Hard landing, Boeing 767-300, I-DEIL, May 22, 1997

Micro-summary: **This Boeing 767-300 was damaged when landing in gusty conditions.**

Event Date: **1997-05-22 at 1438 EDT**

Investigative Body: **National Transportation Safety Board (NTSB), USA**

Investigative Body's Web Site: **http://www.ntsb.gov/**

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1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).

2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***

3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.

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National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: NYC97FA098	Aircraft Registration Number: IDEIL
Occurrence Date: 05/22/1997	Most Critical Injury: None
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
NEWARK	NJ	07101	1438	EDT	

Airport Proximity: On Airport	Distance From Landing Facility:	Direction From Airport:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Boeing	767-300	Airplane

Sightseeing Flight: No Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

HISTORY OF FLIGHT

On May 22, 1997, at 1438 eastern daylight time, a Boeing 767-300, I-DEIL, operated by Alitalia Airlines as flight 600 (AZA 600), was substantially damaged while landing at Newark International Airport (KEWR), Newark, New Jersey. The 10 crewmembers, and 158 passengers were not injured. Visual meteorological conditions prevailed for the scheduled international passenger flight that originated at Milano, Italy. Flight 600 was operated on an instrument flight rules (IFR) flight plan under 14 CFR Part 129.

According to air traffic control records, from the Federal Aviation Administration (FAA), the following Automatic Terminal Information Service (ATIS) was in effect at the time that flight AZA 600 arrived in the New York terminal area, and remained in effect through the time of the accident.

"Newark tower information whiskey one seven five one zulu, wind three five zero at two four [knots], visibility one zero [miles], ceiling seven thousand broken, temperature one seven [Celsius], dewpoint one [Celsius], altimeter two niner niner four, i l s four right approach in use, landing runway four right, departing runway four left...low Level windshear advisories are in effect...."

Flight 600 made initial contact with the New York Terminal Radar Approach Control (TRACON) at 1412, and was told to expect an ILS Runway 4R approach, and was issued the current altimeter. About 10 second after the initial contact, the crew from flight 600 reported they had information WHISKEY, which was acknowledged by the controller.

Examination of the air/ground voice communications tape from Newark Air Traffic Control Tower revealed that at 1427:55, and again at 1428:09, the local controller reported to arriving airplanes:

"...gain or loss of fifteen knots below three hundred feet reported by several aircraft."

At 1432:47, Flight 600 made initial contact with Newark air traffic control tower and transmitted, "newark tower good afternoon alitalia six hundred heavy intercepting zero four right I l s."

At 1432:52, the local controller replied, "alitalia six hundred heavy newark tower good afternoon runway four right number five wind three four zero at one seven gusts two niner cleared to land."

Flight 600 replied, "cleared to land number five alitalia six hundred copy wind."

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At 1434:02, the local controller transmitted to a departing flight, "...wind three four zero at one six...."

At 1434:27, flight 600 was advised of a nearby helicopter which was acknowledged.

At 1434:57, the local controller transmitted as part of a landing clearance to a preceding flight, "...wind three three zero at one seven...."

At 1435:16, the local controller began a relief briefing which was not transmitted outside of the facility, but was recorded on the air/ground communications tape. The relief briefing was interrupted twice, and continued at 1435:52, and again at 1437:25, when it was completed. The controller being relieved stated in part, "...two nine belongs to you its active its available...just waiting for your use...some guys been requesting [it] as the wind gusted up...your weather is v f r the winds have been doing this I've been getting gusts up to 40...[there] was a loss gain or loss of fifteen knots below three hundred by several aircraft maybe about fifteen minutes ago...."

At 1437:29, the voice on local control had changed.

At 1439:05, the local controller transmitted, "alitalia six hundred heavy left turn left turn sir", and flight 600 replied, "...negative negative alitalia six hundred heavy...our gear has collapsed we have to stop this position."

Emergency response equipment was notified, and the passengers were eventually offloaded by the use of portable stairs.

The captain stated:

"We were cleared for the approach (ILS RNWY 04R); our indicated airspeed was 180 knots. We contacted the EWR tower and were cleared to land 04R, number five. Wind was reported 330/19/29. Our reference speed was 135 knots and, based on the reported winds, we adjusted our speed to a target of 150 knots approximately 7 N. miles from the airport."

