Aviation Investigation Final Report

Location:	Las Vegas, Nevada	**Accident Number:**	WPR15LA253
Date & Time:	August 28, 2015, 10:10 Local	**Registration:**	N959MC
Aircraft:	Beech C90	**Aircraft Damage:**	Substantial
Defining Event:	Ground collision	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

During the initial preflight checks of the jet before departure, the first officer (FO) observed the BRAKE ACCU light illuminated, which indicated insufficient hydraulic pressure to the parking brake. The FO then referenced the quick reference handbook (QRH) Abnormal Checklist, which noted "Residual pressure normally allows six brake applications to the first detent. No further action required." When the pilot-in-command (PIC) entered the flight deck, the FO advised him of the anomaly and what the QRH Abnormal Checklist stated, which the PIC confirmed. After the ground crewman removed the wheel chocks, the airplane began to roll down a slight incline. Attempts by both flight crewmembers to stop the airplane by applying toes brakes and pulling the emergency brake handle were unsuccessful. The airplane continued to roll down the incline before colliding with a parked twin-engine turboprop airplane, causing substantial damage to the turboprop airplane and minor damage to the jet.

The investigation revealed that the jet's flight crew had used the inappropriate checklist for the BRAKE ACCU light anomaly. Rather than using the QRH Abnormal Checklist, the flight crew should have been familiar with, based on their training, and referenced the Normal Operations Pre-Flight Interior Inspection checklist. This checklist specifically states that, if the BRAKE ACCU light is on, the accumulator should be charged using the standby pump or by monitoring engine #2 and the chocks should not be removed until the light is extinguished. The flight crew maintained that they had no recollection during their simulator type-rating training that the QRH Abnormal Checklist was to be used for in-flight anomalies only. However, two simulator instructors employed by the firm that conducted the training for both flight crewmembers stated that all of their instructors are taught to stress that the QRH Abnormal Checklist is to be used only for in-flight anomalies. Had both of the jet's flight crewmembers thoroughly understood the correct checklist to use, the parking brake system, and how to appropriately resolve the BRAKE ACCU light anomaly, this accident would have not occurred.

The investigation also revealed that the jet's parking brake check valve was faulty, which was most likely the reason for the illumination of the BRAKE ACCU light. A design improvement to the valve had been developed about 7 years before the accident, which resulted in a new check valve to replace

the previously defective check valve. However, the new check valve was never installed on the accident airplane.

Probable Cause and Findings

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

The jet flight crew's use of an inappropriate checklist to resolve a parking brake hydraulic system pressure anomaly, which resulted in the airplane rolling down a slight incline and colliding with the parked twin-engine turboprop airplane. Contributing to the accident was the defective parking brake check valve.

Findings

Personnel issues	Knowledge of procedures - Pilot of other aircraft
Personnel issues	Forgotten action/omission - Pilot of other aircraft
Personnel issues	Use of checklist - Pilot of other aircraft
Aircraft	Master cylinder/brake valve - Malfunction

Factual Information

History of Flight

Standing-engine(s) not oper	Ground collision (Defining event)

On August 28, 2015, about 1010 Pacific daylight time, a Dassault Falcon 2000, N187AA, and a Beech C90, N959MC, were damaged during a ground collision at McCarran International Airport (LAS), Las Vegas, Nevada. The Falcon 2000 was registered to Anton Air LLC of Henderson, Nevada, and operated by SC Aviation, Inc. of Janesville, Wisconsin. The Beech C90 was registered to and operated by Nebraskaland Tire Inc. of Lexington, Nebraska. The Beech C90 sustained substantial damage, and the Falcon 2000 sustained minor damage. The airline transport pilot, the sole occupant of the Beech C90, and the two airline transport pilots and two passengers aboard the Falcon 2000 were not injured. Visual meteorological conditions prevailed for the proposed cross-country flights, both of which were to be operated under the provisions of Title 14 Code of Federal Regulations Part 91. Instrument Flight Rules (IFR) flight plans had been field for both flights, with Wheeling, Illinois, as the planned destination for the Falcon 2000, and Lexington, Nebraska, the Beech C90's destination.

