



# Aircraft Accident Info:

2005, August 2 - Toronto, Ontario: Air France Airbus A 340, Flight 358

**Report No 10** (August 10, 2005)

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## Introduction

During a fierce thunderstorm at Pearson International Airport, an Air France Airbus 340 with 309 people aboard skidded off the end of runway 24L at 4:09 pm. The plane overshot the East-west runway by approximately 200 meters (660 feet), crashed through barriers and fell into a small ravine near a stand of trees close to the busy highway 401. A short time later the plane burst into flames.

Everyone was able to evacuate the plane before it was fully engulfed in flames and none of the 297 passengers and twelve crew aboard Air France Flight 358 arriving from Charles de Gaulle Airport in Paris died.



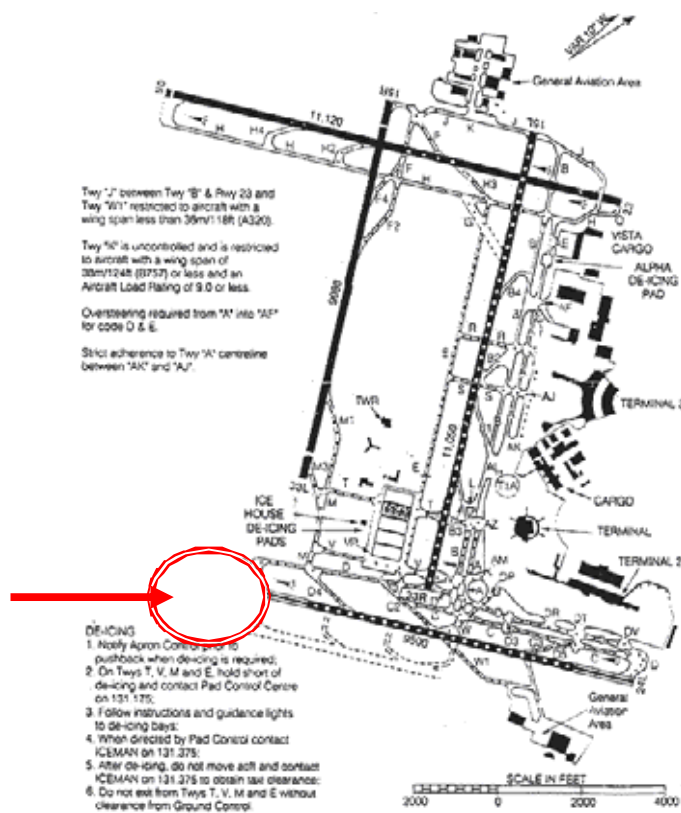
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Up to 43 passengers have been reported injured so far, at least thirteen have been hospitalized, including a nine-month-old infant that was taken to Toronto's Children Hospital.

The burning wreckage and clouds of black smoke were seen on live video captured by different sources including CTV cameras at highway 401. Firefighting efforts continued for several hours.



The crashed airplane was an Airbus A340-300 with the registration number F-GLZQ and it has been in service since 1999. The aircraft was last inspected on July 5, and it had flown 28,418 flight hours across a total of 3,711 flights.



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## Crash sequence

The following is an excerpt of a conversation that took place on Tuesday, August 2, 2005 between air traffic controllers at Pearson International Airport and pilots looking to land, including Air France Flight 358:

**Air Traffic Control: Air France 358 (inaudible) approach 24 left.**

**AF358: ...24 left.**

**Air Traffic Control: ...Air France 358 reduce speed now to 160 knots.**

**AF358: Reducing to 160, 358...**

**Air Traffic Control: Air France 358 slow to your final approach speed.**

**AF358: (Pilot response inaudible)**

**Air Traffic Control: Correct, minimum speed Air France 358...**

**Air Traffic Control: ...Air France 358 contact Toronto tower at the (inaudible) frequency 118.35...**

*Air Traffic Control: ...AM691 keep me advised if you require any deviation off the approach course. I'm showing what appears to be now some lightning at your 12:30 over to your 2:30 position at a range of about six miles.*

