National Transportation Safety Board
Aviation Accident Final Report

Location:	Providence, RI	**Accident Number:**	DCA08FA018
Date & Time:	12/16/2007, 1648 EST	**Registration:**	N470ZW
Aircraft:	BOMBARDIER CL600-2B19	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	34 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

The flight crew was conducting a straight-in ILS approach during instrument meteorological conditions with reported cloud ceilings about 100 feet above the decision height. During the descent into the terminal area and initial approach, tailwinds of up to 100 knots were affecting the flight and the crew reported feeling rushed because of the high ground speed. The crew did establish the airplane on the approach course at the proper speed and altitude, however they did not perform a complete approach briefing. The first officer (FO) was the pilot flying, and had very little instrument approach experience in the CRJ-200. Prior to making visual contact with the runway, the FO disengaged the autopilot and flight director, but only mentioned the autopilot in his verbal callout. At the time of the accident, there was no prohibition against making a raw data approach to minimums in the Air Wisconsin (AWAC) flight manual. Subsequently, the airplane drifted left of course and above the glidepath. As the airplane deviated from the approach course the flight was outside stabilized approach criteria, and as the airplane descended beneath the ceiling, both pilots noticed the deviation and misalignment with the runway.

At this point, the captain offered to take over control of the airplane and salvage the landing instead of abandoning the approach and executing a missed approach. At the time of the accident, Air Wisconsin procedures provided the crews latitude in determining when a go-around was necessary.

As the captain took control of the airplane, the FO misunderstood a statement by the captain and reduced power to idle without the captain's knowledge. The airplane developed a high sink rate and during the flare likely stalled, impacting the runway at a high vertical rate. The forces developed during the flare and touchdown exceeded the certified limit loads of the landing gear and the gear support trunnion fractured as intended. There was no evidence of any pre-existing damage to the gear components, and the fracture and gear separation occurred as designed.

During his postaccident interview, the FAA aircrew program manager discussed the circumstances of some AWAC new-hire pilots who did not successfully complete initial training. Specifically, the FAA official stated that AWAC had changed the simulator time

requirements for these pilots because they had completed a type rating course (provided by another training program) before starting AWAC's training program. AWAC determined that these pilots needed fewer hours of simulator time than other new-hire pilots. However, according to the FAA official, these pilots had high initial operating experience times and "weren't getting it, so [AWAC] let them go." It is possible that these pilots might have performed better if they had been more thoroughly trained by the company.

A captain who was also a CL-65 flight instructor stated that, because of constraints with simulator time, all pilots needed to complete their training during the time that had been scheduled. The director of flight training stated that the simulator, at full utilization, provided 600 hours of training per month, but that the company needed 1,000 hours of simulator training per month. The amount of IOE time provided to new-hire FOs had significantly increased because AWAC had not revised its simulator training to accommodate the needs of pilots with little or no jet experience. As a result, IOE had to be routinely extended beyond the FAA's requirement. Since many simulator training scenarios cannot be accomplished in an airplane, particularly during passenger carrying flights, IOE is not an adequate substitute for simulator training exercises.

Further, new-hire FOs who completed AWAC's initial training program were subject to a 1-year probation period. However, unlike other 14 Code of Federal Regulations Part 121 operators, AWAC did not effectively conduct a program to assess the performance of probationary pilots. The accident FO's training and checkrides did not reveal his weaknesses with automation, pacing, and crew coordination, which rendered him unprepared to properly execute the approach into Providence during the accident flight. In addition, captains did not produce trip reports after flying with first officers, and, according to the Norfolk base manager, meetings to discuss probationary FO's progress during their first year were no longer held because the base managers were "too busy." Thus, two potential methods to identify FOs' weaknesses were not used by AWAC.

Because the first officers hired by AWAC in the 2 years preceding this accident had decreased levels of experience, these first officers would have benefited from additional training and oversight. However, AWAC's training program was ineffective because it did not accommodate these needs.