In a statement submitted to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the pilot of C90, reported that after completing his preflight checklists in preparation for a proposed cross-country flight, the Falcon 2000 caught his eye as it started to move. The pilot assumed that the pilots had started the engines, and were beginning to taxi out of the ramp; but as they started to move, instead of turning into the designated turning lane, they continued mostly straight ahead. The pilot further reported that as the Falcon continued to roll ahead its right wing passed under the left wing of a Falcon 20, lifting it up about a foot or so. The Falcon 2000 then continued to roll forward toward the C90, subsequently colliding into its left wing, outboard of the engine. The pilot stated that the collision moved the C90 backward about 20 feet, and spun the airplane left about 70 to 80 degrees, which resulted in the ground power unit becoming lodged under the tail section of the airplane.

In a statement submitted to the NTSB IIC, the pilot-in-command (PIC) of the Falcon 2000, N187AA, reported that in preparation for the cross-country flight, the first officer (FO) had completed the checklist procedures up to the Before Start Checklist. The PIC further reported that the SIC had previously noted the airplane's BRAKE ACCU light was illuminated, and stated that he had referenced the [Abnormal] Checklist, which noted "The system allows six brake applications to the first detent. No further action required." The PIC acknowledged what the SIC had said, then initiated the Before Start Checklist. The PIC reported that he then set the parking brake, looked out of the left side screen and observed the lineman standing next to the aircraft, at which time he signaled for chock removal. The PIC stated that as he continued the Before Start flow and was reaching down for the Fuel Eng[ine] switches on the center pedestal, the FO said, "We're rolling." The PIC opined that he immediately pressed the toe brakes, and [received] no brake response, after which he pulled the emergency brake handle, but again received no response. The PIC stated that the airplane was now without steering or brakes, as it was rolling across the aisle (ramp) in an easterly direction. "The airplane veered slightly left, and our right wing clipped the left wing of a Falcon 20 parked ahead of us." The PIC concluded that the airplane continued rolling in

an eastbound direction across a second aisle and collided with a King Air C90, which was parked ahead and to their left, and facing in the opposite direction.

In a statement submitted to the NTSB IIC, the FO of the Falcon reported that in preparation for the cross-country flight he had completed the checklist procedures up to the Before Start checklist, and that he had previously noted that the BRAKE ACCU light was illuminated, and referenced the [Abnormal] Checklist for the BRAKE ACCU light. The FO stated that he informed the PIC of the light, and that the checklist read, "Residual pressure normally allows six brake applications to the first detent. No further action required," to which the PIC acknowledged. The FO further stated that as they initiated the Before Start checklist the PIC set the parking brake, and as he continued to read the Before Start checklist he noticed the airplane begin to roll. When he advised the PIC that the airplane was rolling, the PIC immediately pressed the toe brakes, however, there was no braking response. The PIC then pulled the emergency brake handle, but there was still no response to braking. The FO opined that he also applied his toe brakes, but with no response. He then asked the PIC if he had any steering, to which the Captain replied, "I've got nothing." The FO stated that at this point the airplane had rolled across the ramp, and their right wing clipped the left wing of a Falcon 20 that was parked ahead of them. The airplane then veered slightly left before colliding with the C90, which was parked ahead and to their left, and facing in the opposite direction.

During the investigation the operator of the Falcon 2000, SC Aviation, submitted to the NTSB IIC two checklists, one of which was the Simuflite "for training purposes only" checklist, while the other was the manufacturer's checklist, both of which were in the airplane at the time of the accident. Both checklists were identical, and labeled, "F2000, QRH2, ABNORMAL – 11." With respect to a BRAKE ACCU – PARK BRAKE SYSTEM anomaly, that is, the BRAKE ACCU light being illuminated on the cockpit annunciator panel, the information provided in the checklist states that for such an anomaly, "Residual pressure will normally allow at least six brake applications to first detent after MASTER + GONG with BRAKE ACCU lighting. No further pilot action required." This checklist was consistent with the checklist the flight crew referred to when the anomaly with the BRAKE ACCU light presented itself.

With respect to the Dassault Aviation Falcon 2000 NORMAL OPERATIONS PRE-FLIGHT, INTERIOR INSPECTION, CODDE 2, DGT125663, the checklist denotes the following for the check of the parking brake handle:

• Set PARK BRAKE to 1st detent prior to removing chocks. Check its operation by:
• BAT……....On
• BRAKE PRESS light…… On - Checked
• BRAKE ACCU light……. Out - Checked

If BRAKE ACCU light on:
• Charge the accumulator using ST-BY PUMP or by motoring Engine 2.
• Do not remove chocks until BRAKE ACCU light is extinguished.