*AM691: Yeah, we've got it on the radar...*

*Air Traffic Control: ...Air Canada 1105 still 150. You'll go through the approach course. I'm going to run you down to the south towards Downsview Airport, get you around some of the heavier weather I'm showing right now in the vicinity of Downsview Airport...*

*Air Traffic Control: ...AC1105 turn right to the heading of 220 degrees. Going to parallel 24 left a little bit. Once you are on the west side of the weather, I'll bring you back to the approach course...*

*AC1156: ...Air Canada's 1156 is showing that weather at about 11 o'clock at about 10 miles.*



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*Air Traffic Control: Yeah, 1156, you are going to have to turn back here very shortly. Turn left at a heading of 320 degrees now...*

*Air Traffic Control: ...Air Canada 1105, apparently we've had an aircraft slide off the end of the runway. You will not be landing on runway 24 left. Your approach clearance is cancelled...*

*AC1105: Air Canada 1105 requesting (inaudible) direct London.*

*Air Traffic Control: Air Canada 1105, roger. Steer heading 220 degrees now and continue to climb to 6,000...*

*Air Traffic Control: ...Air Canada 1105, we'd like an expeditious climb through 5,000...*

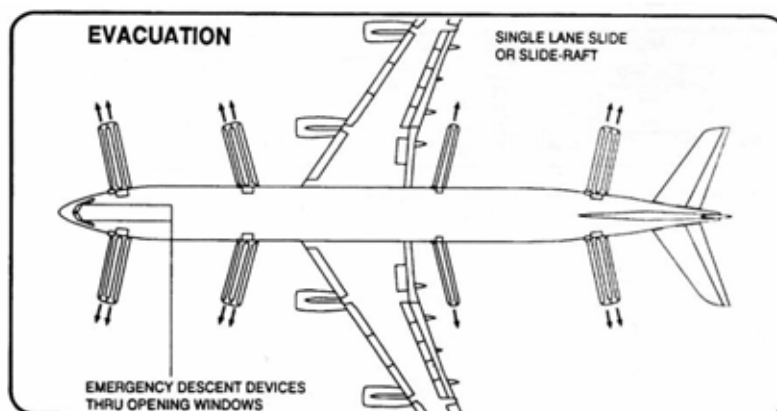
*Air Traffic Control: Air Canada 1156, I would suggest you probably want to go to your alternate now, I think the airport is going to be closed for quite a while.*

After a "long" touch-down (at least 1,500 feet or 500 meters further down the runway than usually) on the 9,000-foot runway 24L the flight crew used emergency braking at least during the last 1,600 feet before skidding of the end of the runway at a speed of about 150 kilometers/hour (95 miles per hour). The airplane ended up in the ravine of Etobicoke Creek 200 meters away.

## Plane Occupants and evacuation

After the aircraft came to halt in the ravine, the occupants tried immediately to escape from the wreckage while flames were visible outside the fuselage. Four of eight doors of the A 340 failed to open or were not opened. One of the used doors was difficult to open. In addition two emergency slides failed to deploy properly. It is not known as of yet whether this was caused by a failure of the device itself or improper handling by crew members or passengers (i.e., pulling the slide/raft disengage handle).

**Graphic showing the eight available exits at an Airbus A 340 aircraft:**





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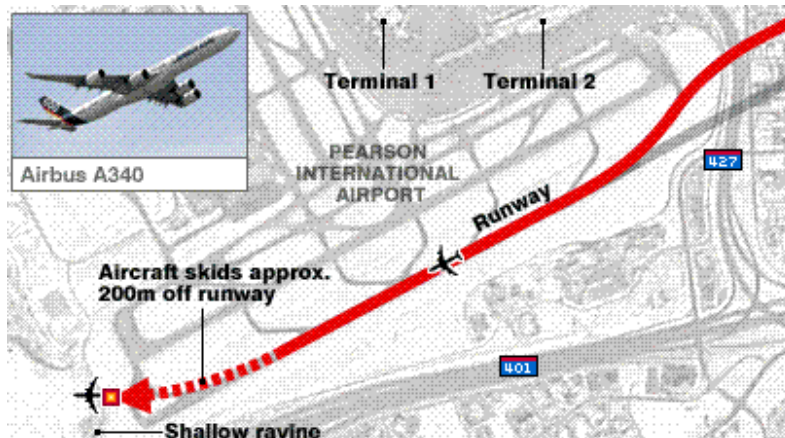
Despite these significant flaws all 309 occupants, including small children and seniors were able to leave the plane in less than 3 minutes. According to photo images and witness accounts some people were even able to take heavy carry-on luggage with them.