The FAA's Principal Operations Inspector (POI) was based in Des Planes, Illinois, but AWAC's primary training center was in Charlotte, NC. The POI stated that providing oversight of AWAC was difficult because of the required travel. Because of the limited on-site oversight of AWAC's training program of new first officers, the FAA did not identify the shortcomings of AWAC's program in preparing these less experienced first officers for flying in high-performance jet airplanes.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the captain's attempt to salvage the landing from an instrument approach which exceeded stabilized approach criteria, resulting in a high sink rate, likely stall, and hard landing which exceeded the structural limitations of the airplane.

Contributing to the accident was the first officer's poor execution of the instrument approach, and the lack of effective intra-cockpit communication between the crew. Additional contributing factors to the accident are the lack of effective oversight by AWAC and the FAA to ensure adequate training and an adequate experience level of first officers for line operations.

Findings

Occurrence #1: HARD LANDING
Phase of Operation: LANDING

Findings
1. (F) CONTINUED - COPILOT/SECOND PILOT
2. (F) PROPER DESCENT RATE - NOT MAINTAINED - PILOT IN COMMAND
3. (F) CREW/GROUP COORDINATION - NOT PERFORMED - FLIGHTCREW
4. IMPROPER DECISION - FLIGHTCREW
5. (F) INADEQUATE SURVEILLANCE OF OPERATION - FAA(ORGANIZATION)
6. (F) INADEQUATE SURVEILLANCE OF OPERATION - COMPANY/OPERATOR MGMT

Occurrence #2: GEAR COLLAPSED
Phase of Operation: LANDING

Findings
7. LANDING GEAR,MAIN GEAR - COLLAPSED

Factual Information

HISTORY OF FLIGHT:

On December 16, at 1645 eastern standard time (EST), a Bombardier CRJ-200 (CL600-2B19), registration N470ZW, serial number 7927, operated by Air Wisconsin as flight 3758 (ATC call sign AWI758A), departed the runway after a hard landing at the Theodore Francis Green State Airport, Providence, RI (PVD). The flight was a regularly scheduled passenger flight which departed Philadelphia (PHL) at about 1600 EST. The First Officer, who had recently completed his Initial Operating Experience (IOE) in the CRJ-200, was the Pilot Flying (PF). This flight was the second time he had flown from Philadelphia to PVD, and the Captain, Pilot Not Flying (PNF), was aware that he was new to the airline. The accident flight was the fourth leg the crew had flown that day, the Captain was PF for the first two legs, and the FO flew the leg from Richmond into PHL. Instrument meteorological conditions prevailed for all of their flights that day.

The flight to the PVD area was reported as routine, with IFR weather enroute. Winds aloft in the vicinity of the initial descent were reported as from 220 degrees at 100 knots, resulting in a large tailwind component. Both crewmembers stated they felt rushed during the descent. The flight was cleared for and executed an ILS runway 5 approach. The airplane was initially established and stabilized on the localizer and glideslope. Approximately 2 miles from the runway threshold, at an altitude of 700 feet, the FO disconnected the autopilot and flight director (FD) and announced that he had disengaged the autopilot. In an interview he stated that he wanted to get the feel of the airplane, and "declutter" the display. At the time, Air Wisconsin procedures allowed hand flying raw data instrument approaches.

About 30 seconds later, the airplane drifted to the left of the approach course, and continued to descend, although above the glidepath. The airplane broke out of the overcast at 300' and the crew saw the approach lights at the 2 o'clock position. The Captain offered to take over the airplane and the FO concurred. The Captain made a statement which the FO incorrectly heard as a command to reduce power to idle, and he did so, without the Captain's knowledge. The Captain maneuvered the airplane in a series of descending banks, reaching a maximum bank angle of 22 degrees at a height of less than 100 feet above the runway. A descent rate of up to 2000 feet per minute developed. During the landing maneuver, pitch attitude decreased to 7 degrees nose down, then flared to 4 degrees nose up within five seconds just prior to touchdown. The captain increased power to about 73% N1 during the flare maneuver. Airspeed was approximately 132 knots at touchdown. Due to the flare rotation and sink rate, the airplane exceed the stall angle of attack, and the stall protection system (stick shaker and pusher) briefly activated. According to a performance study, the airplane touched down in about a nine degree left bank, heading about 049 degrees with a sink rate of approximately 18 feet per second.