With respect to the Dassault Aviation Falcon 2000 NORMAL OPERATIONS, PREFLIGHT, BEFORE START; START checklist, CODDE 2, DGT125663, the BEFORE START DO-LIST calls for the pilot flying (PF) to perform the following:

PARK BRAKE……... 1st detent
Chocks…… Removed

Additionally, the checklist stipulates that if the BRAKE ACCU light is on, for the crew to:

• Chock airplane
• Charge the accumulator using the ST-BY PUMP or by motoring Engine 2.
• Do not remove the chocks until BRAKE ACCU light is extinguished.

During the investigation, the Director of Operations (DO) for SC Aviation, the operator of N187AA, stated in a letter to the IIC, that based on information the IIC had previously provided him, he understood that use of the Abnormal QRH was not an appropriate reference for a ground-based anomaly. The DO further stated, "Considering the actions of both crewmembers during the accident, it appears that they may have been unaware of the consequences relative to removing the chocks with the BRAKE ACCU light illuminated. Our internal investigation revealed that neither crewmember had a recollection of any reference during training that the Abnormal QRH Checklist was to be used as an 'in-flight only' checklist. In fact, following the accident, the crew reviewed their training notes, and did not find any reference that the Abnormal QRH Checklist is to be used in-flight only. Nevertheless, after discussing the accident with the CAE Simuflite instructors, it has been confirmed that the Abnormal QRH Checklist is intended for in-flight use only. Both pilots reported the lack of any recollection from their Initial Aircraft Type-rating training that it was an error to reference the Abnormal QRH Checklist to resolve a BRAKE ACCU light anomaly. Furthermore, it should be noted that the pilots attended separate Initial Type-rating courses, and neither pilot reported having any notes or recollection of an emphasis area warning them that the Abnormal QRH Checklist is intended for in-flight use only."

In an interview conducted by the NTSB IIC with a Lead Instructor for CAE Simuflite, Dallas, Texas, the instructor, whose name was provided by SC Aviation, reported that he had 18 years of experience as a simulator instructor, of which about 7 years was as an instructor on the Dassault Falcon 2000 airplane. The instructor stated that during initial and recurrent training, all CAE instructors instruct all Falcon students that the Falcon 2000 Abnormal QRH Checklist is to be used for in-flight anomalies only, and not for ground-based anomalies. The instructor also confirmed that if the BRAKE ACCU light is illuminated on the ground, that the wheel chocks are not to be removed until the BRAKE ACCU light is extinguished, which is noted in the Normal Operations Preflight – Interior checklist, and reiterated in the Normal Operations Before Start – Start checklist, each of which is part of the instructional curriculum for the Falcon 2000 airplane.

In an interview conducted by the NTSB IIC with a second CAE Simuflite instructor, also assigned to the Dallas, Texas, training facility, and whose name was also provided by SC Aviation, the instructor stated that he had been employed by CAE Simuflite for 15 years as a simulator instructor, 12 of which had been as a Falcon 2000 instructor and check airman. Additionally, the instructor stated that he had more than 4,500 hours of pilot-in-command time in the Falcon 2000, which he currently flies. When queried by the IIC about when the Falcon 2000 Abnormal QRH Checklist should be used, the instructor stated that it is to only be used for in-flight anomalies, which is stressed during training with all pilots. He also opined that while BRAKE ACCU light anomaly cannot be replicated in the simulator, this anomaly is discussed in detail during both ground and flight simulator training. He further stated that if the BRAKE ACCU light is on before starting engines, the Normal Checklist, both in the PRE-FLIGHT phase and the BEFORE START phase, instructs the flight crew not to remove the chocks. He also related that both

checklists instruct the crew to charge the parking brake accumulator by using the standby pump or motoring the #2 engine. Further, when asked by the IIC if he had any knowledge of any previous events where a Falcon 2000 had started rolling when the flight crew used the Abnormal QRH Checklist to resolve a similar BRAKE ACCU light anomaly, he said he could not recall anything like this happening previously.