Very early into the incident, it was confirmed to on-site responders that all occupants had left the plane. However, their whereabouts were unknown for quite some time. Many people had fled the burning crash-site through the creek toward Highway 401. At the highway they were picked-up by private vehicles, airport busses, and ambulances. A Mississauga fire engine that initially responded to a minor traffic accident on Highway 401 also assisted those survivors.

Some of the injured were not able to evacuate far away from the aircraft. Those persons were removed by fire personnel, including one individual that was discovered and rescued by Mississauga fire personnel from under the wing of the aircraft.

It took the authorities gathered in the Airport Emergency Operations Center more than 4 hours, until 20:00 local time, to account for all aircraft occupants and determine their whereabouts.

The nationalities of the 297 passengers and 12 crew members: 101 French, 104 Canadian, 19 Italian, 14 US, 8 Indian, and 7 British citizens.



## Toronto Lester B. Pearson Airport (YYZ)

With nearly 30 million passengers and more than 380,000 aircraft movements annually, Pearson is Canada's busiest airport. The facilities have been operated by the Greater Toronto Airports Authority (GTAA) since December 1996 and handle today up to 1,200 flights daily (including more than 50 flights to international destinations) and up to 80,000 passengers.



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The airport is in operations 24 hours and is located west of Toronto (exact latitude 43.677222, 43° 40' 38.00" N; longitude -79.630556, 079° 37' 50.00" W) at an elevation of 569feet (173meters).

Communications and frequencies: tower 118.35, 118.7, and 236.6.

## **Runways**

Runway 05/23: Part Concrete, Part Asphalt 11,120 x 200 feet (3,389 x 61 metres)

Runway 15R/33L: Asphalt 9,088 x 200 feet (2,770 x 61 meters)

Runway 06L/24R: Asphalt 9,697 x 200 feet (2,956 x 61 meters)

Runway 06R/24L: Asphalt 9,000 x 200 feet (2,743 x 61 meters) ILS equipped

## **Previous accidents at Pearson Airport**

On July 5, 1970 an Air Canada DC-8 jet, en route from Montreal to Los Angeles, went down north of the airport, killing all 109 people aboard.

On June 26, 1978 an Air Canada DC-9 overran runway 24R during an aborted takeoff and crashed. Two of the 107 people aboard died.

## **Toronto Airport Fire Rescue Services**

According to a recent article in a firefighting trade magazine, the airport maintains the following emergency equipment:

2 x 1998 Oshkosh TI-1500 Red 1 & Red 4

2 x 1994 Oshkosh T-3000 Red 2 & Red 5

2 x 1998 Oshkosh TI-3000 with 50' Snozzles Red 3 & Red 6

1 x 2000 Ford F-550/Crestline rescue-ambulance Red 7

2 x 2001 E-One Cyclone II structural engines Red 8 & 11

1 x 2002 GMC K-3500/Almonte mini-pumper Red 12

The airport fire service consists of 85 firefighters operating from two fire houses, South Station and North Station. Odd number units are located at the South Station while even number units are assigned to the North Station. The current Chief, Mike Figliola, worked with the City of Toronto Fire Department for 16 years, before joining the Airport Fire Department as a Deputy Chief in 2001. In 2004 he was named the Chief of the Department.

Chief Figliola reported that his fire department was on scene within 52 seconds of the plane's running 200 meters off the end of the runway. By the time fire crews arrived, three-quarters of the passengers had already disembarked and all were off by the time the plane burst into flames.

