
Tail strike during go-around, Boeing 727-227, November 15, 1993

Micro-summary: This Boeing 727-227 attempted a low-altitude go-around when it was determined the gear wasn't down. The tail of the airplane collided with the ground.


Event Date: 1993-11-15 at 1513 CST


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

Investigative Body's Web Site: <http://www.nts.gov/>

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		NTSB ID: CHI94FA039		Aircraft Registration Number: N16762	
		Occurrence Date: 11/15/1993		Most Critical Injury: None	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place CHICAGO		State IL	Zip Code 60666	Local Time 1513	Time Zone CST
Airport Proximity: On Airport		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer BOEING		Model/Series 727-227		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>HISTORY OF THE FLIGHT</p> <p>On November 15, 1993, at 1513 central standard time, a Boeing 727-227, N16762, operated by Continental Airlines, Inc., as Flight 5148, providing scheduled air carrier service between Houston, Texas and Chicago, Illinois, sustained substantial damage to the lower portion of the aft fuselage when it contacted the runway during a go around at Chicago's O'Hare International Airport (ORD). The go around was initiated when the flight crew realized the landing gear was not extended for landing. The three flight crew members, four flight attendants, and seventy nine passengers reported no injuries. Visual meteorological conditions prevailed at the time of the accident, and the flight operated on an IFR flight plan. The flight operated under 14 CFR Part 121, and originated from Houston, Texas, approximately 1312.</p> <p>The flight crewmembers stated when they arrived in the Chicago area, it was a heavy traffic period and ORD Air Traffic Control (ATC) was using parallel runways (27L and 27R) for landing. The flight crewmembers stated they were radar vectored onto a longer than normal (estimated 17 to 18 miles) final approach for Runway 27L, and received early assigned airspeed reductions, which they attributed to the volume of traffic. The crew members estimated they were on an eight mile final for the runway when ATC assigned an airspeed of 150 knots. The flight crew selected twenty-five degrees of flaps to maintain the assigned airspeed. They stated they elected to delay landing gear extension "until normal gear extension point" and continued the approach.</p> <p>The flight crewmembers stated they received Traffic Collision Avoidance System (TCAS) Traffic Alerts (TAs) throughout the approach. The Flight Engineer (FE) stated they broke out of the clouds about 2,500 feet Mean Sea Level (MSL) and visually identified a TCAS traffic alert target (a Boeing 747) on the parallel approach for Runway 27R.</p> <p>The FE reported they received another aural TCAS traffic alert "almost immediately" after the 1000 foot above ground level (AGL) altitude call-out. The target appeared below them, at their three o'clock position, and one mile, moving from right to left across their path. The FE stated "...This caused a large distraction...while we searched for a potential conflict." He indicated that, although spurious, or "phantom" TCAS warnings were not uncommon, "...the threat seemed real because we had already confirmed the B747." He reported all three flight crewmembers gave the potential traffic conflict "...the highest priority" and searched the airspace around them for the traffic. They were unable to visually identify the target.</p> <p>The flight crew reported as they descended through 500 feet AGL the Ground Proximity Warning System (GPWS) began to sound "Whoop Whoop Terrain." The crew verified they were operating in visual conditions, clear of terrain/obstructions, and continued the approach, as per company policy. The flight crew unsuccessfully attempted to troubleshoot and identify the cause of the GPWS alert, while the GPWS continued to broadcast its "Whoop Whoop Terrain" warning. They stated when they</p>					
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Narrative (Continued)

were about 200 feet AGL, they received another TCAS Traffic Alert.

The flight crewmembers reported they were distracted as they continued the approach, calling out altitudes, looking for traffic and trying to determine what was causing the GPWS warning. The FE stated "...for a time there, nothing made sense." At 50 feet AGL the GPWS aural warning ceased. The flight crewmembers stated when the distracting noise stopped, they all suddenly recognized they "didn't have three green" (the landing gear was not extended.) They added power and performed a go around, scraping the aft fuselage on the runway in the process. The airplane returned to land on Runway 32L without further incident.

