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16. Abstract About 2002 e.s.t. on November 12, 1975, Eastern Air Lines, Inc., Flight 576 struck the ground about 282 feet short of runway 23 at the Raleigh-Durham Airport, Raleigh, North Carolina, bounced up onto the runway and slid to a stop 4,150 feet past the runway threshold. The accident occurred during an instrument landing system approach in heavy rain showers. The aircraft was damaged substantially. Of the 139 persons aboard the aircraft, 8 were injured; one of the injuries was serious. The National Transportation Safety Board determines that the probable cause of the accident was the pilot's failure to execute a missed approach when he lost sight of the runway environment in heavy rain below decision height.					
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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: May 19, 1976

EASTERN AIR LINES, INC.
BOEING 727-225, N8838E
RALEIGH, NORTH CAROLINA
NOVEMBER 12, 1975

SYNOPSIS

About 2002 e.s.t. on November 12, 1975, Eastern Air Lines, Inc., Flight 576 struck the ground about 282 feet short of runway 23 at the Raleigh-Durham Airport, Raleigh, North Carolina, bounced up onto the runway and slid to a stop 4,150 feet past the runway threshold. The accident occurred during an instrument landing system approach in heavy rain showers. The aircraft was damaged substantially. Of the 139 persons aboard the aircraft, 8 were injured; one of the injuries was serious.

The National Transportation Safety Board determines that the probable cause of the accident was the pilot's failure to execute a missed approach when he lost sight of the runway environment in heavy rain below decision height.

1. INVESTIGATION

1.1 History of the Flight

On November 12, 1975, Eastern Air Lines, Inc., Flight 576, a Boeing 727-225, N8838E, operated as a scheduled passenger flight from Miami, Florida, to Washington, D.C., with intermediate stops at Atlanta, Georgia, and Raleigh, North Carolina.

Flight 576 departed from Atlanta at **1848 1/** with 139 persons, including 8 crewmembers, aboard. It was cleared to the Raleigh-Durham Airport in accordance with a computer stored instrument flight rules (IFR) flight plan. The flight was uneventful until it approached the Raleigh-Durham area, where several deviations from course were required to circumnavigate heavy precipitation areas southwest of the airport, as depicted on the aircraft's weather radar. No areas of heavy precipitation or thunderstorm activity were observed by the flightcrew, either visually or on the aircraft's radar in the immediate vicinity of the Raleigh-Durham Airport.

During the en route descent for landing, the flightcrew received the Airport Terminal Information Service (ATIS) **2/** report as follows:

"Raleigh-Durham Information Oscar, 2253 Greenwich
Weather; 'estimated ceiling, 2,000 overcast; visibility 7;
light rain; temperature, 69; dewpoint, 65; wind, 170" at 4;
altimeter, 29.75. Expect ILS approach landing runway 23.
Stage 3 departures advise clearance delivery on 120.1 of
intended heading and altitude. Advise you have 'Oscar'."

At 1956:06, Raleigh-Durham approach control gave Flight 576 the following revised weather: ". . . Raleigh-Durham weather, 1,000 scattered, measured ceiling - 2,000 overcast, visibility - 4 miles."
At 1957:28, approach control cleared the flight: "576, turn right heading 200, you're cleared for an ILS runway 23 approach." The first officer acknowledged the transmission.

From 1957:49 until 1958:18, while turning inbound to intercept the ILS localizer, the flightcrew completed the items on the "before landing-final" checklist.

1/ Unless otherwise indicated, all times herein are eastern standard, based on the 24-hour clock.

2/ ATIS-The continuous broadcast of recorded noncontrol information in selected high activity terminal areas. "Oscar" was the phonetic designation of information being broadcast when Flight 576 was on the approach.

The captain, who was flying the aircraft, conducted an approach briefing during the descent. The briefing included a discussion of the missed approach procedure. The flight engineer reviewed the first officer's instrument approach chart to familiarize himself with the procedure.

At 1958:21, approach control gave the flight further clearance: "Eastern 576, 5 miles northeast of Leesville, 3/ contact tower 119.3." The first officer acknowledged the transmission and contacted the Raleigh-Durham tower.