During the investigation, and under the supervision of a Federal Aviation Administration aviation safety inspector, the airplane's parking brake check valve, Part Number L95H07-202, serial number 20667, was examined for functionality. The inspector reported that during the bench flow test, the check valve failed, as it was observed to be leaking. It was further revealed during the investigation, that Falcon Service Advisory (FSA) 32-40-032-R01-A, dated November 19, 2009, was issued for Park Brake Check Valve P/N L95H07-202, as there had been previous failures with the check valve; the purpose of the check valve is to sustain hydraulic pressure to keep the parking brake energized. The FSA noted that a design improvement had been developed to improve the reliability of the unit, by introducing a new seal material, along with revised tolerances to assure proper seal retention. The new parking brake check valve, P/N L95H07-204, which incorporated the new improvement, was available for Falcon 2000 operators at the time the FSA was published in 2009, about 7 years prior to the accident. There was no record that the improved check valve had ever been installed on the accident Falcon 2000, N187AA.

In an incident that was reported to the NTSB IIC by Dassault Aviation, on August 11, 2014, at the Calgary Airport, Alberta, Canada, the flight crew of a Falcon 2000LX, serial number 129, experienced a parking brake failure after shutdown with the parking brake set to the first detent. After the passengers had deplaned, the airplane began moving backward. At this time the pilot pulled the park brake to the second detent, which did not stop the airplane. The pilot then turned on the batteries and standby pump, after which he applied the brakes and successfully stopped the airplane 10 meters from a Boeing 737. Maintenance personnel subsequently found that park brake check valve P/N L95H07-202 was faulty, and replaced it with park brake P/N L95H07-202.

Pilot Information

Certificate:	Airline transport	**Age:**	52,Male
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 With waivers/limitations	**Last FAA Medical Exam:**	December 18, 2014
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 21, 2015
Flight Time:	6362 hours (Total, all aircraft), 1794 hours (Total, this make and model), 5317 hours (Pilot In Command, all aircraft), 42 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N959MC
Model/Series:	C90	**Aircraft Category:**	Airplane
Year of Manufacture:	1979	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	LJ-821
Landing Gear Type:	Retractable -	**Seats:**	8
Date/Type of Last Inspection:	August 21, 2015 Condition	**Certified Max Gross Wt.:**	10500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	13087 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-135A
Registered Owner:	On file	**Rated Power:**	750 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LAS,2181 ft msl	**Distance from Accident Site:**	
Observation Time:	09:56 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 1200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	34°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Las Vegas, NV (LAS)	**Type of Flight Plan Filed:**	IFR
Destination:	Lexington, NE (LXN)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class B

Airport Information

Airport:	McCarran International LAS	**Runway Surface Type:**	
Airport Elevation:	2181 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	36.099445,-115.162498(est)

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	John Ceresna; Federal Aviation Administration; Las Vegas, NV Jack Roche; Federal Aviation Administration; Reno, NV James Urcinole; Federal Aviation Administration; Teterboro, NJ Nicholas Colombe; SC Aviation, Inc.; Monroe, WI Stacy Lewis; Dassault Aircraft Services; Reno, NV
Original Publish Date:	March 23, 2017
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=91887

Aviation Investigation Final Report

Location:	Las Vegas, Nevada	**Accident Number:**	WPR15LA253
Date & Time:	August 28, 2015, 10:10 Local	**Registration:**	N187AA
Aircraft:	Dassault Falcon2000	**Aircraft Damage:**	Minor
Defining Event:	Ground collision	**Injuries:**	4 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

During the initial preflight checks of the jet before departure, the first officer (FO) observed the BRAKE ACCU light illuminated, which indicated insufficient hydraulic pressure to the parking brake. The FO then referenced the quick reference handbook (QRH) Abnormal Checklist, which noted "Residual pressure normally allows six brake applications to the first detent. No further action required." When the pilot-in-command (PIC) entered the flight deck, the FO advised him of the anomaly and what the QRH Abnormal Checklist stated, which the PIC confirmed. After the ground crewman removed the wheel chocks, the airplane began to roll down a slight incline. Attempts by both flight crewmembers to stop the airplane by applying toes brakes and pulling the emergency brake handle were unsuccessful. The airplane continued to roll down the incline before colliding with a parked twin-engine turboprop airplane, causing substantial damage to the turboprop airplane and minor damage to the jet.