Postaccident examination of the landing gear warning system and the Ground Proximity Warning System (GPWS) revealed they were capable of normal operation. Flight crew statements obtained during interview indicated supported this. Copies of pertinent maintenance entries are appended.

DAMAGE TO AIRCRAFT

The #3 VHF antenna and the aft drain mast separated when the aft fuselage touched the runway during the go around. The aft fuselage exhibited dents, punctures and longitudinal scratches. The aircraft pressure vessel was punctured/compromised during ground impact.

COMMUNICATIONS

ATC records indicate at 1512:40, ORD North Local Controller (NLC) was contacted by an American Airlines flight crew member, who indicated the Continental flight did not have the landing gear extended. The NLC coordinated with the South Local Controller (SLC), and at 1512:48 SLC advised "Continental, go around, go around. Continental no gear, no gear." The flight crew reported they did not hear the controller's instructions. They stated they were probably too busy performing the go around to recognize the radio transmission. Controller statements and an ATC transcript are appended.

FLIGHT RECORDERS

The Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR) were transported to the National Transportation Safety Board's (NTSB's) laboratory in Washington, D.C. for readout and evaluation. The CVR, a 30 minute, continuous loop tape, contained only nonpertinent postaccident ground crew discussion. The DFDR data indicated the airplane descended on a 270 degree magnetic heading to an altitude of approximately 646 feet MSL before it began to climb. The DFDR Factual Report is appended. The CVR and DFDR were released to the operator upon completion of laboratory examination.

MEDICAL/PATHOLOGICAL INFORMATION

Toxicological test results were negative on all three flight crew members. Results are appended.

ADDITIONAL INFORMATION

The flight crew indicated the landing gear warning system never warned them the gear was not extended. They did not observe three green lights indicating gear down for landing, but neither did they observe a red gear position warning light either. The landing gear warning horn and red light are triggered when the landing gear is not down and locked and either of the following conditions exist:

1. Flaps greater than 25 degrees.
2. Throttle lever/levers in the aft 10 degree position on the throttle quadrant.

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The flight crew stated they were established in a stable, power on approach, and never exceeded 25 degrees flaps selected, thus they never triggered the landing gear warning system. The manufacturer stated: "The 727 airplane was certified for flaps 30 or flaps 40 landings...(therefore) the trigger point of the continuous aural warning system was set to...flaps greater than 25." Excerpts from the Boeing 727 maintenance manual are appended.


Continental operates their Boeing 727 airplanes equipped with Sundstrand Mark I or Mark II GPWS units, which provide verbal aural warnings in response to aircraft configuration/operation deficiencies. The accident airplane was equipped with the Mark I GPWS unit, which provides a "Whoop Whoop Terrain" warning "...when the aircraft penetrates below 500 feet with the landing gear not down." This warning will sound continuously until the airplane reaches 50 feet AGL, when it is automatically inhibited. The GPWS maintenance manual indicates the warnings are automatically inhibited below 50 feet of radio height "to reduce nuisance alarms caused by ground-effect induced static pressure fluctuations."


Conditions which result in the "Whoop Whoop Terrain" warning are as follows:

1. Rate of descent exceeds certain threshold values.
2. Terrain closure rate exceeds certain threshold values, dependent on aircraft configuration.
3. Takeoff altitude loss or takeoff rate warning.
4. Below 500 feet AGL with landing gear not down.
5. Gear down, but flaps not extended sufficiently when operating between 200 and 500 feet AGL, with a sink rate exceeding certain values.
6. Below 200 feet AGL with gear down, but flaps not selected to the landing position.