The touchdown point was approximately 1000 to 1200 feet from the threshold of runway 5. The left main gear collapsed and the airplane exited the left side of the runway and slid through a snow-covered grassy area. The airplane came to a stop on a magnetic heading of approximately 320 degrees at about 3700 feet from the threshold. The 3 crew members and 31 passengers were not injured, and exited the airplane via the normal airstair door.

INJURIES TO PERSONS:

None.

DAMAGE TO AIRCRAFT:

The left main gear separated from the main landing gear support trunnion at the pivot assembly (pintle pin). The trunnion fractured, and the rear portion was forced upward and aft, bending the aft landing gear support "false spar" and separating it from the inner mounts. The wheel truck penetrated the flap and upper wing skin. Fractures in the upper wing skin of approximately 18" surrounded the penetration area. The aft main spar was bent in the vicinity of the forward support of the trunnion. The gear door was separated, and the door brace was broken. The main gear remained attached to the airplane by the actuator, and the actuator mounting supports were bent. The gear assembly itself was intact with scraping damage and cuts to the tires consistent with encountering the wing and flap components. Wing tip damage to the light and fairing was also observed. There was no fuel spill. The left engine had minor FOD damage causing numerous nicks and cuts to about 10 fan blades.

The airworthiness group examined the aircraft and landing gear components at PVD. The team found no evidence of fatigue cracking, corrosion damage, undue wear, arcing strikes or other damage on either the landing gear components or in the left hand MLG wheel well cavity.

The MLG mounting trunnion sustained a massive diagonal fracture, but remained attached to the wing structure. The trunnion pin (pintle pin) was sheared off and was seized in the housing. The trunnion parts were removed from the airplane for metallurgical examinations.

OTHER DAMAGE:

Three lights along the left side of runway 5 were broken when the airplane slid off the runway.

PERSONNEL INFORMATION:

The captain, age 30, was hired by Air Wisconsin (AWAC) on September 15, 2003. He held an Airline Transport Pilot certificate, multi-engine land, a commercial pilot certificate with an instrument-airplane rating, and was a certified flight instructor and instrument instructor. He had a CL-65 type rating and a BE-1900 type rating. He had a first class medical with vision correction required.

He had a total flying time of 5500 hours, of which 3000 was pilot-in-command (PIC), 2300 of which was in the CL-65, and 1000 of which was CL-65 PIC. His prior commercial flight experience was on the BE-1900D and C-182. He flew the BE-1900D at Great Lakes Airlines as First Officer and Captain.

The first officer, age 39, was hired by Air Wisconsin on July 22, 2007. He held an Airline Transport Pilot certificate single-engine land, a commercial pilot certificate multi-engine land with instrument-airplane rating, and is a certified flight instructor, instrument, single and multi-engine land. He holds advanced and instrument ground instructor certificates with an FAA "gold seal". He has a type rating in the CL-65. He held an FAA first class medical, dated December 7, 2007 with limitations.

He had a total flying time of 2000 hours, of which 1400 was single engine, 600 multi engine, and 150 hours of turbine time, all of which was on the CL-65 at Air Wisconsin. He had worked for two years as a Certified Flight Instructor (CFI), most recently for one year at Frederick, MD, and the year before that at Chesapeake, VA. Prior to that he managed a flight school at Frederick. He had an earlier career in accounting and consulting, held a degree in accounting

and was a Certified Public Accountant.