"We cleared the fence stabilized in all respects on the approach. Well below 50 ft, AGL, the aircraft windshear detection system was activated. Within 2-3 seconds thereafter, the aircraft's left main landing gear touched down, followed by the right main and nose gear in that order. Given our altitude, speed, and power settings, we did not have an opportunity to react. We were, however, able to maintain directional control of the aircraft and prevent further damage to the aircraft and any injury to our passengers, who were safely evacuated via moveable steps."

A follow-up interview with the captain by an NTSB Investigator disclosed:

"...The captain observed the FO leaning forward during the impact, and the captain stated that the hardest impact was on the nose gear. Once the nose gear touched down, the crew kept the airplane on the runway with the yoke. After impact, the captain recognized that the power levers were not at idle, and he reduced the power levers to the idle position and into reverse. The speed brakes, which were in the armed position, deployed once the captain reduced the power levers to idle. Also, after impact, the steering was not working and the nose of the airplane was slightly tilted to the right side...."

The first officer stated:

"...After touchdown and the sudden dropping of the nose-gear to the runway, (as described by Capt. Vincenti), I was pushed forward and in the process, also pushed the yoke forward. Upon recovery,

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we immediately commenced appropriate roll-out procedures, which included placing the throttle to idle, this stopping the aircraft."

A follow-up interview with the first officer by an NTSB Investigator disclosed:

"When asked what 'target speed' was, the FO stated it was the approach speed (Vref 135 KIAS) plus 15 knots. This is predetermined by Alitalia's policy which calls for adding half the headwind component plus the gust. The minimum and maximum that can be added are 5 and 20 knots respectively. The headwind component was determined to be 5 knots with the wind 60 degrees off of runway centerline, plus the gust factor provided a plus 15 knots component to Vref."

"During the approach, as the airplane descended through 1,000 feet, the airspeed was dropping from 150 to about 145 KIAS. The airspeed then increased from 150 to 160 KIAS, at which time the FO reduced the power levers. There were small corrections made for airspeed throughout the approach. The airplane crossed the runway threshold below 50 feet above ground level (AGL). The airplane then rolled left which the FO corrected. The Ground Proximity Warning System (GPWS) then gave one wind shear warning alert, followed by the airplane's descent and contact with the runway. The airplane contacted the runway with the left main landing gear, followed by the right main landing gear and nose gear. The FO attempted to pull aft on the yoke to minimize the vertical speed prior to contact. The FO stated that the first contact with the runway on the main landing gear was 'very strong,' and he pulled back on the yoke; however, [the] nose came down very hard. The impact was so hard that his headphones fell off falling between his feet, and he found himself looking down on his lap. After the landing, the FO looked up to see that the airplane was on the runway centerline, at which time the captain reduced the power levers to idle and into reverse, while the FO was applying maximum braking with the pedals. The Captain reached for the power levers about one second before the FO."

A witness stated:

"We were positioned in AF 747 at entrance rd. Alitalia A/C appeared to be in a normal landing situation until what appeared to be at about 40-75 Ft above the ground...At that point the aircraft abruptly dipped its right wing and the...[right] main gear contacted the ground. The A/C then bounced over to the left gear. A/C nose was still up this oscillation occurred from my recollection 1-2 more times. During that, the nose gear came down and contacted the runway the main gear looked to have lifted off the ground for about 50-100 Ft of distance. All gear settled down and the A/C taxied down and then pulled off to the...[right] side of the runway and stopped...."

Another witness stated:

"A CAL DC-10 had just blown a tire on landing...The next A/C to land was Alitalia 767. The A/C was in a normal approach. During roll-out the A/C abruptly pitched...[right] wing down. [Right]...MLG contacted runway. A/C bounced up and to the left, and out of camera view."

PERSONNEL INFORMATION

Both pilots had been issued pilot certificates and medical certificates in accordance with the Italian government. Both pilots had type ratings in the Boeing 767.

The captain had about 9,800 hours of flight experience, with 4,000 hours as pilot-in-command, and 150 hours in the Boeing 767. In addition, the Captain was also a crew resource management (CRM) instructor.

The captain had qualified on the airplane about 1 1/2 months prior to the accident flight. He reported that he elected to communicate on the radio due to his greater command of the English

language, and allowed the first officer to perform the landing due his greater familiarity with KEWR.

The first officer had approximately 2,500 hours of flight experience, of which 2,000 hours were in DC-9's and 68 hours were in the Boeing 767.

The accident flight was the first officer's second trip into KEWR, and his first trip without a flight instructor onboard. His first trip into KEWR occurred on May 12, 1997. The first officer hand flew the approach from 1,000 feet above ground level.

