National Transportation Safety Board
Aviation Accident Final Report

Location:	New York, NY	**Accident Number:**	MIA08LA086
Date & Time:	04/03/2008, 2014 EDT	**Registration:**	N750WM
Aircraft:	Cessna 750	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Positioning		

Analysis

The copilot (CP) was flying and air traffic control (ATC) was vectoring the airplane for an approach to a 10,000-foot long, 150-foot-wide runway, when an amber abnormal indicator light illuminated on the engine indicating and crew alert system (EICAS), indicating the hydraulic fluid on system A was low. The pilot-in-command (PIC) and the CP completed the checklist procedures down to the blow down of the landing gear. The flight crew did not follow the checklist sequence, and they did not evaluate the hydraulic pump to see if the hydraulic pump pressure could be restored. The flight crew turned on the A side pump, the power transfer unit was engaged, and the landing gear was lowered. The flight crew did not inform ATC of the loss of hydraulic fluid. The airplane touched down on the first 1,000 feet of runway 13L, and the CP informed the PIC that the brakes were not working. The PIC activated the emergency brakes one time, which appeared to work. The CP did not report any problems with nose wheel steering. The CP applied reverse thrust and the arm extend light illuminated on the right thrust reverser. The airplane started veering to the right and the CP could not maintain directional control. The PIC continued pulling the emergency brake handle as the airplane went off the right side of the runway, sheared off the left main landing gear, and came to a complete stop. Download of the EICAS system revealed the CP did not take the right thrust reverser out of reverse thrust. Review of airplane logbooks revealed the left hydraulic reservoir installed in the airplane was a repaired unit. The unit had been removed from another airplane due to an EICAS message stating it was empty when it was full. The switch was found to be out of adjustment. The unit was inspected and no anomalies were noted.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The co-pilot's failure to maintain directional control during the landing roll. Contributing to the accident was a loss of system A hydraulic fluid for undetermined reasons and the flight crew's failure to follow the checklist sequence.

Findings

Occurrence #1: LOSS OF CONTROL - ON GROUND/WATER
Phase of Operation: LANDING - ROLL

Findings
1. (F) HYDRAULIC SYSTEM,RESERVOIR - LEAK
2. (F) CHECKLIST - NOT FOLLOWED - FLIGHTCREW
3. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - COPILOT/SECOND PILOT

Occurrence #2: GEAR COLLAPSED
Phase of Operation: LANDING - ROLL

Findings
4. TERRAIN CONDITION - RUNWAY

Factual Information

On April 3, 2008, at 2014 eastern daylight time, a Cessna 750, N750WM, registered to WM Aviation LLC, departed the right side of runway 13L on landing roll out at John F. Kennedy International Airport (JFK), New York, New York. The positioning flight was conducted under the provisions of 14 Code of Federal Regulations Part 91 on an instrument flight rules flight plan. Night visual meteorological conditions prevailed and the airplane received substantial damage. The airline transport rated pilot-in-command (PIC) and co-pilot (CP) reported no injuries. The flight departed Orlando International Airport, Orlando, Florida, at 1816 on April 3, 2008.

Runway 13L was 10,000 feet long and 150 feet wide. The PIC stated they were in cruise flight with the CP flying the airplane. Air Traffic Control (ATC) was providing a vector for the very high frequency omni directional range (VOR) approach to runway 13L at JFK, when an amber abnormal indicator light illuminated on the engine indicating and crew alert system (EICAS). The indicators revealed the hydraulic fluid on system A was low. The PIC and the CP completed the checklist up to the blow down procedure on the landing gear. The flight crew did not inform ATC of the hydraulic problem. The landing gear was subsequently lowered and the CP landed the airplane. The airplane touched down on the first 1,000 feet of runway 13L, and the CP informed the PIC that the brakes were not working. The PIC activated the emergency brakes one time and they appeared to work. The CP applied reverse thrust and the arm extend light illuminated on the right thrust reverser. The airplane started veering to the right and the CP could not maintain directional control. The PIC continued pulling the emergency brake handle as the airplane went off the right side of the runway, sheared off the left main landing gear, and came to a complete stop.