At 1958:35, the tower controller stated: "Eastern 576 is cleared to land runway 23. The wind is variable **180**" at 4, and I have a Queen Air reported strong wind from the left about 20 kn at between 900 and 1,000 --.correction,-- and 2 -- and 1,200 feet **on** final." At 1958:54, the first officer replied: "Okay, thank you sir. It looks like you have quite a storm coming your way."

The aircraft intercepted the runway **23** localizer course about 7 miles from the FAF. The glide slope was intercepted about **1,800** feet m.s.l., 4/ and the aircraft was flown with flaps at 30". The landing reference speed for the approach was 137 KIAS. During the approach, airspeed indications were stabilized and the airspeed indicator needles did not "bounce." The highest airspeed indication observed by the flightcrew after the aircraft passed the FAF was 147 KIAS and the lowest was 142 KIAS. Except for personal preference, the captain gave **no** other reason why airspeed was maintained above target speed during the approach.

At 2000:35, the tower controller reported: "Eastern 576, visibility at the airport now is a mile and three-quarters.'" At 2000:43, in answer to a request by the first officer, the tower controller stated: "The wind right now is 190° at 5; it's been holding pretty well at 5 kn.

The flightcrew made altitude awareness calls and instrument crosschecks at **1,000** feet and at 500 feet. The instrument check indicated that all systems were operating normally. At 2001:37, at 500 feet, the first officer reported "ground contact." The aircraft descended below a well defined ceiling at 400 feet. At the same time, the first officer reported the "flashers" (runway alignment indicator lights) in sight.

At 2001:55, the first officer reported the runway in sight. The crew said that the approach lights, threshold lights, and runway lights were well defined and easily seen, without noticeable halo effect or backscatter.

3/ Leesville - A nondirectional beacon (NDB) which serves as the final approach fix (FAF).

4/ All altitudes are above field elevation unless otherwise indicated.

The first officer's first callout, "VASI--look a little bit low," was made about 5 seconds after the runway was reported in sight. About 4 seconds later, he announced "rate of descent too high." However, he did not recall having seen a descent rate of more than 700 feet per minute (fpm). The captain testified that he heard but did not understand either of these callouts.

After the captain saw the runway lights he did not look back inside the cockpit. The flight engineer glanced momentarily at his panel; however, when he returned his scan to the first officer's instrument panel, he noticed that the aircraft had descended below the glide slope. Because the captain was adding thrust and the first officer had called out: "VASI--look a little bit low," and "rate of descent too high," the flight engineer believed the captain was aware of the deviation from the glide slope, and he did not call the deviation to the captain's attention.

The flightcrew said that they encountered light to moderate rain from the FAF to about 200 feet, where they encountered heavy rain. The captain had the windshield wipers turned to "high," but he did not use the rain-repellent fluids on either windshield. The flight engineer said that his forward visibility "went to nil" and that he did not see any lights until the aircraft passed over the green threshold lights. The first officer said that he lost forward visibility at the 1,000-foot approach light bar and that his visibility was limited to three or four approach light bars ahead of the aircraft. He said that he did not have any sensation of a downdraft; however, at the time, he felt uncomfortable and thought a missed approach should be started.

The captain increased the thrust at 200 feet when he noticed the aircraft's position below the glide slope. He said that he planned to level the aircraft, or "to go flat" momentarily, and to regain the centerline of the glide slope. He said that he did not make a conscious effort to increase the aircraft's angle of attack since he still had the threshold and runway lights in sight. Both pilots noticed that the VASI indication was a "pinkish" color, which indicated that the aircraft was below the desired ILS glidepath.

The captain said that at 100 feet, the crosswind increased and he adjusted the aircraft heading to maintain runway alignment. The flight data recorder showed a 2° heading change to the left. Almost simultaneous with the drift correction, he lost all forward visibility as the windshield became "opaque" and the external light glare became "brilliant." He described the situation as encountering "a wall of water" and as having "the bottom fall out" as he added thrust. He was unable to recall the amount of added thrust. The captain stated that he had not considered a missed approach because at no time did he believe anything to be wrong with the approach.