The plane's co-pilot was the last person off, and, according to Chief Figliola, "*did a quick walk through the plane from front to back and came off and told our guys there was nobody left.*"

The aircraft had crashed through two security fences into a ravine with the nose down. According to the airport fire chief only two crash trucks could attack the fire



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at one time. The ARFF vehicles would pump their foam loads on the burning aircraft and have to pull out to let the next in. Eventually a bull dozer was used to make the terrain accessible to several trucks. It took nearly 12 hours to extinguish the fire.

Including the airport's structural firefighting engines and two light rescue squads, a total of 60 airport fire personnel responded. Mutual aid companies from Mississauga and Toronto Fire Departments provided hand lines and manpower for evacuating some of the immobile injured from the site. One firefighter is reported to have suffered from dehydration.

Quotes from two US Airport Fire Fighting professionals after viewing the fire fighting operations on Live-TV: *"Seemed like it took forever to get any agent flowing, but it also looked like the plane may have been down along a creek or something..."* – *"It looks like they were puttin out plenty of agent, but the wind and location of the plane were hindering the extinguishment of the rear fuselage section near the tail..."*

The rather casual and defensive fire fighting efforts, as seen on live TV, can easily be explained by the circumstances. The terrain (ravine, slippery slopes, limited access), the weather, fuel, and the fire itself provided a hazardous environment for fire personnel. Since fire commanders knew that all occupants had evacuated the aircraft and that the Airbus A 340 was already destroyed by impact forces there was no need to endanger fire personnel or valuable ARFF equipment.

## **City of Mississauga Fire and Rescue**

The city of Mississauga in the Regional Municipality of Peel surrounds nearly the entire property of Toronto Pearson airport. The city, population 700,000, maintains a Fire & Emergency Service Department under the leadership of Fire Chief Garry Mordon with 632 personnel working on four shifts operate out of 20 fire stations. First line apparatus currently numbers in excess of 28 units including 18 engine companies, 7 aerial ladders, 3 rescue units, 1 hazardous response vehicle, and various support vehicles. Four stations (No. 105, 109, 116, 119) are located very close to the airport.

According to Chief Mordon, Mississauga Fire/Rescue participates regularly in full-scale and table-top exercises at Toronto Pearson Airport which led to a well coordinated fire and rescue operations with clear communications and command at the crash-site.

Mississauga Fire/Rescue dispatched a First Alarm assignment at 16:02 to a "1-Alpha" emergency (Aircraft Crash on Airport Property). After arrival at the airport seven minutes later, the fire units were escorted to the crash site. On-site the Mississauga Fire/Rescue officer requested a "second alarm". In all nine front-line



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apparatus (engines and aeriels) and four specialty vehicles, including lighting and air supply units, with 35 firefighters and 3 chief fire officers were dispatched. The last fire apparatus from Mississauga left the crash site the next day (Wednesday) at 20:15. Chief Morden responded to the Airport Emergency Operations Center.

## **Water Supply**

The crash site at the (western) end of runway 24L did not have a water hydrant system. Subsequently the Region of Peel dispatched five water tankers from municipal volunteer fire departments to the site (four from the City of Campton, another one from the City of Caledon).

## **Additional response factors**

It is important to note that the Peel region and particularly the City of Mississauga were at the same time hit by the severe thunderstorm that may have contributed to the crash. Other units from Mississauga Fire department had to respond to additional 31 emergency calls during the height of the storm (i.e., storm damage, fire alarms caused by lightning strikes, power interruptions) from 16:00 to 18:00.

## **EMS and ambulance response**

Lester B. Pearson International Airport is located within the Municipal Region of Peel (comparable to a county in the United States). The Peel Regional Ambulance Service is the exclusive EMS provider in the region.

To the east, the airport borders the City of Toronto. The Metro Toronto Ambulance Services responded as well.

## **Peel Police**

The Region of Peel maintains its own regional police forces that responded to the crash site as well as to Highway 401. Additional information about their activities is not available at this time.

## **Continuity of flight operations**

Subsequent to the crash, other flights scheduled to land at Pearson were diverted to airports in Ottawa, Montreal, and Winnipeg. Many flights from WestJet had been cancelled and Air Canada had cancelled all domestic and U.S. flights to and from Toronto until Wednesday morning (August 3).