The CP stated the airplane touched down on the first 1,000 feet of the runway. He applied thrust reversers, the airplane yawed a little to the right, and the right reverser arm, unlocks, and deploy light illuminated. He took the reversers out of reverse, aligned the airplane with the centerline of the runway, and applied normal brakes. The brakes were spongy and he informed the PIC that he did not have any brakes. The PIC deployed the emergency brakes; the airplane slowed down straight ahead, and yawed to the right. The CP stated he was unable to maintain directional control and the airplane went off the right side of the runway and came to a complete stop.

The flight crew informed the Federal Aviation Administration (FAA) that the CP was flying the airplane. After touchdown the CP stated he did not have nose wheel steering, brakes, or any feeling of engine thrust reverse at approximately 80 knots. The crew applied emergency air brakes, and the airplane veered off the runway to the right. The airplane collided with a dirt divider, sheared off the left main landing gear, buckled the nose gear, the left wing dug into the sand, and the airplane came to a complete stop. The flight crew informed the New York Port Authority Police in a written statement, "lost steering and braking on landing roll, departed runway (13L) to the right."

The airplane's EICAS was downloaded by the aircraft manufacturer in the presence of an FAA inspector. The download revealed a "HYD VOLUME LOW A," amber abnormal indication light illuminated at 1943. At 1946, a "HYD PUMP UNLOAD A" amber warning light illuminated, and at 1955,"HYD PTU FAIL" amber warning light illuminated. The PIC stated in an interview with a National Transportation Safety Board Investigator that the HYD VOLUME LOW A light

illuminated about 20 miles out from JFK. The CP stated the light illuminated during their descent. Both crewmembers stated they completed the checklist procedure for the HYD VOLUME LOW A system. The PIC stated he rechecked the A volume system quantity. The quantity indicated 20 percent and he put the hydraulic pump back to the normal position, and lowered the main landing gear. The flight crew stated they did not report the malfunction to the ATC controller. When the PIC was asked if he observed the additional amber indications lights, he stated he was aware of the messages, but assumed they were the result of going through the checklist when he unloaded the hydraulic A pump, and pulled the Power Transfer Unit (PTU) circuit breaker.

A Cessna representative examined the airplane and runway under the direct supervision of the FAA. Examination of the 10,000-foot runway revealed 300 feet of tire marks on the runway as the airplane veered off the right side just beyond the high-speed turn off at taxiway ZA. The left main landing gear (MLG) assembly and actuator had separated from the airplane. The right MLG outboard tire had a flat spot down to the cord. The right MLG inboard tire had a wear spot on the inboard edge. Damage occurred to the nose section and nose wheel well area, the left wing, and center fuselage. The left belly fairings were crushed upwards. Fluid streaking was observed from the airplane's center belly area to the tail. Some fluid streaking was observed from the left pylon down and along the side of the tail cone; aft of the hydraulic reservoir. The emergency brake bottle gauge reading was 1,500 PSI. The nose wheel gear was displaced from its mounting structure; aft and to the right. The nose wheel steering (NWS) cable was separated. The NWS accumulator gauge reading was 2,400 PSI. Aircraft power was turned on and the NWS linkage (top of nose gear) was actuated. The nose gear turned 15 to 20 degrees to the left and right for approximately four to five cycles before the accumulator bled down to the pre-charge (1,300 PSI). The right hydraulic reservoir B fluid level/reading was full. The left hydraulic reservoir A level/reading was approximately 5 percent.

The reservoir was serviced to full by a technician from the New York Citation Service Center (NYCSC) and the breached lines at the parking brake valve were capped. The auxiliary hydraulic pump, which pressurizes only the A system, was operated twice and for approximately 8 minutes each time. The lines, fittings, and components were inspected during pump operation and no obvious hydraulic leaks were evident. Running the auxiliary hydraulic pump recharged the NWS accumulator. The NWS linkage was actuated again and the nose gear turned 15 to 20degrees to the left and right for approximately seven cycles before the accumulator bled down to the pre-charge (1,300 PSI). Note: Maximum travel of the NWS was not attempted due to surrounding structural damage in the nose wheel well. A subsequent test of the left hydraulic reservoir was conducted on June 4, 2008, in the presence of the FAA. All hydraulic quantity, pressure and warning indication systems functional checks were conducted in accordance with maintenance manual instructions. No anomalies were noted.