The first officer and flight engineer said that the aircraft continued to descend after the captain added thrust. The captain said the intense rain, the loss of outside visibility, the increased thrust, and the aircraft's contact with the ground occurred almost simultaneously. Contact was made about 6 feet below the runway touchdown zone elevation at an indicated airspeed of 147 kn.

The flightcrew believed that the aircraft would land on the runway, or at most, several feet short. The first officer believed that the aircraft had made a premature touchdown on the runway. The crew described the first ground contact as firm or "stiff," and the travel down the runway as "rough." They believed that a tire, or tires, had blown.

The captain said that when the aircraft flew out of the "heavy rain" at the runway threshold, he could then see the entire length of the runway. He deployed the ground spoilers and placed Nos. 1 and 2 engines into reverse thrust. No. 3 engine thrust reverser had been deactivated before this flight. His concern at that time was stopping the aircraft on the wet runway. He did not have wheel braking and ordered the antiskid system turned off. He stated that he did not have directional control problems; however, while the aircraft's longitudinal axis remained aligned with the runway, the aircraft drifted off the right side of the runway and stopped with a portion of the left wing extended over the runway. The captain pulled the fire-control/fluids shutoff handles and turned the emergency lighting switch on.

The flight engineer went into the passenger cabin area to assist with the evacuation of the passengers. He left the aircraft from the forward left door and found the escape slide wet and very fast."

Shortly thereafter, the pilots left the cockpit and found that the passenger evacuation was almost complete. They verified that all the occupants had evacuated the aircraft, then departed by the forward door slide.

The accident occurred at night, at an elevation of about 436 feet m.s.l., and at latitude 35° 52'N and longitude 78° 47'W.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Other</u>
Fatal	0	0	0
Nonfatal	0	8	0
None	8	123	

1.3 Damage to Aircraft

The aircraft was damaged substantially.

1.4 Other 'Damage

The localizer antenna for the instrument landing system (ILS) of runway 05 was damaged substantially.

The antenna is located about 400 feet before the approach end of runway 23 and is aligned with the runway centerline. Centerline monitors and width monitors for the ILS localizer, located 260 feet before the threshold, were destroyed.

Five approach lights, located 200 feet before the threshold, were destroyed. Two runway threshold lights and some blue taxiway lights on the right side of runway 23 were broken.

1.5 Crew Information

The eight crewmembers were properly certificated for the flight. (See Appendix B.)

1.6 Aircraft Information

The aircraft was certificated, equipped, and maintained in accordance with Federal Aviation Administration (FAA) requirements. The aircraft was configured for installation of a ground proximity warning system; however, because of a manufacturing delay, the hardware for this aircraft had not been delivered to Eastern Air Lines.

The aircraft was not equipped with an aural radio altimeter signal.

The gross weight and c.g. were within prescribed limits for both takeoff and landing. At the time of the accident, about 17,000 lbs of Jet A-1 fuel was on board. (See Appendix C.)

1.7 Meteorological Information

The terminal forecast for Raleigh-Durham, issued by the National Weather Service (NWS) at Raleigh, on November 12, 1975, and valid for 24 hours beginning at 1700 was, in part:

1700 - 2200: 1,200 feet scattered, 2,000 feet overcast, wind -- 1800 at 10 **kn**; occasionally, 800 feet overcast, visibility -- 3 miles, light rain, fog; chance of visibility -- 1/2 mile, thunderstorms and heavy rain showers.

The official NWS surface weather observations at Raleigh-Durham Airport near the time of the accident were as follows:

1955: 1,000 feet scattered, measured 2,000 feet overcast, visibility -- 4 miles, moderate rain, fog, temperature -- 67°F, dewpoint -- 66°F, wind 160" at 5 kn, altimeter setting 29.72 in. Hg.

2004 - Special: Partial obscuration, estimated 500 broken, 1,500 feet overcast, visibility -- 3/4 mile, heavy rain, fog, wind -- 160" at 6 kn, altimeter setting -- 29.73, runway 05 RVR -- 4,000 feet variable to 6,000 + feet, rain and fog obscuring 4/10 of the sky.