A KLM Boeing 747 (flight 691) with 443 passengers on board en-route from Amsterdam was scheduled to land at Pearson airport shortly after the wrecked Air France flight 358. The flight crew declared a fuel emergency after the closure of Toronto airport. The aircraft was diverted to Hancock Int'l. Airport in Syracuse, New York State with less than 30 minutes of fuel left.





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## **Air France**

Air France was officially inaugurated at Paris-Le Bourget Airport in October of 1933 following the takeover of the assets of the bankrupt Aéropostale. According to its website, Air France-KLM with a fleet of 375 planes and 1,800 daily flights is today the largest European passenger carrier. In the last fiscal year the airline carried 43.7 million passengers to 84 countries around the globe.

Aside from the August 2, 2005 crash in Toronto, Air France passenger planes have had at least 20 major accidents since 1950. These crashes involved more than 1,184 people onboard the planes; of those 1,025 died and only 125 survived.



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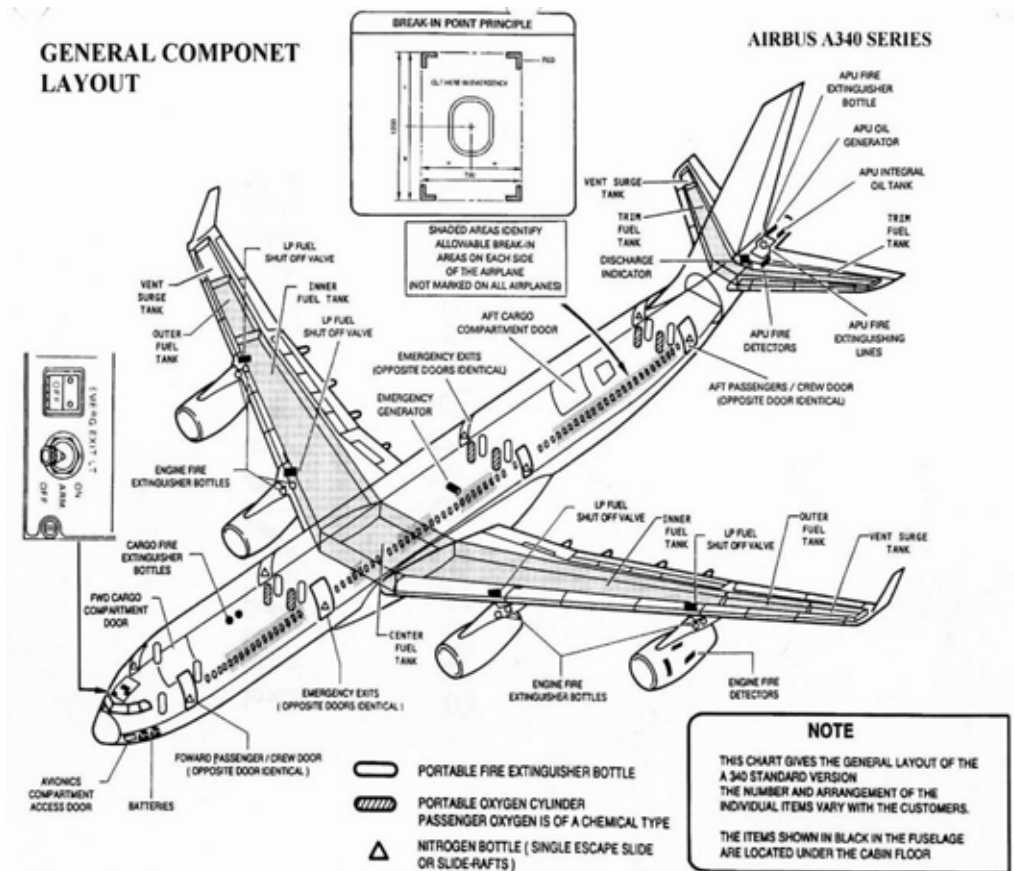
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### Airbus A 340

The A340 is a long-range aircraft powered by four CFMI engines. The first model flew in 1991. The A340-300 carries 295 passengers in a typical three-class cabin layout over 6,700 nautical miles (12,400 kilometers). After fixing some design flaws in the first model the modified A340-300 began commercial service in 1993 with Lufthansa and Air France.