AIRCRAFT INFORMATION:

N470ZW, a CL-600-2B19, serial number 7927, was about 3 ½ years old. Air Wisconsin acquired the airplane new. The airplane was equipped with General Electric CF34-3B1 engines. Air Wisconsin dispatch records indicate that the airplane was loaded within appropriate weight and balance criteria. Estimated landing weight was 45,052 pounds. Post-accident examination of the flight deck revealed that the anti-skid system was armed, spoilers retracted, thrust reversers armed, and flaps at 45 degrees. The speed card page for a 45,000 pound landing weight was open, which showed a Vref speed of 138 knots. There were no relevant open maintenance items in the aircraft logs. One MEL item "APU inlet door inhibited open" resulted in a speed limitation of 300 knots IAS. Flight recorder circuit breakers were found pulled.

METEOROLOGICAL INFORMATION:

The current observation at the time of the accident was reported at 2106 UTC, and indicated wind from 010 degrees at 8 knots, visibility one and three quarter miles in rain and mist, ceiling 300 feet overcast, temperature three degrees Celsius, dewpoint 2 degrees Celsius, altimeter setting 29.06 inches of mercury. Remarks indicated that drizzle changed to rain at 2058. Just after the accident weather was reported as wind 050 at three knots, visibility one and one half miles in mist, three hundred feet overcast, temperature three degrees Celsius, dewpoint two degrees Celsius, altimeter setting 28.96 inches of mercury. Remarks indicated that rain ended at 2139 and pressure was falling rapidly.

An arriving A319 ahead of the accident airplane reported that they broke out of the clouds at 300 feet. ATC reported that many arrivals reported tailwinds on the approach, which diminished at about 1000 feet.

ATC reported that at two occasions about one hour prior to the accident a readable RVR value was produced, due to an arriving airplane disturbing snow alongside the runway causing the local visibility to drop. They momentarily indicated a value of 6000 RVR and then, when the disturbed snow settled, returned to the prevailing visibility. There was no temporary obscuration at the time of the accident airplane's landing.

AIDS TO NAVIGATION:

The instrument landing system (ILS) runway 5 at PVD provides standard straight-in arrival minima of 200 feet decision height, with ½ mile visibility (lower CAT II and CAT III minima are available to appropriately equipped and crewed aircraft). The localizer component is aligned to 047 degrees magnetic, the glideslope is 3 degrees. An ALSF2, standard 2,400 foot high intensity approach lighting system with centerline sequenced flashers was installed. On Tuesday, December 18, 2007, the FAA performed a flight inspection of the facility and all parameters were found within normal tolerances.

COMMUNICATIONS:

No communications problems were noted at any time during the accident sequence.

AERODROME INFORMATION:

The Theodore Francis Green State Airport is located approximately 6 miles south of the city of Providence, Rhode Island. The airport averages about 300 operations per day, with about two

thirds of the operations comprised of major and regional air carriers. Runway 5 is 7,166 feet long by 150 feet wide and constructed of grooved asphalt. Touchdown zone elevation is 51 feet msl. The runway is marked for precision instrument operations, has in-pavement centerline and touchdown zone lighting, and is equipped with a standard high intensity approach lighting system with centerline sequenced flashing lights. The runway is unobstructed.

A field condition report at 1506 EST indicated that runway 5 was "wet with a few scattered thin patches of slush." General taxiway condition was recorded as "wet with scattered patches of packed snow/slush/ice up to 1 inch." This runway condition had been consistently reported since 1047 EST. The last treatment of the runway occurred at that time, and friction measurements were 45/49/43 mu. According to airport management after that time, the weather event had ended, the runway was wet and all pilot reports of braking action were "good." At the time of the accident the runway was reported as wet with no contamination. An Airbus 319 which arrived four minutes prior to the accident airplane reported braking action was good.

FLIGHT RECORDERS:

The Digital Flight Data Recorder was an L-3 Communications FA2100 Serial number 260909. The recorder was in good condition and the data were extracted normally. Details of the recorder and plots of selected parameters are in the NTSB public docket. FDR information was used as the basis of the performance studies and other sections of the report.