2009 - Local: Partial obscuration, estimated 500 broken, 1,500 feet overcast, visibility -- 3/4 mile, heavy rain, fog, wind -- 190" at 8 kn., altimeter setting -- 29.73, runway 05 RVR -- 4,000 feet variable to 6,000 + feet, rain and fog obscuring 4/10 of the sky, lightning in clouds and cloud-to-ground west. Aircraft mishap.

The NWS record of precipitation measurements at the airport indicated that the rate of rainfall from 2000 to 2005 was more than 2 inches per hour. The total precipitation recorded for an hour period ending at 2054 was 1.45 inches. The rain gauge is located near the accident site. The accident occurred in heavy rain showers and darkness. These showers were associated with thunderstorm activity west of the airport.

A WRS-3 weather radar set is located at the NWS station at the Raleigh-Durham Airport. It is **an** obsolete system used only for local information. No official reports are required **or** made from information observed on this weather radarscope. A line of convective activity was observed on this radar by the observer on duty at the time of the accident. The line extended from the northwest to the southwest of the airport; however, significant weather cells were not portrayed. This information was not transmitted, nor was it required to be transmitted, to any other agency.

Downdrafts are known to accompany heavy rainshower activity during the mature and dissipating stages of storm cell life cycles. During the development of cells into a mature stage, raindrops grow heavier and fall as cold rain from above the freezing level. The cold rain drags air with it, creating a downdraft. Downdraft activity is to be expected, particularly in the heavy rain core.

1.8 Aids to Navigation

The Raleigh-Durham Airport is equipped with **an** ILS for runway 23, with an inbound course of 229". The Leesville NDB is located **on** the inbound course 4 nmi **from** the threshold of runway 23, and is the FAF for the approach.

The altitude at the FAF is 1,800 feet m.s.l. (1,365 feet above the touchdown zone) and the glide slope is intercepted just before crossing the Leesville NDB. The glide slope crosses the NDB at 1,785 feet m.s.l. (1,350 above the touchdown zone). Decision height for the approach is 200 feet.

There were no reported discrepancies in the navigational aids at the time of the accident. Postaccident flight checks of the ILS, the VASI, and the NDB showed no indications of malfunctions or misalignments.

1.9 Communications

No air-to-ground communication difficulties were reported.

1.10 Aerodrome and Ground Facilities

Runway 23 at the Raleigh-Durham Airport, an asphalt surfaced runway, is 7,500 feet long and 150 feet wide. The published elevation of the touchdown zone is 435 feet m.s.l. The runway is equipped with high intensity runway lights, medium intensity approach lights, runway alignment indicator lights, and a type-A VASI on the left side of the runway. All runway lights, approach lights, and the VASI were illuminated at the time of the accident.

1.11 Flight Recorders

The aircraft was equipped with a Fairchild Model A-100 cockpit voice recorder (CVR), Serial No. 740. The CVR was not damaged and the tape was read out without deviations.

The aircraft was also equipped with a Sundstrand Data Control, Model FA-542, flight data recorder (FDR), serial No. 1304. The recorder and foil medium were undamaged and all parameter traces had been recorded clearly and actively.

The FDR showed that the airspeed on the final approach varied from 140 kn to 145 kn until about 300 feet where it increased to about 147 kn at initial impact. The rate of descent remained fairly constant at between 650 fpm and 700 fpm until about 100 feet where it increased to 1,250 fpm. At 3.6 seconds before touchdown, the descent rate increased to an average of 1,400 fpm.

Both recorders were located in the aft section of the aircraft fuselage. Data from the FDR and the CVR were correlated into a descent profile. (See Appendix D.)

1.12 Wreckage

The aircraft first struck the ILS localizer antenna screen for runway 05, which is located 400 feet before the threshold of runway 23. The top 2 feet of the parallel antenna screen wires were severed. The elevation of the top wire was about 430 feet m.s.l., about 1.5 feet below the runway threshold elevation and about 5 feet below the touch-down zone elevation. An antenna dome was also damaged. (See Appendix E.)

