



Aviation Investigation Final Report

Location:	Henderson, Nevada	Accident Number:	WPR09LA100
Date & Time:	January 27, 2009, 11:10 Local	Registration:	N210TF
Aircraft:	Cessna 210A	Aircraft Damage:	Substantial
Defining Event:	Landing gear not configured	Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Flight test		

Analysis

During a post-maintenance test flight following the replacement of both the engine-driven hydraulic pump and the hydraulic power pack, both main landing gear failed to fully extend. The overhauled pump and the serviceable power pack were replaced as corrective action to address a repetitive problem with the airplane's hydraulically driven landing gear and flap actuating systems. Although the landing gear had been extended with the emergency extension hand pump during the preceding post-maintenance test flight (when the gear failed to fully extend using the normal system), it failed to do so during the accident flight. The pilot therefore landed with the main gear partially extended, resulting in the airplane departing the runway and impacting rough terrain. A series of post-accident inspections and tests did not reveal any evidence of anomalies, malfunctions, or leaks associated with the airplane's hydraulic plumbing, hydraulic fittings, or engine-driven hydraulic pump. The hydraulic power pack, which controls the function of the flap system, as well as both the normal and emergency gear extension and retraction systems, was also tested and disassembled for internal inspection. Although the power pack, which was described by the testing technician as an older unit needing overhaul, displayed a number of minor discrepancies during the testing and inspection process, it successfully passed a functional test sequence. The technician also stated that the power pack may have failed to operate the flaps, the normal landing gear extension, and emergency landing gear extension modes because of particulate contamination of the fluid restricting the movement or alignment of a poppet valve. He stated that any such contamination might be dislodged by the impact forces created during the accident sequence, and then flushed from the system by the flow of fluid during the functional bench test sequence.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An undetermined failure of the hydraulic power pack to fully extend the main landing gear through both the normal and emergency systems.

Findings	
Aircraft	(general) - Malfunction
Aircraft	Main landing gear - Inoperative
Environmental issues	Rough terrain - Contributed to outcome

Factual Information

History of Flight	
Maneuvering	Sys/Comp malf/fail (non-power)
Landing	Landing gear not configured (Defining event)

On January 27, 2009, about 1110 Pacific standard time, a Cessna 210, N210TF, collided with the terrain after sliding off the runway during a landing with its main landing gear partially extended at Henderson Executive Airport, Las Vegas, Nevada. The airline transport pilot, who was the sole occupant, was not injured, but the airplane, which belonged to a client of the company for which the pilot was flying, sustained substantial damage. The 14 Code of Federal Regulations Part 91 post-maintenance test flight, which departed Henderson Executive Airport about 45 minutes prior to the accident, was being operated in visual meteorological conditions. No flight plan had been filed.

According to the pilot, the post-maintenance test flight was being conducted in order to confirm that the landing gear retraction and extension system and the flap activation system functioned properly after the completion of maintenance activity associated with the hydraulic system. Soon after taking off and turning out of the traffic pattern, the pilot retracted the landing gear. Once that sequence was complete, he lowered the landing gear handle to the gear down position, but the main landing gear only extended part way. He then tried to recycle the gear to the up position, but the nose gear remained down, and both main gear remained partially extended. After determining that he could not lower or retract the gear using the normal system, the pilot attempted to pump the main gear down using the emergency extension hand pump. That effort was unsuccessful, as was his attempt to extend the flaps, so after the airport emergency equipment was in place, the pilot landed with the nose gear fully extended and both main gear in the partially extended position. After touching down, the airplane initially stayed on the runway surface, but it eventually slid off the side of the runway and collided with uneven terrain. The accident sequence resulted in internal damage to the horizontal stabilizer.

A post-accident inspection of the airplane's hydraulic system and fittings did not reveal any evidence of anomalies or fluid leakage.

During the investigation it was determined that the airplane's owner originally brought the airplane to the maintenance facility because of a hydraulic leak. During troubleshooting associated with that leak, it was determined that the hydraulic power pack would not operate the flaps with the airplane's engine running, and the emergency extension gear handle had excessive pressure against it after the engine was shut down. The hydraulic leak itself was traced to the overflow vent line from the power pack.

As a result of these findings, the hydraulic power pack, which controls the function of both the landing gear extension/retraction system and the flap positioning system, was removed and replaced with a used serviceable unit. The replacement unit and the airplane's hydraulic system were then leak checked and operationally tested with a hydraulic service mule. That test included both a normal landing gear swing and an emergency gear extension check. During the test process, a couple of leaks were found at the hydraulic pack fittings, and each leak was repaired by installing new seals in the fittings.