The Cockpit Voice Recorder was an L-3 Communications FA2100-1010, Serial Number 226552. The recorder was in good condition and the data were extracted normally. A CVR group was convened at NTSB headquarters and produced a transcript, which appears in the NTSB public docket.

WRECKAGE AND IMPACT INFORMATION:

The first piece of aircraft debris was located approximately 1000 feet from the arrival threshold. Two main gear pivot (pintle pin) bushings and a bracket were located on the runway. Additional pieces of fiberglass aircraft parts consistent with the main gear door were found nearby broken runway edge lights at approximately 2500 feet from the threshold. Ground tracks indicated all three landing gear were off the runway at approximately 3200 feet from the threshold, and the airplane came to rest about 300 feet left of the runway in a grass and snow covered area about 3,700 feet from the threshold, oriented on a bearing of about 320 degrees magnetic.

The flight crew performed a shutdown checklist and secured the airplane. Airport management emergency personnel responding to the accident ensured that the circuit breakers for the flight recorders were pulled.

MEDICAL AND PATHOLOGICAL INFORMATION:

Toxicological samples provided by the flight crew to representatives of Air Wisconsin Air Lines tested negative.

FIRE

None.

SURVIVAL ASPECTS:

The 3 crew members and 31 passengers were not injured, and exited the airplane via the normal airstair door. Both pilots reported that the Captain called the Flight Attendant on the interphone and asked him if there was any fire or any injuries, and that he then used the PA to say "remain seated" and "you can see what happened." However, the Flight Attendant said he did not know that they had had an accident until after he opened the door and saw damage to the airplane. The pilots ran the Immediate Action Checklist for Evacuation and shut the engines down but left the APU running. The Captain said once he was satisfied that there was no fire, his concern was keeping lights and heat to calm the passengers. He reported that Airport Rescue and Fire Fighting personnel arrived quickly, were positioned by the doors, and assisted in an orderly evacuation.

TESTS AND RESEARCH:

Results of the metallurgical testing of the left main landing gear mounting trunnion revealed no abnormal findings in visual inspections both by naked eye and under a stereoscopic microscope. No evidence of fatigue marks was noted along the fracture surfaces. Gross 45-degree shear lips were apparent throughout the primary fracture and in secondary cracks. Shear lips of this nature are typically associated with a static failure of ductile material

Electrical conductivity readings indicated the trunnion was in a sound/uniform thermal condition (i.e., devoid of segregation and/or soft spots) and the part appeared to be free of undue wear zones, arcing strikes, corrosion damage by-products and similar service defects.

The tensile properties in the trunnion were within the specified limits and no evidence of subsurface or surface defects was found which might have contributed to crack initiation.

A 2" long segment cut from the diagonal fracture in the trunnion was subject to Scanning Electron Microscope examination. Evidence of elongated dimples was apparent throughout the specimen, which are normally associated with shear failure mode in a ductile member under static load. No evidence of fatigue striations was noted on the specimen.

The materials examination concluded that the fracture in the trunnion was the result of an abnormal static loading; as would be associated with a hard landing. The trunnion functioned as designed and released the landing gear when the loads exceeded the design limits.

The left main landing gear was removed and examined at the manufacturer's facility. External visual inspection revealed no obvious signs of major damage to the gear. The cross pin holding the trunnion pin in place in the assembly could be removed with ease and rotated freely. The trunnion pin however was jammed in the housing. After removal the pin was measured to be 0.016" bent. Typical wear marks were observed on the trunnion pin. The main fitting trunnion bore was also bent, in the same direction.

The shock strut assembly, gear outer cylinder, and landing gear axle indicated no abnormalities, and dimensional checks were within tolerances.

Under the supervision of an NTSB Vehicle Performance Specialist, Bombardier Flight Sciences used a flight-test validated Level D Aerodynamic Flight Simulation Model to determine the aircraft sink rate at touchdown and to calculate the resultant load on the landing gear.