The investigation revealed that the jet's flight crew had used the inappropriate checklist for the BRAKE ACCU light anomaly. Rather than using the QRH Abnormal Checklist, the flight crew should have been familiar with, based on their training, and referenced the Normal Operations Pre-Flight Interior Inspection checklist. This checklist specifically states that, if the BRAKE ACCU light is on, the accumulator should be charged using the standby pump or by monitoring engine #2 and the chocks should not be removed until the light is extinguished. The flight crew maintained that they had no recollection during their simulator type-rating training that the QRH Abnormal Checklist was to be used for in-flight anomalies only. However, two simulator instructors employed by the firm that conducted the training for both flight crewmembers stated that all of their instructors are taught to stress that the QRH Abnormal Checklist is to be used only for in-flight anomalies. Had both of the jet's flight crewmembers thoroughly understood the correct checklist to use, the parking brake system, and how to appropriately resolve the BRAKE ACCU light anomaly, this accident would have not occurred.

The investigation also revealed that the jet's parking brake check valve was faulty, which was most likely the reason for the illumination of the BRAKE ACCU light. A design improvement to the valve had been developed about 7 years before the accident, which resulted in a new check valve to replace

the previously defective check valve. However, the new check valve was never installed on the accident airplane.

Probable Cause and Findings

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

The jet flight crew's use of an inappropriate checklist to resolve a parking brake hydraulic system pressure anomaly, which resulted in the airplane rolling down a slight incline and colliding with a parked twin-engine turboprop airplane. Contributing to the accident was the defective parking brake check valve.

Findings

Personnel issues	Knowledge of procedures - Pilot
Personnel issues	Knowledge of procedures - Copilot
Personnel issues	Forgotten action/omission - Pilot
Personnel issues	Forgotten action/omission - Copilot
Personnel issues	Use of checklist - Pilot
Personnel issues	Use of checklist - Copilot
Aircraft	Master cylinder/brake valve - Malfunction

Factual Information

History of Flight

Standing-engine(s) not oper	Ground collision

On August 28, 2015, about 1010 Pacific daylight time, a Dassault Falcon 2000, N187AA, and a Beech C90, N959MC, were damaged during a ground collision at McCarran International Airport (LAS), Las Vegas, Nevada. The Falcon 2000 was registered to Anton Air LLC of Henderson, Nevada, and operated by SC Aviation, Inc., of Janesville, Wisconsin. The Beech C90 was registered to and operated by Nebraskaland Tire Inc., of Lexington, Nebraska. The Beech C90 sustained substantial damage, and the Falcon 2000 sustained minor damage. The airline transport pilot, the sole occupant of the Beech C90, and the two airline transport pilots and two passengers aboard the Falcon 2000 were not injured. Visual meteorological conditions prevailed for the proposed cross-country flights, both of which were to be operated under the provisions of Title 14 Code of Federal Regulations Part 91. IFR flight plans had been field for both flights, with Wheeling, Illinois, as the planned destination for the Falcon 2000, and Lexington, Nebraska, the Beech C90's destination.

In a statement submitted to the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the pilot of N959MC, reported that after completing his preflight checklists in preparation for a proposed cross-country flight, the Falcon 2000, N187AA, caught his eye as it started to move. The pilot assumed that the pilots had started the engines and were beginning to taxi out of the ramp, but as they started to move, instead of turning into the designated turning lane, they continued mostly straight ahead. The pilot further reported that as the Falcon continued to roll ahead its right wing passed under the left wing of a Falcon 20, lifting it up about a foot or so. The Falcon 2000 then continued to roll forward toward the C90, subsequently colliding into its left wing, outboard of the engine. The pilot stated that the collision moved the C90 backward about 20 feet, and spun the airplane left about 70 to 80 degrees, which resulted in the ground power unit becoming lodged under the tail section of the airplane.