The main landing gear tires hit the ground first--about 282 feet short of the runway 23 threshold. The elevation of the ground marks was about 425 feet m.s.l., about 3.5 feet below the elevation of the runway threshold, and about 6 feet below the elevation of the touch-down zone. The aircraft's angle of descent between the broken ILS localizer antenna domes and the ground marks was about 2.5".

After it first contacted the ground, the aircraft again became airborne; however, its second touchdown point could not be determined. Shortly after first ground contact, both main landing gears and the No. 3 engine separated from the aircraft. These components continued down the runway and came to rest.

After its second contact with the ground, the aircraft slid down the runway and off the right side. It left the runway about 3,250 feet from the threshold. The aircraft stopped about 4,150 feet beyond the threshold and about 33 feet off the right side of the runway.

The nose landing gear remained on the aircraft; the tires were flat. Portions of both main landing gear support structures, the left inboard, mid-inboard, and the mid-trailing edge flaps; the airstair handrails; and airstair control access panel were found between the point of the first ground contact and the runway threshold.

There was no evidence of a failure of the aircraft's systems, structures, or powerplants before impact. All of the high lift wing devices were found fully extended. The measurements of the outboard trailing edge flap jackscrew showed that the flaps were extended 27.5" on the left wing and 28" on the right wing. The aircraft's fuel system remained intact.

1.13 Medical and Pathological Information

Eight persons were injured during the evacuation. One passenger sustained a fractured right ankle and was hospitalized; the remaining seven injuries were minor.

1.14 Fire

There was no fire.

A witness said that when he saw the aircraft strike an object short of the runway threshold, he also saw a burst of fire of very short duration near the No. 3 engine at the rear section of the aircraft fuselage.

According to a report of the crash/fire/rescue operation, the control tower initiated the crash alarm at 2006 and the first vehicle responded at 2007. At 2008, the control tower sent ambulances to the accident scene; three units responded.

1.15 Survival Aspects

This was a survivable accident. The cabin and crew compartment remained intact; the fuselage and cabin floor did not deform substantially.

Because the aircraft came to rest in a level attitude, the occupants evacuated quickly and without difficulty. The evacuation was completed in 1.5 minutes; all 4 exit doors and the overwing exits were used. The four escape slides deployed properly and only one slide lighting system malfunctioned. All aircraft emergency lights operated normally, except for the unit located above the main cabin door.

1.16 Tests and Research

None.

1.17 Other Information

1.17.1 Eastern Air Lines, Inc., Flight 738

Eastern Air Lines Flight 738, another Boeing 727-225, landed at Raleigh-Durham Airport, about 14 minutes before Flight 576. The Safety Board obtained its FDR, read it out, and compared the traces with those obtained from the FDR readout for Flight 576.

Both FDR altitude traces disclosed similar flight profiles until about 100 feet above the runway surface. At that point, Flight 738's rate of descent decreased to near zero.

The captain of Flight 738 said that he was alerted to a descent below the glide slope by a change in color of the VASI and an aural warning from the glidepath warning system. He took control of the aircraft from the first officer and completed the approach and landing.

1.17.2 14 CFR 91 -- Instrument Flight Rules

With regard to descent below minimum descent altitude (MDA) or decision height (DH), 14 CFR 91.117(b) states:

"Descent Below MDA or DH No person may operate an aircraft below the prescribed minimum descent altitude or continue an approach below the decision height unless--

"(1) The aircraft is in a position from which a normal approach to the runway of intended landing can be made; and

"(2) The approach threshold of that runway, or approach lights or other markings identifiable with the approach end of that runway, are clearly visible to the pilot.

"If, upon arrival at the missed approach point or decision height, or at any time thereafter, any of the above requirements are not met, the pilot shall immediately execute the appropriate missed approach procedure."

1.17.3 FAA Advisory Circular No. 91-25A

FAA AC No. 91-25A, dated June 22, 1973, "Loss of Visual Cues During Low Visibility Landings--Discussion," reads as follows:

"Pilots conducting instrument approaches utilize visual cues as they become available during the approach. At the DH or MDA the pilot should, however, be aware that due to shallow fog, snow flurries, or heavy precipitation, these cues may be lost after descent below the DH or MDA.