Although there are some uncertainties in the data, such as CG position, fuel loading, and wind information, the time histories for normal load factor and radio altitude are well matched. Furthermore, the time of impact is in-line with FDR analysis. The rate of descent at impact was found to be between 19 ft/sec and 18 ft/sec.

Using the most conservative 18 fps rate of descent from the simulation, and the weight on landing of approximately 45,200 lbs, yields a total landing energy of 227,403.7 ft-lbs. At the time of impact the bank angle of the aircraft was about 9.5 degrees left wing down. As the impact load reaches its peak (as the vertical acceleration peaks to 3.25g), the bank angle goes to approximately 7.8 degrees left wing down.

At the point of initial impact, both main landing gear oleos would have been fully extended. With the left main landing gear just touching the runway, a bank angle of 9.5 degrees left wing down would place the right main landing gear still about twenty inches off the ground.

With the left main landing gear oleo fully compressed on the runway, and a bank angle of 7.8 degrees, geometry shows that the right main landing gear oleo would be just beginning to compress. Thus, the majority, if not all, of the load evidenced by the vertical acceleration parameter must come from impact on the left main landing gear.

The study further calculated that between the time of initial impact of the left main landing gear and the time of impact of the right main landing gear, the aircraft rate of descent decreased by 10.67 fps. and the total energy dissipated would be 189,654.8 ft-lbs The certified reserve energy condition (14 CFR 25.723 (b)) for the CRJ-200 is based on a landing at 47,000 pounds at a descent rate of 12 fps, resulting in a reserve energy, per landing gear, of 52,546.2 ft-lbs. The performance study calculations indicate that the left main landing gear was subject to a force 3.6 times greater than the certified reserve energy condition.

ORGANIZATIONAL AND MANAGEMENT INFORMATION:

Air Wisconsin is a privately held regional airline based in Appleton, Wisconsin. The company was founded in 1965 and purchased by a group of private investors in 1993. At the time of the accident, AWAC served approximately 70 cities and carried approximately 6 million passengers per year. It operated 70 CRJ-200 aircraft under contract to US Airways as US Airways Express, with hubs at Philadelphia and Washington D.C.

Air Wisconsin maintained about 810 pilots. According to the Director of Flight Training, due to attrition, the company hired between 200 and 240 pilots in the most recent calendar year, and 300 pilots the year before. Their stated flight time minimums were 500 total hours and 125 multi-engine hours. Their normal washout ratio for new hires was 3-5% but it was 22% in 2007. They had no bonus program for new pilots and they did not do a simulator check as part of hiring employment screening.

The chief pilot stated that the experience level of the new-hire pilots was decreasing and that candidates had no 14 Code of Federal Regulations Part 121 or turbine-powered engine experience. However, four check airmen stated that they did not recall any training regarding swept-wing, high performance aircraft at AWAC, which performs significantly different from the aircraft most new hires were accustomed to flying.

According to the Chief Pilot the experience level of applicants had been decreasing because of the competition for candidates. They discovered that there was no correlation between flight time and success in training and were adjusting training to accommodate low time pilots. This comprised a planned new training "footprint" that would include two extra simulator periods and mandatory jumpseat observation, but the accident FO had not received this training. A captain who was also a CL-65 flight instructor stated that, because of constraints with simulator time, all pilots needed to complete their training during the time that had been scheduled. The director of flight training stated that the simulator, at full utilization, provided

600 hours of training per month, but that the company needed 1,000 hours of simulator training per month. The amount of IOE time provided to new-hire FOs had significantly increased because AWAC had not revised its simulator training to accommodate the needs of pilots with little or no jet experience. As a result, IOE had to be routinely extended beyond the FAA's requirement. AWAC was attempting to develop a cognitive learning tool to help identify successful pilot candidates.