ORGANIZATIONAL AND MANAGEMENT INFORMATION

The investigation revealed that the Boeing 767 was new to the Alitalia fleet, and had only been on line for one month. Although operational control of the flight remained with the captain, both pilots had received the same training. There were no restrictions on first officers for takeoffs and landings.

FLIGHT RECORDERS

The digital flight data recorder (DFDR) was forwarded to the NTSB Vehicle Performance Division for readout. The DFDR read out revealed that about 5 seconds prior to touchdown, the fight crew received a windshear alert. The flight crew continued with the approach and touched down in a 4 degree nose high pitch attitude, and with a 1.8 G load. The right and then the left main landing gear tilt switches transitioned to the ground position, and the speed brake handle deployed.

Following main landing gear touchdown, the airplane pitched down at a rate of about 3 degrees per second. Two seconds after touchdown, a second G spike was recorded at 2.8 Gs. This coincided with a momentary level off of the nose down pitch attitude at 1.2 degrees. This was followed by first, the left, and then the right main landing gear tilt switches transitioning back to the flight mode, and the speed brake handle returning to the stowed position. Four seconds after the initial touchdown, the airplane achieved a -2.8 degrees nose down pitch attitude.

A check of the elevator position revealed that after main landing gear touchdown and the 2.8 G spike, the elevator trailing edge momentarily increased about 2-3 degrees up for one second, and then continued to move to a trailing edge down position.

WRECKAGE AND IMPACT INFORMATION

Examination of the airplane revealed that the nose landing gear trunions remained attached to the bulkhead that they were affixed to; however, the bulkhead was torn loose from surrounding structure. There were multiple broken stringers and cracked frames, and wrinkled fuselage skin in the vicinity of the nose landing gear. In addition, hydraulic lines were ripped and hydraulic fluid (Skydrol) was sprayed into the electronic equipment bay. The damage to the nose landing gear prevented use of the cockpit actuated nose wheel steering. In addition, due to failure of the nose landing gear bulkhead, the nose landing gear was canted at an angle.

The cost of repairs was in excess of $20,000,000 US.

ADDITIONAL INFORMATION

According to the Newark Airport Informal Runway Use Program:

"If runways are dry, the crosswind component must not be greater than 20 knots and the tailwind

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component must not be greater than 5 knots."

According to Page AP-4-2 of the Newark Tower Standard Operating Procedures the maximum winds for runway 4 including gusts were:

Wind Direction	Maximum Velocity
300	20 knots

•••360••••31 knots

The program also stated:

"Participation in the program is voluntary for aircraft operators/pilots. Whenever a request is made for other than the assigned runway, the pilot will be advised that the requested runway is not the noise abatement runway. If the assigned runway is still unacceptable, the pilot will be assigned the runway requested."

A view of the air/ground communications between Newark Tower, and AZA 600 revealed that the runway assignment of Runway 4R was accepted without question.

A check of the runways revealed that Runway 4R/22L was 9,980 feet long and 150 feet wide, with an asphalt surface. Runway 29/11 was 6,800 feet long and 150 feet wide, with an asphalt surface.

According to the FAA Air Traffic Handbook, 7110.65, Section 3-1-8, Low Level windshear Advisories:

"When low level windshear is reported by pilots or detected on any of the Doppler or Low Level Windshear Alert Systems (LLWAS), controllers shall issue the alert to all arriving and departing aircraft until the alert is broadcast on the ATIS and pilots indicate that they have received the appropriate ATIS code. A statement shall be included on the ATIS for 20 minutes following the last report or indication of windshear."

The specified terminology for windshear was, "WINDSHEAR ADVISORIES IN EFFECT."

The local controller stated in his written statement:

"I cleared AZA600 to land Runway 4R. Wind information was given and no reports of wind shear were noted from other aircraft for approximately 15 minutes. Wind shear advisories were on the ATIS. I observed nothing abnormal about AZA600 on final. I did not observe his landing."

A review of the weather from KEWR revealed gusty winds were first recorded on the 0751 weather report and continued through the 2051 report.

The vertical acceleration sensor was located on the wing spar in the wheel well area. The investigation revealed that the accelerometer was sampled at a rate of eight times per second. The accelerometer recorded the G load at the time of sampling and not necessarily the peak G load.