If visual cues are lost after DH or MDA, the pilot should execute the appropriate missed approach procedure as required by Federal Aviation Regulations. Missed approaches, when properly executed, involve little loss of altitude below the altitude at which the missed approach is 'started'."

1.17.4 Eastern Air Lines Procedures

The following is excerpted from the pertinent Eastern Air Lines, B-727, Flight Operations Manual, Enroute Operation Section (Altitude Awareness Call-outs) and E-727 Flight Manual, Normal Operations (Callouts as Required), Revision 147; dated October 21, 1975:

"During approach, the pilot flying* will call out:

When IFR:

Altitude crossing FAF (i.e., OM, VOR, etc.)
above field level (AFL)
1,000 feet above field level.

Any significant deviation below **1,000** feet should be announced. Immediate corrective action will be taken, or the approach abandoned.

100 feet above **DH** or **MDA**.
Minimums (DH or MDA)

*The pilot not flying will verbally acknowledge all callouts. In addition, he will cancel the terrain warning system when necessary.

The second officer will serve as an additional backup. The pilot(s) not flying will challenge the absence of any callout."

The following Company NOTAM (Notice to airmen) issued October 22, 1975, was attached to flight papers for every flight between October 23, 1975 and November 21, 1975:

"Important all flight crew members review new altitude awareness callout procs as described in Vol. one, rev. 174, Page 4-1-12 and in the latest revision to each airplane flight manual, all dated 10/21/75. Also note changes in pre-takeoff and approach briefings as described in normal operation and flight training sections of all AFM's."

"Missed Approach

By definition, a missed approach and a rejected landing are two separate maneuvers. The procedures for execution of these two maneuvers are identical.

To initiate a Missed Approach or Rejected Landing:

Apply takeoff thrust.
Rotate to **8"** nose up - stop descent.
Flaps **25"**.
Positive rate of climb - "Gear Up."
Airspeed - V_2 to $V_2 + 10K$.
Clean up as in normal climb.
Follow published missed approach procedure."

The following item is excerpted from the Company Training Manual:

"Landings

- B. The recommended approach and landing consists primarily of the following:
1. Aim point or point of intended landing 1,000 feet beyond the runway threshold. Touchdown should occur at a point between 500 feet and 1,500 feet inside the runway threshold;
 2. Stabilized approach from the outer marker or 1,000 feet depending upon the type of approach being made. Gear and flaps extended, stabilized on desired speed, rate of descent between 500 and 700 FPM. A rate of descent in excess of 1,000 FPM is considered undesirable and must be corrected prior to 500 feet above the field or a missed approach executed."

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The aircraft was certificated, equipped, and maintained according to regulations. The gross weight and c.g. were within prescribed limits during the approach to Raleigh-Durham Airport.

The Safety Board concludes that the aircraft's powerplants, airframe, electrical and pitot/static instruments, flight controls, and hydraulic and electrical systems were not factors in this accident.

The flightcrew was certificated and qualified in accordance with company and FAA requirements and regulations.

The Weather

The weather in the Raleigh-Durham Airport area was worse than forecast. The weather over the approach end of runway 23 deteriorated rapidly as Flight 576 progressed down the approach path for landing. This rapid deterioration is attested to by the flightcrew statements and the fact that the recorded rate of rainfall from 2000 to 2005 was more than 2 inches per hour.

Flight 576 encountered heavy rain which was probably associated with downdraft activity and a slight horizontal wind shear as it descended below 200 feet. Although visual contact with the runway environment was lost at this point, the captain regained forward visibility as the aircraft passed over the threshold lights. Any horizontal windshear

which may have been encountered was small in magnitude since only a 2° heading change to the left was required to maintain the localizer and no significant airspeed changes occurred.

The Board's review of the meteorological conditions indicates that this type of storm is capable of producing downdrafts of about 20 feet per second magnitude. Whether the aircraft actually encountered a downdraft of any such magnitude is questionable. The actual increase in the rate of descent of about 500 fpm (8fps) was shown on the aircraft's FDR readout slightly before initial impact. This may have been associated with downdraft activity from the storm.

