National Transportation Safety Board
Washington, DC 20594

Brief of Accident

Adopted 12/03/2004

SEA03FA024

File No. 16787 | 01/08/2003 | Medford, OR | Aircraft Reg No. N409QX | Time (Local): 18:15 PST

Make/Model:	Bombardier / DHC-8-401
Engine Make/Model:	Pratt & Whitney / PW 150-A
Aircraft Damage:	Substantial
Number of Engines:	2
Operating Certificate(s):	Flag Carrier/Domestic
Name of Carrier:	HORIZON AIR INDUSTRIES INC
Type of Flight Operation:	Scheduled; Domestic; Passenger Only
Reg. Flight Conducted Under:	Part 121: Air Carrier

	Fatal	Serious	Minor/None
Crew	0	1	2
Pass	0	0	29

Last Depart. Point:	Seattle, WA
Destination:	Same as Accident/Incident Location
Airport Proximity:	Off Airport/Airstrip

Condition of Light:	Night/Bright
Weather Info Src:	Pilot
Basic Weather:	Visual Conditions
Lowest Ceiling:	None
Visibility:	20.00 SM
Wind Dir/Speed:	Calm
Temperature (°C):	7
Precip/Obscuration:	

Pilot-in-Command Age: 54

Certificate(s)/Rating(s)

Airline Transport; Flight Instructor; Multi-engine Land; Single-engine Land

Instrument Ratings

Airplane

Flight Time (Hours)

Total All Aircraft:	18662
Last 90 Days:	Unk/Nr
Total Make/Model:	4922
Total Instrument Time:	UnK/Nr

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HISTORY OF FLIGHT

On January 8, 2003, approximately 1815 Pacific standard time, a Bombardier DHC-8-401, N409QX, collided with an undetermined number of birds approximately four miles northeast of Rogue Valley International Airport, Medford Oregon. The airline transport pilot in the left seat received serious injuries, and was temporarily unable to perform his flight crew duties, but the first officer was uninjured. The flight attendant and the 29 passengers were not injured. The aircraft, which was being operated on a scheduled 14 CFR Part 121 flight by Horizon Airlines, sustained substantial damage. The flight crew, which had been on an IFR flight plan, departed Seattle International Airport, Seattle, Washington, at 1726.

According to the flight crew, what appeared to the first officer as a flock of seven or eight birds suddenly appeared in front of the aircraft while they were approaching Medford on a clear dark night. At the time of the event, the aircraft was descending through approximately 3,900 feet, on an extended right visual

downwind for runway 32. The birds were momentarily illuminated by the aircraft's approach lights and flare lights, but before the flight crew could take any action, several of the birds impacted the aircraft's nose and windshield. The force of the impact fractured the inner pane of the forward windshield on the captain's side of the aircraft, and numerous small pieces of the glass hit the captain in the face, scalp and chest. The captain, who was cut by the glass in several places, turned over control of the aircraft to the first officer, who asked the tower to turn up the brightness on the runway lights, because she had momentarily lost sight of the runway due to the distraction of the impact. About 20 seconds after the impact, the aircraft experienced a partial loss of electrical power resulting in the aircraft's primary navigational, flight, and avionics displays becoming inoperative. The first officer then slowed the aircraft and configured it for landing according to the checklist, while using the backup attitude indicator as her primary flight instrument. The captain then declared an emergency and advised the tower that there had been an injury to a flight crew member. During this sequence, both engine fire warning lights on the glare shield came on, but there was no audible fire warning tone, nor did either fire T-handle illuminate. After the aircraft was established on final approach, the captain was able to lean forward to read the secondary airspeed indicator and make airspeed callouts to the first officer. About five minutes after the impact with the birds, the first officer executed a successful landing at Medford.

INJURIES TO PERSONS

At the time of the impact, hundreds of pieces of glass of various sizes and shapes separated from the windshield's inner pane and traveled toward the aft wall of the flight deck. The captain, who at the time of the event was wearing special polycarbonate safety glasses, was hit in the upper torso, face, and scalp by numerous pieces of fractured glass. He sustained between 60 and 70 cuts to his face and scalp, and ultimately received approximately 20 stitches to the injuries that were severe enough to warrant such treatment. In addition to the glass that penetrated his skin, numerous smaller pieces of glass became lodged between his eyeballs and his eyelids, but did not penetrate the membrane of either surface. Many of the cuts to his forehead and scalp bled heavily, and the dripping blood interfered with his ability to see. The force of the glass impacting his face knocked his safety glasses to the floor, and when later recovered, the lenses of the glasses were determined to have been scratched and gouged by the impacting of the glass. In addition to the damage to the lenses, the frames themselves were twisted, bent, and nicked. Later, after the captain was taken to the hospital, emergency room personal spent approximately three hours removing pieces of glass from his skin and eyes. Two days after the event, the forehead, cheeks and nose area of the captain turned a light brownish-green due to the bruising associated with the force of the glass impacting his face.

The captain reported that the force of the glass hitting him in the face caused him to be stunned, dazed, and a little disorientated, but he felt that he was not totally incapacitated. He said that for the first two minutes after the impact, he was dazed and not thinking clearly, and had a hard time locating knobs and switches that he was use to manipulating on a daily basis. He ultimately was able to read the secondary airspeed indication, but had some trouble seeing because of the amount of blood that was dripping down from his forehead. During an early post-accident interview, the captain said that he felt that if the other pilot had have been incapacitated that he could have kept control of the aircraft, but in a later telephone conversation he stated that he was not sure that his original evaluation of his capability to control the aircraft during the sequence of events was correct.