The investigation revealed that the retraction of the speed brake lever after touchdown coincided with the main landing tilt switches transitioning to the flight mode again. Further

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investigation revealed that once the speed brake lever returned to the stowed position and the speed brake panels on the wings retracted, a further return to the ground position of the tilt switches would not re-deploy the speed brakes. They would have to be manually re-deployed.

According to the Alitalia B 767 Operations Manual:

"The policy for the flight crew in coping with windshear is to avoid areas of known severe windshear....Severe windshear is that which produces airspeed changes greater than 15 knots or vertical speed changes greater than 500 feet per minute."

According to the Boeing 767 Flight Crew Training manual:

"...Avoid all areas of known severe windshear. Severe windshear is that which produces airspeed changes greater than 15 knots. If severe windshear is indicated, delay takeoff or do not continue an approach until conditions improve...."

During a post accident interview, the captain was asked why he did not perform a missed approach. He reported there was no time once the wind shear alert sounded, and that he envisioned a tail strike if a missed approach was performed from that position.

The following caution and additional information was found in the Boeing 767 Flight Crew Training Manual:

"CAUTION: Pitch rates sufficient to cause airplane structural damage can occur if large nose down control column movement is made prior to nose wheel touchdown."

"If the airplane should bounce, hold or re-establish a normal landing attitude and add thrust as necessary to control the rate of descent. Thrust need not be added for a shallow bounce or skip. When a high hard bounce occurs, initiate a go-around. Apply go-around thrust and use normal go-around procedures. A second touchdown may occur during the go-around. Do not retract the landing gear until a positive rate of climb is established."

Nothing was found in the Boeing 767 Flight Crew Training Manual, or the Alitalia 767 Operations Manual that would have restricted or prohibited a go-around.

A check with Continental Airlines failed to identify the DC-10 with a blown tire or to obtain a copy of the video tape of the landing.

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
NEWARK INTERNATIONAL	EWR	18 Ft. MSL	4R	9300	150

Runway Surface Type: Asphalt

Runway Surface Condition: Dry

Type Instrument Approach: ILS-complete

VFR Approach/Landing: Full Stop

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Boeing	767-300	28147

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	238	399700 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	GE	CF6-80-C2B6F	

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness	04/1997	344 Hours	4917 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
ALITALIA AIRLINES	VIALO A MARCHETTTI, 111	ROME, ITALY		

Operator of Aircraft	Street Address	City	State	Zip Code
Same as Reg'd Aircraft Owner	Same as Reg'd Aircraft Owner			

Operator Does Business As:

Operator Designator Code: AAPF

- Type of U.S. Certificate(s) Held: None

Air Carrier Operating Certificate(s):

Operating Certificate:

Operator Certificate:

Regulation Flight Conducted Under: Part 129: Foreign

Type of Flight Operation Conducted: Scheduled; International; Passenger/Cargo

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First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	48

Sex: M | Seat Occupied: Left | Principal Profession: Civilian Pilot | Certificate Number: On File

Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): Airplane Multi-engine; Airplane Single-engine; Instrument Airplane

Type Rating/Endorsement for Accident/Incident Aircraft? Yes | Current Biennial Flight Review?

Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 03/1997

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	9880	156	1913	7967	869					
Pilot In Command(PIC)	4196	156	1913	7967						
Instructor	804		312	492						
Last 90 Days	103	103		103						
Last 30 Days	42	42		42						
Last 24 Hours	9	9		9						

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? No | Second Pilot? Yes

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
MILANO, ITALY	OF	LIMC	0540	EDT

Destination	State	Airport Identifier
Same as Accident/Incident Location		EWR

Type of Clearance: IFR

Type of Airspace: Class B

Weather Information

Source of Briefing: Company

Method of Briefing:

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
EWR	1451	EDT	18 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Scattered 7500 Ft. AGL

Condition of Light: Day

Lowest Ceiling: None 0 Ft. AGL

Visibility: 10 SM

Altimeter: 29.00 "Hg

Temperature: 17 °C

Dew Point: 1 °C

Wind Direction: 320

Density Altitude: Ft.

Wind Speed: 16

Gusts: 25

Weather Condtions at Accident Site: Visual Conditions

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Intensity of Precipitation: Unknown

Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: Substantial

Aircraft Fire: None

Aircraft Explosion None

Classification: Foreign Registered/U.S. Soil

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants				8	8
Other Crew					
Passengers				158	158
- TOTAL ABOARD -				168	168
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	168	168

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Administrative Information

Investigator-In-Charge (IIC)

ROBERT L. HANCOCK

Additional Persons Participating in This Accident/Incident Investigation:

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