Review of Orlando Citation Service Center (OCSC) Work Order 6026183, revealed that the left hydraulic reservoir, P/N 9914454-3, S/N 00057, was installed, and it was a repaired unit. The component repair record states the unit was removed from a previous aircraft due to, "Low volume "B" indicator, EICAS says empty when full." "Found switch out of adjustment, readjusted switch." The vendor was contacted and reported the switch that was out of adjustment was the hydraulic volume-low volume switch (16%). The OCSC personnel stated to the Safety Board Investigator, the airplane was placed on jacks while replacing the hydraulic reservoir. Prior to down jacking, the hydraulic system was purged of air. The hydraulic system was serviced to full and an engine run was accomplished. During the engine run, the hydraulic

quantity indicator and EICAS messages were viewed and were normal. After the engine run, the left hydraulic reservoir fittings and lines were inspected for leaks, none were found, and the left pylon panels below the reservoir were reinstalled.

The EICAS was downloaded and the following messages were recorded:

1943 EDT - Hyd Vol Low A (1)

1946 EDT - Hyd pump unload A (2)

1955 EDT - Hydraulic PTU Fail (3)

1959 EDT - Hyd Vol Low A (4)

2000 EDT - Hyd PTU Fail (5)

2008 EDT - Slats Fail (6)

2009 EDT - Hyd Vol Low A (7)

2009 EDT - Hyd Pump Unload A (8)

2010 EDT - Hyd PTU Fail (9)

2014 EDT - No Takeoff annunciation-cyan, Speed brakes annunciation-white (indicating on ground)

2014 EDT - TR auto stow R (10)

According to Cessna Aircraft Company, the Condition/Comments below correspond to the EICAS download above:

"(1) Hydraulic low volume message alert is at 16%, which is reservoir fluid level of 62 cubic inches or lower. Initial indication of low volume was not accompanied by Pump Fail A message. Therefore, it is likely fluid and pressure remained in system at this time.

(2) Hydraulic pump unload selected and hydraulic pressure below 2,350 PSI. Crew action to unload System A per AFM. Since there was no Hydraulic Pump Fail A message posted prior to this, crew action removed hydraulic pressure from pump outlet.

(3) System B greater than 2,200 PSI and System A less than 1,000 PSI. This would result from pulling HYDR B/PTU control circuit breaker. This is the first indication that System A is actually at a reduced pressure. PTU should have been maintaining System A pressure following pump unload. When System A pressure is reduced the accumulator fluid will dump back to reservoir.

(4) Hydraulic low volume message alert is at 16%, which is reservoir fluid level of 62 cubic inches or lower. Reposting of this message could indicate fluid pressure was restored. This could have been due to pushing HYDR B/PTU circuit breaker back in.

(5) System B greater than 2,200 PSI and System A less than 1,000 PSI. Pulling the HYDR B/PTU circuit breaker would cause this message to repost and System A systems (left thrust reverser, hydraulic nose wheel steering, hydraulic brakes) to be non-functional.

(6) Slat asymmetry or auto-slat failure. No red auto-slat failure message is posted, so calculated miscompare between left and right position sensors probable reason for message post. But no slat asymmetry message was posted. System B is designed to accomplish slat operation without failure in event of System A failure.

(7) Hydraulic low volume message alert is at 16%, which is reservoir fluid level of 62 cubic inches or lower. Crew action to unload System A. Since there was no Hyd Pump Fail A message posted prior to this, crew action removed hydraulic pressure.

(8) Hydraulic pump unload selected and hydraulic pressure below 2,350 PSI. Crew action to unload System A. Since there was no Hyd Pump Fail A message posted prior to this, crew action removed hydraulic pressure.

(9) System B greater than 2,200 PSI and System A less than1, 000 PSI. Due to unloading Sys A.

(10) Auto-stow command for thrust reverser in-flight deployment. This would occur if the right thrust reverser was deployed during loss of weight on wheels or the squat switch ground was lost when left gear separated."

The FAA to the registered owner released the airplane on April 10, 2008. On April 14, 2008, the Citation Customer Service representatives returned to JFK airport to conduct further inspections of the hydraulic system and to complete a damage evaluation of the airplane in order to return the airplane to service. According to the representatives, "three possible sources of hydraulic fluid fitting leakages were found; however there was no way to determine if these fittings were loose prior to the landing incident, or loosened during the accident. None of these three leaks are believed to be the root cause of in-flight loss of hydraulic fluid in the "A" hydraulic system. The plumbing where leaks were found would not have been pressurized during the entire duration of the flight. No leaks were found in the area associated to the (left) "A" hydraulic system reservoir that was recently replaced by the OCSC. No other conclusive evidence points to the cause of the in-flight hydraulic leak. General consensus is that the hydraulic leak could have been related to flight conditions, such as cold soaking and in-flight flexing of plumbing -- which could not be duplicated during our on-site visit."