During his postaccident interview, the FAA aircrew program manager discussed the circumstances of some AWAC new-hire pilots who did not successfully complete initial training. Specifically, the FAA official stated that AWAC had changed the simulator time requirements for these pilots because they had completed a type rating course (provided by another training program) before starting AWAC's training program. AWAC determined that these pilots needed fewer hours of simulator time than other new-hire pilots. However, according to the FAA official, these pilots had high initial operating experience times and "weren't getting it, so [AWAC] let them go."

Further, new-hire FOs who completed AWAC's initial training program were subject to a 1-year probationary period. However, unlike other 14 Code of Federal Regulations Part 121 operators, AWAC did not effectively conduct a program to assess the performance of probationary pilots. In addition, captains did not produce trip reports after flying with first officers, and, according to the Norfolk base manager, meetings to discuss probationary FO's progress during their first year were no longer held because the base managers were "too busy."

The FAA assigned three inspectors to manage the Air Wisconsin certificate; a Principal Operations inspector (POI), an Assistant POI, and an Aircrew Program Manager (APM). Their office was located in Des Plaines, IL near the Chicago O'Hare airport. The headquarters of Air Wisconsin was in Appleton, WI, the primary training center was in Charlotte, NC, and the crew domiciles were in Philadelphia, Washington, D.C. and Norfolk, VA. The POI stated that providing oversight of Air Wisconsin was difficult because of the required travel to Charlotte and to cities where the company flies. THE POI had not been to Charlotte to observe training since he became POI for AWAC.

The POI stated that he was not aware of the amount of time AWAC pilots needed to complete IOE, and that, if he had known, he would have been very concerned. He stated that if a lot of pilots were requiring a lot of IOE, it might indicate something wrong with the training.

Air Wisconsin had 40 check airmen, ten of whom were new. The APM did initial qualification checks on all the new check airmen in 2007, he certified five or six new Aircrew Program Designees (APD's), and he did 50% of new captain final line checks in 2007. However, the company had an exemption to 14 CFR 121.434 (c) (1) (ii) which allowed the company to substitute their own check airmen in place of an FAA inspector to observe a qualifying PIC during his Operating Experience (OE). The APM stated that it was possible for a new captain to go through the entire upgrade process and never see the FAA.

ADDITIONAL INFORMATION:

Air Wisconsin Procedures:

Flight Director and Autopilot Use

The AWAC Flight Operations Manual (FOM), CL-65 Flight Crew Manual, and Training Manual all recommended or suggested the use of the flight director and autopilot while flying

Instrument Landing System (ILS) approaches in instrument meteorological conditions; however it was not required. The autopilot and flight director were turned off by the FO during the approach. In an interview, he stated he "could have used more training on the autopilot." He further stated that his reason for turning off the flight director was to "declutter" the display and "to get the feel of the aircraft." The Captain reported that he did not know that the FO had turned off the flight director. The FO made a verbal callout when switching off the autopilot, although not in accordance with Air Wisconsin standard phraseology, and the Captain said he heard the disconnect alert tone.

After the accident, AWAC changed their automation policy. On December 28, 2007, AWAC issued a notice making autopilot and flight director use mandatory when available when weather conditions are less than 1000 foot ceiling and 3 miles visibility (1000/3).

Approach Briefings

The AWAC FOM In-Range Procedures, paragraph 12.2 stated that the following items will be briefed and coordinated:

A. ATIS (Automatic Terminal Information Service) or airport information.

B. The approach and runway to be used and chart date.

C. Approach aid frequency.

D. Approach course bearing.

E. MSA (Minimum Safe Altitude), Altitudes for initial, final approach fix, and MDA/DA (Minimum Descent Altitude/Decision Altitude)...

F. Airport or touchdown zone elevation as appropriate.

G. Missed approach point (except ILS)

H. Missed approach heading/course and altitude...

I. Confirm landing distance is adequate.

J. Acceptability of LAHSO (Land And Hold Short Operation) procedures..."

The FOM further stated: "If a precision approach is being accomplished and the weather is at or near minimums, the crew should review the visual requirements necessary to continue descent below DA to 100 ft above the TDZ (Touchdown Zone), and then, the visual conditions necessary to continue descent below 100 ft above the TDZ for landing."