The specifications and dimensions for an Airbus A340-300 include:

- Wing span 60.30m (197ft),
- Length 63.70m (209ft),
- Height 16.74m (54ft 11in),
- Cabin Width 5.28m,
- Wing area 363m<sup>2</sup> (3,900sq ft);
- Landing speed: 140–150 knots (170mph or 270km/h);
- Weight: operating empty 129,800kg (286,150lb),
- Max takeoff load 260,000kg (573,200lb).
- Max fuel capacity between 141,500liters (37,384usg) and 155,040liters.



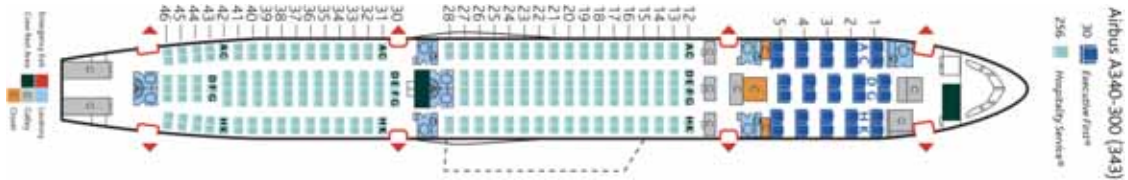


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## Typical A340-300 Seating Arrangement:



## Other A 340 incidents:

To date a few accidental events involve an Airbus A 340. On January 20, 1994, after a completed check, an empty Air France Airbus 340 was pulled from the maintenance hangar to the terminal at Paris-Charles de Gaulle Airport. A fire broke out probably due to the overheating of a hydraulic pump operating the aircraft cargo doors. The airport fire services were not able prevent the aircraft from being damaged beyond repair by the fire. Nobody was reported injured.

Other significant incident reports include a landing gear failure at London Heathrow airport on November 6, 1997, another main gear collapse of a Sabena Airbus 340 during landing at Brussels airport on August 28, 1998, and a runway overrun by a Singapore Airlines A340 during takeoff at Johannesburg airport on April 9, 2004 (*"aircraft initially failed to respond to control inputs for rotation"*)

## Other accidents

On September 14, 1993 a Lufthansa Airbus A 320 (not an A 340!), flight no. 2904 skidded off the end of the runway during landing in severe weather and heavy rain at Poland's Warsaw airport. The aircraft touched down with sink rate low enough that the onboard flight computers did not consider it to be "landing," which inhibited thrust reverse and brake application for at least nine seconds. Two of the seventy people aboard died and many others were injured. The airplane was destroyed in the subsequent fire. Since this accident shows some similarities at this point in time (August 5), a summary of the Warsaw accident can be found in Annex 1 of this report.

## Lightning strike

On Friday, August 5 Transport Safety Board investigators concluded that the aircraft has not been hit by lightning during landing or on the ground.

## Accidents caused by wind shear

Wind shear is a sudden change in wind speed or direction. The most dangerous form is called a microburst and is caused by air descending from a thunderstorm. Since 1960 more than 30 major passenger plane crashes have been attributed to wind shear as a contributing factor.



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However, on Thursday, August 4 Transport Safety Board investigators concluded that nothing went wrong with the A 340 until it was on the ground. This makes wind shear an unlikely culprit.

## **Cause of THIS accident**

The accident investigation by Canada's Transport Safety Board (TSB) is headed by Réal Levasseur. As usual representatives from Air France (airline chairman Jean-Cyril Spinetta) and Airbus will assist in the investigation. So far it is known that the co-pilot was in control during the landing. On Thursday, August 4, TSB suggested that nothing went wrong until the plane as actually on the ground. The plane touched down on the 9,000 feet (2.7 kilometers) long runway 24L at a speed of about 140 knots (260 kilometers/h). When the A 340 sped off the runway into the ravine it was still traveling at a speed of about 80 knots (150 kilometers/h).

