft bolts. The forward bolt hole on the lower

clamp was elongated at the split line, which was consistent with the presence of the bolt during the spreading deformation. The nuts, as received, on both upper bolts and the lower forward bolt were threaded fully onto the respective bolts, exposing about six bolt threads. However, a photograph taken of the upper bolts by an FAA inspector, who responded to the accident location, showed that the upper bolts, prior to removal from the landing gear, had about three full bolt threads exposed. An aft outboard bending moment was noted on a landing gear clamp piece. Fretting marks were also noted and was indicative of the clamp movement relative to the bulkhead; however, the time of the fretting could not be conclusively determined. Examination of the three fractured bolts revealed fracture and deformation patterns consistent with shearing overstress.

Pieces of the white polymeric material and a gel-like red substance found in the fuel tank were sent to the NTSB Materials Laboratory for examination. The white polymeric material was consistent with polyurethane based material that was used to coat the fuel tank. The gel-like red substance was consistent with a silicone sealant. The white polymeric material pieces were examined to determine the fracture mechanism. The fracture surface exhibited chevron lines which were consistent with ductile (overstress) tearing failure of the material. The fracture surfaces also contained entrapped gas voids within the material which was consistent with air becoming trapped in the sealant prior to curing.

Administrative Information

Investigator In Charge (IIC):	Etcher, Shawn
Additional Participating Persons:	Wayne D Skaggs; FAA/FSDO; Herndon, VA Beverley Harvey; Transportation Safety Board of Canada; Hull Peter Williams; Transport Accident Investigation Commission; Wellington
Original Publish Date:	February 3, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89194