The GPWS unit installed in the accident airplane will also sound a "Glideslope Pull Up" message in the event of an inadvertent descent below Glideslope when an ILS frequency is selected by the pilot. No more specific vocabulary warnings are available in the Mark I GPWS units. The Sundstrand Mark II GPWS unit offers an expanded vocabulary which allows for more specific warnings as to the nature of the airplane deficiency. The expanded vocabulary includes "Too Low Gear," "Too Low Flaps," "Too Low Terrain," "Sinkrate," "Don't Sink," and "Minimums." Excerpts from the Sundstrand maintenance manuals are appended.

The flight crew stated they were confused by the "Terrain" terminology under those circumstances. They ascertained they were operating clear of terrain, in daylight, visual meteorological conditions, and continued the approach. The flight crew members stated they received training in the operation of the GPWS system. They were academically familiar with the various triggering flight conditions/events, but they expected a more specific warning. They stated they had not experienced the GPWS Mark I aural warning ("Whoop Whoop Terrain") for landing gear before, and with the other distractions during the approach, they were unable to decode its significance. Continental has incorporated the accident scenario into its training curriculum, and GPWS specifics are now addressed in classroom and simulator exercises.

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Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
O'HARE INTERNATIONAL	ORD	667 Ft. MSL	27L	10141	150
Runway Surface Type: Asphalt					
Runway Surface Condition: Dry					
Type Instrument Approach: NONE					
VFR Approach/Landing: Go Around					
Aircraft Information					
Aircraft Manufacturer		Model/Series		Serial Number	
BOEING		727-227		21245	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 152	Certified Max Gross Wt.	190500 LBS	Number of Engines: 3	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Fan	P&W	JT8D-9A	14500 LBS		
- Aircraft Inspection Information					
Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time		
Continuous Airworthiness	09/1993	512 Hours	43721 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner		Street Address			
UNITED STATES TRUST CO. NY		114 W. 47TH STREET			
		City	State	Zip Code	
		NEW YORK	NY	10038	
Operator of Aircraft		Street Address			
CONTINENTAL AIRLINES, INC.		P.O. BOX 4607			
		City	State	Zip Code	
		HOUSTON	TX	77210	
Operator Does Business As:			Operator Designator Code: CALA		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): Flag Carrier/Domestic					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; Domestic; Passenger/Cargo					

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First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 43
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Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport; Commercial; Flight Engineer

Airplane Rating(s): Multi-engine Land; Single-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes	Current Biennial Flight Review?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--no waivers/lim.	Date of Last Medical Exam: 08/1993
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	11000	8200	600	10400	2200	2200	250			
Pilot In Command(PIC)	10000	7200	500	9500	1900	1900	200			
Instructor										
Last 90 Days	160	160		160	32	32	2			
Last 30 Days	60	60		60	12	12				
Last 24 Hours	6	6		6	2	2				

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? Yes	Second Pilot? Yes
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Flight Plan/Itinerary

Type of Flight Plan Filed: IFR	
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Departure Point HOUSTON	State TX	Airport Identifier IAH	Departure Time 1312	Time Zone CST
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Destination Same as Accident/Incident Location	State	Airport Identifier	
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Type of Clearance: VFR

Type of Airspace: Class B; Class E

Weather Information

Source of Briefing:
Commercial Weather Service

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
ORD	1450	CST	667 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Unknown	1800 Ft. AGL	Condition of Light: Day
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Lowest Ceiling: Overcast	1800 Ft. AGL	Visibility: 12 SM	Altimeter: 30.00 "Hg
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Temperature: 6 °C	Dew Point: 2 °C	Wind Direction: 280	Density Altitude: Ft.
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Wind Speed: 4	Gusts:	Weather Conditions at Accident Site: Visual Conditions
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Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Unknown
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Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: Substantial	Aircraft Fire: None	Aircraft Explosion: None
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Classification: U.S. 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				1	1
Cabin Attendants				4	4
Other Crew					
Passengers				79	79
- TOTAL ABOARD -				86	86
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	86	86

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Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

JODI L. REEVES

Additional Persons Participating in This Accident/Incident Investigation:

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