The investigators determined (August 4) that at all four thrust reversers were working normally on landing and had been deployed. The thrust reversers account less than 10% of the plane's stopping ability; the speed of an aircraft is mainly reduced by the actual wheel brakes and the spoilers -- flaps on the wings that swing up on landing.

The flight data recorder and the cockpit voice recorder were recovered on Wednesday, August 3. On Thursday, August 4, the Canadian Safety Board discovered they don't have the software and equipment needed to read the aircraft's flight recorders. The recorders have been sent to France, where the "Le Bureau d'enquête et d'analyse des accidents" will analyze the data.

According to the investigators statement from Monday, August 8, the spoilers worked properly, and there were no indications "*that the aircraft's system, structure or controls or anything like that would not have been working properly*". This included the aircraft's engines and brake pressure. It was also determined (August 5) that the aircraft was not struck by lightning during its landing.

So far the cause of the crash is still speculative. It might have been a failure of other equipment, such as landing gear, steering systems, or a computer malfunction in the highly complex aircraft, hydroplaning of the runway, flight crew error or a combination of factors.

## **Runway Overruns**

Runway overruns, particularly in severe weather, are rather common and the cause for a number of fatal crashes. Two days before the A 340 accident in Toronto an Air India Boeing 747 (flight AI 127) skidded off the end of a wet runway at Mumbai Airport, India. None of the 333 passengers aboard was injured and the aircraft sustained only minor damages.



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On June 1, 1999 American Airlines flight 1420 overshot the runway at Little Rock airport in Arkansas during a severe thunderstorm. The MD-80 aircraft landed about 2,000 feet into a 7,200-foot-long runway. Wing-mounted slats called spoilers, which pop up to slow a plane when it lands, were not deployed either manually or automatically. After sliding off the runway, the plane went down an embankment, slammed into a line of approach lights, cracked into at least three pieces and erupted into flames. Eleven occupants, including pilot Richard Buschmann, were killed and more than 80 of the 145 people aboard were injured. It took more than 15 minutes for airport emergency crews to locate and reach the crash site on airport premises.

On September 23, 1999, at about 22:47 local time, a Qantas Boeing 747 (Registration VH-OJH) overran runway 21 Left (21L) while landing at Bangkok International Airport, Thailand. The aircraft landed long and aquaplaned on a runway which was affected by water following very heavy rain. The aircraft sustained substantial damage during the overrun. None of the three flight crew, 16 cabin crew or 391 passengers reported any serious injuries.

On March 6, 2000, at 18:11 local time, a Southwest Airlines Boeing 737 (flight 1455) with 142 people (137 passengers and 5 crew) aboard skidded off the end of a rain-slicked runway in Burbank, California. The jet smashed through an airport fence and ran into a Hollywood way, striking two cars on the busy five-lane highway.

On October 6, 2000 an Aeromexico DC-9 overshot the runway in the town of Reynosa near the U.S. border while landing in a heavy rainstorm. The aircraft crashed into a neighborhood.

## Aftermath

### Legal actions

Days after the accident Toronto lawyer Paul Miller, representing passenger Suzanne Deak of Toronto as the lone plaintiff, filed a class-action lawsuit on behalf of all 297 passengers on board. According to the law firm's website Paul Miller was called to the Bar in 1997 and is a partner with the law firm of Will Barristers: Morin & Miller.

The plaintiff accuses Air France, the Greater Toronto Airports Authority (GTAA) and Nav Canada -a private civil air navigation service that provides airports weather and aeronautical information- of negligence in landing the Airbus A340.

### Internet resources

[www.gtaa.ca](http://www.gtaa.ca)  
[www.tsb.gc.ca](http://www.tsb.gc.ca)

Greater Toronto Airports Authority  
Transportation Safety Board of Canada



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[www.airfrance.com](http://www.airfrance.com)

[www.airbus.com](http://www.airbus.com)

[www.edmus.info](http://www.edmus.info)

Air France

Airbus Industries

Emergency & Disaster Management, Inc.

## To be determined:

- ✍ Which four of the eight (emergency) exits have been used for evacuation?
- ✍ Which of the chutes did not deploy properly?
- ✍ Why were passengers allowed / able to evacuate with bags and --- according to news photos- even with heavy carry-on luggage?
- ✍ What were the initial actions of first arriving emergency crews?