DAMAGE TO AIRCRAFT

Inspection of the aircraft revealed that one or more ducks impacted the airframe in four separate locations (see diagram #1). The most forward impact point was on the centerline of the aircraft, near the top rear of the forward nose compartment (Zone 212). The bird(s) that collided with the aircraft at that point penetrated the honeycomb skin (see photo #1) and impacted the DC Contactor Box (DCCB), resulting in 18 of the 31 circuit breakers opening do to impact forces, not thermal overloading (see photo #2). The popping of the circuit breakers resulted in the first officer flying the aircraft by reference to the standby instrument pack, eventually aided by airspeed callouts from the captain. In addition to the flight instrument limitations, the Audio and Radio Control Display (ARCDU) showed numerous red fail lights, and the engine fire lights on the glare shield illuminated (there was no engine fire warning tone nor illumination of the T-

handles). The crew also discovered that there was no elevator trim, and that the nose wheel steering did not work after touchdown.

The second impact point was on a line almost directly in front of the captain at the riveted seam between the forward nose compartment (Zone 212) and the flight crew cabin (Zone 211). The impact at that location resulted in a partial penetration and a separation of the riveted seam along approximately two feet of its length (see photo #3). This impact did not directly alter the function of any electrical or mechanical subcomponents.

The third impact occurred about two feet below the first officers front windscreen, just aft of the aforementioned 211/212 rivet seam. Although the aircraft skin was dented and buckled at this location, there was no penetration.

The fourth impact area was on the windscreen in front of the captain (see photo #4). All glass panes of this window fractured, and hundreds of small irregular pieces of glass were ejected from the inner-most pane into the left side and center of the flight deck. In addition to the aforementioned injuries to the captain, the captain's seat and floor area, and most of the center console were covered with large quantities of broken glass (see photo #5). Further inspection revealed that no direct penetration of the windshield occurred, although a small amount of blood and vitreous fluid from the bird(s) passed between the edge of the windscreen and the rubber seal that holds it in place on the airframe.

METEOROLOGICAL INFORMATION

According to the crew, at the time of the accident there were no clouds of any type in the sky around Medford. The night was dark and clear, and the visibility was good enough that they had clearly seen the lights of Medford while more than 90 miles north of the city. The temperature at the airport was seven degrees centigrade, and the dew point was zero degrees. The winds were clam.

ADDITIONAL DATA AND INFORMATION

After the accident, the pilot's windscreen was removed from the aircraft and delivered to the NTSB for further inspections and evaluation. After an initial inspection at the NTSB's Northwest Regional Office, the windshield was transferred to the facilities of Sierracin/Sylmar Corporation, the manufacturer, for a multi-party NTSB-supervised inspection and evaluation. During this process it was determined that this windshield (Sierracin P/N 802600-07, S/N 317) is a three-pane windshield, consisting of an outer "sacrificial" glass pane, a middle (buried) chemically tempered (strengthened) structural glass pane, and an inner (toward the crew) chemically tempered (strengthened) structural glass pane. All three panes are of different thicknesses, and the outer and inner panes are joined to the middle pane by two adhesive interlayers (one on each side of the middle pane). The inspection process determined that all three glass panes met the thickness requirements of Sierracin/Sylmar Acceptance Test Procedure 02-74-300-444, Revision E, and the two chemically strengthened panes met the surface compression (strength) requirements of Sierracin/Sylmar Acceptance Test Procedure 02-74-300-495, Revision A.

Further inspection of the windshield determined that on each pane there was a clearly discernable point from which a series of fracture lines ran radially out to the border of the pane on all four edges. On the outer pane, this point was located approximately six inches from the aft edge and three inches down from the top. On the center (imbedded) pane, the radiation point was located six inches from the aft edge and one-half inch directly above the point on the outer pane. On the inner pane, this point was located about eleven inches from the aft edge of the pane, and eight inches from the top edge. The direct-line distance from the radiation point on the outer pane to the radiation point on the inner pane was approximately eight inches (see diagram #2). It was also determined that when the windshield was inspected on the ground after the accident, but prior to being removed from the aircraft, neither of the adhesive interlayers had failed, and no portion of the bird(s) had penetrated the windshield itself. It was also noted that in less than one-tenth of one percent of the surface area of the inner pane did the glass separate from the adjacent adhesive interlayer. Instead, the large number of small pieces of glass that were ejected into the flight deck area separated

intergranularly from a deeper layer of the inner pane itself (spalling).

A review of the Federal Aviation Administration and Transport Canada regulations that dictate the design, construction, and testing parameters for windshields in pressurized transport category airplanes (Part 25.775 for both), determined that the penetration limitation requirements defined there do not directly address multiple bird impacts of the same windshield.

Remains of the birds that impacted the aircraft were collected and sent to both the Smithsonian National Museum's Department of Natural History and to the United States Department of the Interior's Fish and Wildlife Service. Both institutions identified the subject birds as Lesser Scaups (Aythya affinis), a diving duck with an average body weight of just under two pounds. According to the Fish and Wildlife Service, the Lesser Scaup is a regular visitor to the lakes and ponds in the county within which the Medford Airport is located (Jackson County). The Wildlife Service's forensic ornithologist further stated that Lesser Scaups often migrate after sunset.

The National Transportation Safety Board determines the probable cause(s) of this accident as follows.
The fracture and spalling of the inner-most pane of the aircraft's port side windshield while on a downwind for a night visual approach due to an imposed load beyond that required for windshield certification (multiple bird strikes). Factors include a dark night, and a flock of ducks (Lesser Scaups) flying in the location of the visual traffic pattern.