Approach and Landing Guidance

The AWAC CL-65 FCM Normal Procedures stated that, "a stabilized approach means that the aircraft must be in an approved landing configuration, must maintain the proper approach speed with thrust set appropriately, and must be established on the proper flight path before descending below [1000 feet above DA]. These conditions must be maintained throughout the rest of the approach for it to be considered stabilized. When at or below the minimum stabilized approach height, descent rates in excess of 1000 feet per minute will be cause for consideration to abandon the approach." The AWAC Flight Operations Manual (FOM) stated that "A go-around should be initiated if there is a deviation from defined standards within 500 feet of the DA/MDA." The defined standards were: airspeed +/- 5 knots, heading +/- 10 degrees, localizer +/- ¼ scale, glide slope +/- ¼ scale.

The FCM noted "Touchdown of the CL-65 is usually firm. Should the PF flare too soon, airspeed will bleed off quickly resulting in a possible stall."

AWAC procedures allowed either pilot to commence the go-around procedure by calling "go around" at any time that he determines it to be necessary. After the accident, AWAC further defined the stabilized approach parameters and added a detailed go around briefing requirement to the FCM and FOM.

Pilot Information

Certificate:	Airline Transport	**Age:**	, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):		**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With Waivers/Limitations	**Last Medical Exam:**	09/24/2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	10/25/2007
Flight Time:	5422 hours (Total, all aircraft), 2298 hours (Total, this make and model), 3162 hours (Pilot In Command, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport	**Age:**	, Male
Airplane Rating(s):	Multi-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With Waivers/Limitations	**Last Medical Exam:**	06/13/2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	09/11/2007
Flight Time:	2051 hours (Total, all aircraft), 142 hours (Total, this make and model), 1867 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BOMBARDIER	**Registration:**	N470ZW
Model/Series:	CL600-2B19	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	7927
Landing Gear Type:	Retractable - Tricycle	**Seats:**	53
Date/Type of Last Inspection:	12/14/2007, Continuous Airworthiness	**Certified Max Gross Wt.:**	53000 lbs
Time Since Last Inspection:	19 Hours	**Engines:**	2 Turbo Fan
Airframe Total Time:	8929 Hours	**Engine Manufacturer:**	General Electric
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	CF-34
Registered Owner:	Air Wisconsin Airlines	**Rated Power:**	
Operator:	Air Wisconsin Airlines	**Air Carrier Operating Certificate:**	Supplemental
Operator Does Business As:		**Operator Designator Code:**	A6WA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	**Condition of Light:**	Dusk
Observation Facility, Elevation:	PVD, 52 ft msl	**Observation Time:**	2151 UTC
Distance from Accident Site:		**Direction from Accident Site:**	
Lowest Cloud Condition:		**Temperature/Dew Point:**	3°C / 2°C
Lowest Ceiling:	Overcast / 300 ft agl	**Visibility**	1.5 Miles
Wind Speed/Gusts, Direction:	3 knots, 50°	**Visibility (RVR):**	
Altimeter Setting:	28.96 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:			
Departure Point:	Philadelphia, PA (KPHL)	**Type of Flight Plan Filed:**	IFR
Destination:	Providence, RI (KPVD)	**Type of Clearance:**	IFR
Departure Time:	1600 EST	**Type of Airspace:**	

Airport Information

Airport:	Theodore F. Green State (KPVD)	**Runway Surface Type:**	Asphalt
Airport Elevation:	52 ft	**Runway Surface Condition:**	Wet
Runway Used:	05	**IFR Approach:**	ILS
Runway Length/Width:	7166 ft / 150 ft	**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	31 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	34 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	William R English	**Adopted Date:**	12/30/2008
Additional Participating Persons:	Chris Soucy; FAA		
Publish Date:	05/29/2012		
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/.		