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## IMAGES





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Passengers: Johnny Abedrabblo (Toronto), Mohammed Abou-Hantash (Mississauga, Ontario), Naim Ayat (San Francisco), Roel Bramar, Martine Chrocca, Maria Cojocar (North York, injured) with seven-year-old girl and three-year-old boy, Suzanne Deak (Toronto), Olivier Dubois (French), Ms. Gwen Dunlop, Eddie Ho, Veronique and Phil LaCaillé with two children (Aurora, Ontario), Veronica Laudes, Gilles Medioni, Enrico Jaccomuzzi Moore and wife (injured, broken vertebrae), Samantha Todd.





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Annex 1

**1993, September 14 - Lufthansa Airbus A 320, Registration D-AIPN, Flight DLH 2904 from Frankfurt/Germany to Warsaw/Poland with 2 flight crew, four cabin crew, and 64 passengers**

Approaching Warsaw to land on runway 11, the flight crew were told that an earlier landing aircraft had experienced severe windshear on final approach. The pilots were given an airport wind of 25 km/hr (13knots) at 1600, 10knots headwind/8knots crosswind. The crew elected to make a manual approach, without autothrottle and `autobrake' landing mode. Following company practice in windshear conditions they chose a speed about 15knots above the normal reference speed (145knots instead of 130knots). From the CVR, it is evident that they were monitoring wind speed carefully throughout the approach. Analysis of the data shows that at between 300feet and 200feet altitude there was a tailwind of around 25knots, gusting +/- 5knots. (Aircraft Flight Manual limit was 10knots). At about 150feet the wind changed to a 15knot tailwind, gusting +/- 5knots. This was commented on by the crew, but they made no throttle adjustment. The airspeed increased to 155knots +/- 5knots, and the aircraft rose slightly above the ILS flight path.

At 50feet the airspeed was 159knots, and the tailwind about 15knots. The landing flare was longer than usual, and the aircraft touched down on one wheel, apparently conforming with company practice for a crosswind landing. De-rotation was normal, but the aircraft was still held with one wing high, so that for some time, only the right main wheel and the nose wheel were in ground contact. The runway was flooded, with standing water to a depth of 3mm. The logic to trigger deployment of reverse thrust and lift dumpers required either both main wheels to be on the ground (signaled by position switches on the landing gear torque links), or one main wheel on the ground and a rotational wheelspeed equivalent to a ground speed of at least 72knots. Brake application depended on the mainwheels spinning up to 80% of a computed reference speed, which is normally the rotational equivalent of ground speed, with special treatment during the transitional touchdown "spin up" phase. Because of the excess airspeed, the aerodynamic lift was much greater than normal, so that the ground reaction on the landing gear was very low. Taken in conjunction with the flooded runway, this provoked hydroplaning of the tires in contact with the runway, so that they never got up to the required rotational speed, and brake application and the application of spoilers/ reverse thrust was delayed. The aircraft slithered along the runway for a further 9 seconds, until aerodynamic and aquaplaning drag had reduced the speed sufficiently to compress both main gears (the other wheel having by now been put onto the runway). Once the automatic sequence had been triggered, the aircraft started to decelerate, but the deceleration was significantly lower than



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*normal, even for a wet runway. When it became clear that the aircraft was not able to stop on the runway length, the crew decided to veer off to the right. Because of the low runway friction -although the aircraft heading changed- the trajectory continued more or less along the line of the runway until the aircraft collided with an embankment, with major impact and subsequent fire.*

*The aircraft rolled over the end of runway with a ground speed of 72 knots and having passed the next 90 meters collided by its left wing with the embankment, slipped over it destroying LLZ aerial located on the embankment, and stopped right behind the embankment. In effect of this movement the landing gear of the aircraft and the left engine were also destroyed.*

*Evacuation of passengers, organized by 4 persons cabin crew in conditions of commencing aircraft fire, contributed to rescue of 63 passengers of 64 on board. As far as 2-person cockpit crew is concerned, the left-seat pilot survived (injured), the other one, seated in the right seat was killed outright.*