In a statement submitted to the NTSB IIC, the pilot-in-command (PIC) of the Falcon 2000, N187AA, reported that in preparation for the cross-country flight, the first officer (FO) had completed the checklist procedures up to the Before Start Checklist. The PIC further reported that the SIC had previously noted the airplane's BRAKE ACCU light was illuminated, and stated that he had referenced the [Abnormal] Checklist, which noted "The system allows six brake applications to the first detent. No further action required." The PIC acknowledged what the SIC had said, then initiated the Before Start Checklist. The PIC reported that he then set the parking brake, looked out of the left side screen and observed the lineman standing next to the aircraft, at which time he signaled for chock removal. The PIC stated that as he continued the Before Start flow and was reaching down for the Fuel Eng[ine] switches on the center pedestal, the FO said, "We're rolling." The PIC opined that he immediately pressed the toe brakes and [received] no brake response, after which he pulled the emergency brake handle, but again received no response. The PIC stated that the airplane was now without steering or brakes, as it was rolling across the aisle (ramp) in an easterly direction. "The airplane veered slightly left, and our right wing clipped the left wing of a Falcon 20 parked ahead of us." The PIC concluded that the airplane continued rolling in

an eastbound direction across a second aisle and collided with a King Air C90, which was parked ahead and to their left, and facing in the opposite direction.

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With respect to the Dassault Aviation Falcon 2000 NORMAL OPERATIONS PRE-FLIGHT, INTERIOR INSPECTION, CODDE 2, DGT125663, the checklist denotes the following for the check of the parking brake handle:

• Set PARK BRAKE to 1st detent prior to removing chocks. Check its operation by:
• BAT……..... On
• BRAKE PRESS light…… On - Checked
• BRAKE ACCU light……. Out - Checked

If BRAKE ACCU light on:
• Charge the accumulator using ST-BY PUMP or by motoring Engine 2.
• Do not remove chocks until BRAKE ACCU light is extinguished.

With respect to the Dassault Aviation Falcon 2000 NORMAL OPERATIONS, PREFLIGHT, BEFORE START; START checklist, CODDE 2, DGT125663, the BEFORE START DO-LIST calls for the pilot flying (PF) to perform the following:

PARK BRAKE……...1st detent
Chocks……Removed

Additionally, the checklist stipulates that if the BRAKE ACCU light is on, for the crew to:

• Chock airplane
• Charge the accumulator using the ST-BY PUMP or by motoring Engine 2.
• Do not remove the chocks until BRAKE ACCU light is extinguished.

During the investigation the Director of Operations (DO) for SC Aviation, the operator of N187AA, stated in a letter to the IIC, that based on information the IIC had previously provided him, he understood that use of the Abnormal QRH was not an appropriate reference for a ground-based anomaly. The DO further stated, "Considering the actions of both crewmembers during the accident, it appears that they may have been unaware of the consequences relative to removing the chocks with the BRAKE ACCU light illuminated. Our internal investigation revealed that neither crewmember had a recollection of any reference during training that the Abnormal QRH Checklist was to be used as an 'in-flight only' checklist. In fact, following the accident, the crew reviewed their training notes, and did not find any reference that the Abnormal QRH Checklist is to be used in-flight only. Nevertheless, after discussing the accident with the CAE Simuflite instructors, it has been confirmed that the Abnormal QRH Checklist is intended for in-flight use only. Both pilots reported the lack of any recollection from their Initial Aircraft Type-rating training that it was an error to reference the Abnormal QRH Checklist to resolve a BRAKE ACCU light anomaly. Furthermore, it should be noted that the pilots attended separate Initial Type-rating courses, and neither pilot reported having any notes or recollection of an emphasis area warning them that the Abnormal QRH Checklist is intended for in-flight use only."

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In an interview conducted by the NTSB IIC with a second CAE Simuflite instructor, also assigned to the Dallas, Texas training facility, and whose name was also provided by SC Aviation, the instructor stated that he had been employed by CAE Simuflite for 15 years as a simulator instructor, 12 of which had been as a Falcon 2000 instructor and check airman. Additionally, the instructor stated that he had more than 4,500 hours of pilot-in-command time in the Falcon 2000, which he currently flies. When queried by the IIC about when the Falcon 2000 Abnormal QRH Checklist should be used, the instructor stated that it is to only be used for in-flight anomalies, which is stressed during training with all pilots. He also opined that while BRAKE ACCU light anomaly cannot be replicated in the simulator, this anomaly is discussed in detail during both ground and flight simulator training. He further stated that if the BRAKE ACCU light is on before starting engines, the Normal Checklist, both in the PRE-FLIGHT phase and the BEFORE START phase, instructs the flight crew not to remove the chocks. He also related that both

checklist instructs the crew to charge the parking brake accumulator by using the standby pump or motoring the #2 engine. Further, when asked by the IIC if he had any knowledge of any previous events where a Falcon 2000 had started rolling when the flight crew used the Abnormal QRH Checklist to resolve a similar BRAKE ACCU light anomaly, he said he could not recall anything like this happening previously.