The cockpit voice recorder (CVR) was removed from the airplane and forwarded to the Safety Board Vehicles Recorders Laboratory in Washington D.C. The CVR had not sustained any heat or structural damage. A CVR group was convened on May 8, 2008, and a partial transcript was prepared. The recording began at 18:11:18 as the airplane was taxing for takeoff. Review of the EICAS download and discussion about the cockpit voice recorder transcript revealed no abnormal amber messages were received until a HYD Volume Low A amber master caution light illuminated at 19:43:00. The flight crew initiated the "HYD VOL LOW-A" procedure in the checklist which pointed them to the "HYD PUMP FAIL A (HYDRAULIC PUMP FAILURE OR FLUID LOSS, A SYSTEM contained in the Model 750 Citation X Pilot's Abbreviated Checklist Emergency/Abnormal Procedures by completing item one and bullet one, and the Before Landing Checklist down to landing gear-blow down item 14. The flight crew did not evaluate the auxiliary hydraulic pump to see if it could restore system pressure, and continued to trouble shoot the fluid loss without following the checklist. During the flight crews evaluation of the hydraulic system, the A side pump was turned on and the PTU circuit breaker was engaged which enabled the normal landing gear extension. The flight crew did not complete the Landing checklist.

Pilot Information

Certificate:	Airline Transport; Commercial	**Age:**	71, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With Waivers/Limitations	**Last Medical Exam:**	12/01/2007
Occupational Pilot:		**Last Flight Review or Equivalent:**	07/01/2007
Flight Time:	29000 hours (Total, all aircraft), 915 hours (Total, this make and model), 22500 hours (Pilot In Command, all aircraft), 56 hours (Last 90 days, all aircraft), 16 hours (Last 30 days, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Commercial; Flight Engineer	**Age:**	68, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With Waivers/Limitations	**Last Medical Exam:**	06/01/2007
Occupational Pilot:		**Last Flight Review or Equivalent:**	07/01/2007
Flight Time:	18705 hours (Total, all aircraft), 900 hours (Total, this make and model), 7110 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	Cessna	**Registration:**	N750WM
Model/Series:	750	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	750-0230
Landing Gear Type:	Retractable - Tricycle	**Seats:**	11
Date/Type of Last Inspection:	04/01/2008, Continuous Airworthiness	**Certified Max Gross Wt.:**	361000 lbs
Time Since Last Inspection:	2 Hours	**Engines:**	2 Turbo Fan
Airframe Total Time:	914.5 Hours	**Engine Manufacturer:**	Allison
ELT:	Installed, not activated	**Engine Model/Series:**	AE-3007C
Registered Owner:	WM Aviation LLC	**Rated Power:**	6440 lbs
Operator:	WM Aviation LLC	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	JFK, 13 ft msl	**Observation Time:**	2019 EDT
Distance from Accident Site:		**Condition of Light:**	Night
Direction from Accident Site:		**Conditions at Accident Site:**	Visual Conditions
Lowest Cloud Condition:	Scattered / 5000 ft agl	**Temperature/Dew Point:**	6°C / -2°C
Lowest Ceiling:	Broken / 9000 ft agl	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	12 knots, 180°	**Visibility (RVR):**	
Altimeter Setting:	30.42 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Orlando, FL (MCO)	**Type of Flight Plan Filed:**	IFR
Destination:	New York, NY (JFK)	**Type of Clearance:**	IFR
Departure Time:	1816 EDT	**Type of Airspace:**	

Airport Information

Airport:	John F. Kennedy Intl Airport (KJFK)	**Runway Surface Type:**	Asphalt
Airport Elevation:	13 ft	**Runway Surface Condition:**	Dry
Runway Used:	13L	**IFR Approach:**	Visual
Runway Length/Width:	10000 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None		

Administrative Information

Investigator In Charge (IIC):	Carrol A Smith	**Adopted Date:**	09/26/2008
Additional Participating Persons:	Michael Cartelli; FAA/FSDO; New York, NY Tom Moody; Cessna Aircraft Company; Wichita, KS		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		