After the airplane was removed from the jacks, an engine ground run was performed in order to test the proper operation of the engine-driven hydraulic pump, and to test the operation of the flaps when powered by engine-driven pump hydraulic pressure. After the completion of those tests, the airplane was left to sit for a couple of days in order to confirm that there were no ongoing hydraulic leaks.

The airplane was then flown in order to perform a post-maintenance operational check of the flap and landing gear systems. During that flight, the landing gear retracted and the flaps operated normally, but the landing gear did not fully extend when the gear handle was moved to the down position. The pilot therefore extended the gear using the emergency extension hand pump, and executed an uneventful landing.

Subsequent to that test flight, the airplane's hydraulic pump was replaced with an overhauled unit, and the gear and flap systems were again tested using a hydraulic service mule, followed by another engine ground run test. The airplane was then flown on the post-maintenance test flight during which the accident occurred.

As part of the investigation the hydraulic power pack and the engine-driven hydraulic pump where removed from the airplane and sent to the Federal Aviation Administration Aircraft Certification Office (FAA-ACO) in Wichita, Kansas, for oversight of testing and inspection at FAA-approved repair stations.

The hydraulic pump, Cessna Part Number 20240-LCB (Serial Number 112), which was tested at Ametek B & S Aircraft Parts and Accessories, met its required specifications both at a fluid temperature matching ambient temperature (about 100 degrees Fahrenheit) and at an operational fluid temperature of about 145 degrees. The pump was not disassembled.

The hydraulic pack, an Electrol EA1332-1 (Serial Number X-001), which was manufactured in 1974, and overhauled by Airight Products at an undetermined date, underwent a functional test and disassembly inspection at APPH Wichita, Inc. Although the pack functioned properly on the test bench, to include a successful activation of the emergency extension hand pump, a number of minor discrepancies were noted. Those discrepancies included leakage past some of the poppet valves, a permanent set deformation of a number of the larger O-rings (flat on one side), visible witness marks on the diameter of the poppet valve seats, wear of the poppet valves (although not excessive for the age of the unit), and a fine black residue on some of the internal components. According to APPH personnel, the fine black residue was most likely a

result of an overheat condition at some time in the past. It was also noted that the pack appeared to be an old unit that was "in need of an overhaul."

According to the APPH technician who tested and disassembled the unit, it is possible that the pack malfunctioned in both the normal and emergency landing gear extension modes, and then later passed the functional bench check, because there was a restriction of the movement/alignment of a poppet valve due to internal contamination. Any such contamination might have then been dislodged by the forces of the accident sequence, and then flushed from the system by the flow of fluid during the functional bench test sequence.

No other anomalies or issues associated with the airplane's gear and flap actuating systems were found during the investigation.

Certificate:	Airline transport	Age:	72,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	June 27, 2008
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	July 26, 2007
Flight Time:	15000 hours (Total, all aircraft), 29 hours (Total, this make and model), 130 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Pilot Information

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N210TF
Model/Series:	210A	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	21057793
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	January 1, 2008 Annual	Certified Max Gross Wt.:	2870 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	4627 Hrs as of last inspection	Engine Manufacturer:	CONT MOTOR
ELT:	Installed, not activated	Engine Model/Series:	IO-470E
Registered Owner:	Robert Hoffman	Rated Power:	260 Horsepower
Operator:	Mojave Aviation	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:		Distance from Accident Site:	
Observation Time:		Direction from Accident Site:	
Lowest Cloud Condition:	Few / 10000 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/ None	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	
Precipitation and Obscuration:	No Obscuration; No Precipitat	tion	
Departure Point:	Henderson, NV (KHND)	Type of Flight Plan Filed:	None
Destination:	Henderson, NV (KHND)	Type of Clearance:	VFR
Departure Time:	10:00 Local	Type of Airspace:	

Airport Information

Airport:	Henderson Executive Airport KHND	Runway Surface Type:	Asphalt
Airport Elevation:	3300 ft msl	Runway Surface Condition:	Dry
Runway Used:	35R	IFR Approach:	None
Runway Length/Width:	5001 ft / 75 ft	VFR Approach/Landing:	Full stop

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None	Latitude, Longitude:	35.972778,-115.134445(est)

Administrative Information

Investigator In Charge (IIC):	Anderson, Orrin
Additional Participating Persons:	Kevin Bender; Las Vegas FAA FSDO; Las Vegas, NV
Original Publish Date:	November 9, 2009
Last Revision Date:	
Investigation Class:	<u>Class</u>
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=73281

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