During the investigation, and under the supervision of a Federal Aviation Administration aviation safety inspector, the airplane's parking brake check valve, Part Number L95H07-202, serial number 20667, was examined for functionality. The inspector reported that during the bench flow test, the check valve failed, as it was observed to be leaking. It was further revealed during the investigation, that Falcon Service Advisory (FSA) 32-40-032-R01-A, dated November 19, 2009, was issued for Park Brake Check Valve P/N L95H07-202, as there had been previous failures with the check valve; the purpose of the check valve is to sustain hydraulic pressure to keep the park brake energized. The FSA noted that a design improvement had been developed to improve the reliability of the unit, by introducing a new seal material, along with revised tolerances to assure proper seal retention. The new park brake check valve, P/N L95H07-204, which incorporated the new improvement, was available for Falcon 2000 operators at the time the FSA was published in 2009, about 7 years prior to the accident. There was no record that the improved check valve had ever been installed on the accident Falcon 2000, N187AA.

In an incident that was reported to the NTSB IIC by Dassault Aviation, on August 11, 2014, at the Calgary Airport, Alberta, Canada, the flight crew of a Falcon 2000LX, serial number 129, experienced a parking brake failure after shutdown with the park brake set to the first detent. After the passengers had deplaned, the airplane began moving backward. At this time the pilot pulled the park brake to the second detent, which did not stop the airplane. The pilot then turned on the batteries and standby pump, after which he applied the brakes and successfully stopped the airplane 10 meters from a Boeing 737. Maintenance personnel subsequently found that park brake check valve P/N L95H07-202 was faulty, and replaced it with park brake P/N L95H07-202.

Pilot Information

Certificate:	Airline transport	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	February 13, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	May 15, 2015
Flight Time:	7802 hours (Total, all aircraft), 133 hours (Total, this make and model), 7277 hours (Pilot In Command, all aircraft), 108 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	31,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	July 29, 2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 31, 2015
Flight Time:	2737 hours (Total, all aircraft), 188 hours (Total, this make and model), 1870 hours (Pilot In Command, all aircraft), 65 hours (Last 90 days, all aircraft), 28 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Dassault	**Registration:**	N187AA
Model/Series:	Falcon2000	**Aircraft Category:**	Airplane
Year of Manufacture:	2001	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	156
Landing Gear Type:	Retractable - Tricycle	**Seats:**	12
Date/Type of Last Inspection:	June 17, 2015 Continuous airworthiness	**Certified Max Gross Wt.:**	36500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo jet
Airframe Total Time:	6641.2 Hrs at time of accident	**Engine Manufacturer:**	Honeywell
ELT:	C126 installed, not activated	**Engine Model/Series:**	CFE-738-1-1B
Registered Owner:	On file	**Rated Power:**	5600 Lbs thrust
Operator:	On file	**Operating Certificate(s) Held:**	None
Operator Does Business As:	On file	**Operator Designator Code:**	G13A

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LAS,2181 ft msl	**Distance from Accident Site:**	
Observation Time:	09:56 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 1200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	34°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Las Vegas, NV (LAS)	**Type of Flight Plan Filed:**	IFR
Destination:	Chicago, IL (PWK)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class B

Airport Information

Airport:	McCarran International LAS	**Runway Surface Type:**	
Airport Elevation:	2181 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Minor
Passenger Injuries:	2 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 None	**Latitude, Longitude:**	36.099445,-115.162498(est)

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	John Ceresna; Federal Aviation Administration; Las Vegas, NV Jack Roche; Federal Aviation Administration; Reno, NV James Urcinole; Federal Aviation Administration; Teterboro, NJ Nicholas Colombe; SC Aviation, Inc.; Monroe, WI Stacy Lewis; Dassault Aircraft Services; Reno, NV
Original Publish Date:	March 23, 2017
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=91887