The Safety Board thus concludes that when Flight 576 entered the heavy rain area it encountered downdraft and windshear activity which adversely affected the captain's efforts to maintain a proper descent profile during the last portion of the final approach. However, the Safety Board believes that, because of the airspeed margin and thrust available, the forces exerted by these meteorological activities could have been overcome had the captain taken immediate action to recover and had he initiated a missed approach in accordance with the prescribed procedures.

The Approach

Based on the CVR readout, the Safety Board concludes that, during the final approach descent from 2,000 feet, the flightcrew did not make the prescribed callouts.

The captain called the 2,000-foot altitude; however, no crewmember called the crossing altitude at Leesville. The second officer made the 1,000-foot call and the first officer reported it immediately and added an airspeed call. The first officer also called the altitude at 500 feet, but at that time he did not call out the airspeed or the rate of descent. At 400 feet, the flightcrew gained visual contact with the ground. They did not refer again to the cockpit instruments except when the first officer and the flight engineer noticed the higher-than-normal rate of descent. As a result, the required callouts at 100 feet above DH and at DH were not made.

Apparently when the aircraft descended into visual meteorological conditions and the runway environment came into view, the flightcrew discontinued reference to a majority of their flight instruments. They were not aware of their descent through DH. The barometric and radio altimeters were not monitored and the DH alerting lights on the radio altimeter and flight director were not observed. The headset aural signal of the middle marker was not used. The flight director computed glide slope display was not used below 400 feet nor was the secondary source of glide slope information used from the raw data display. Had the ground proximity warning system been installed, its aural warning signal may have alerted the crew in time to react correctly.

On October 22, 1975, a company NOTAM was issued concerning new altitude awareness callout procedures. These procedures, available to the flightcrew as changes to their Flight Manual and their Flight Operations Manual dated October 21, 1975, were not followed by the flightcrew of Flight 576. This lack of flightcrew coordination may have slowed the captain's reactions when the aircraft went below the glide slope.

The company manual required that a callout be made and immediate corrective action be taken when a significant deviation from the approach target speed is observed. Company procedures require that the final approach be flown at target speed (in this case 135 kn) plus 1/2 headwind (in this case 2 kn) plus gust (in this case none). The target speed for this approach was **137 kn**.

Although the airspeed on the final approach, as derived from the FDR readout, ranged from 140 to 145 KIAS, the flightcrew did not make the required airspeed callouts, and their omissions were not challenged by any crewmembers.

The flightcrew recalled that the rate of descent was about 700 fpm during the approach; however, the FDR trace shows rates as high as 1,400 fpm during the last 3.6 seconds of flight. About 4 seconds before the initial impact, the first officer made the descent rate callout "rate of descent too high." He did not specify the numerical rate as required. Had he done so, the captain may have been alerted and consequently may have considered a missed approach. Because of the low voice volume of the callout and the high noise level caused by the operation of the windshield wipers and the rain striking the aircraft, the captain did not understand the first officer's alerting call. This callout was the only rate-of-descent call made during the approach.

When the aircraft entered the heavy rain and downdraft activity and the captain lost all visual reference, he should have initiated the prescribed missed approach procedure. The Safety Board concludes that the captain's decision to continue the approach when the approach lighting which marked the approach end of the runway was not clearly visible did not conform to prescribed or recommended practices and that the captain did not exercise the prudence and care expected of an air carrier pilot in selecting a safe course of action.

2.2 Conclusions

(a) Findings

1. The aircraft's structures, powerplants, and systems did not malfunction.
2. The VASI lights alerted the first officer that the aircraft had descended below the glide slope.

3. The aircraft entered heavy rain showers and downdraft activity below **DH** and the flightcrew lost forward visibility.
4. When forward visibility was lost and the downdraft activity was encountered, the captain added engine thrust but did not increase the aircraft's angle of attack sufficiently to arrest the rate of descent.
5. Downdraft activity associated with the heavy rain showers contributed to the captain's inability to arrest the descent before the ground contact.
6. The captain did not execute a missed approach when he lost forward visibility.
7. The pilots failed to monitor their flight instruments until a safe landing was assured.
8. The captain did not use all of the flight instruments available to him.
9. The first officer did not make loud, distinct callouts when a hazardous situation was encountered.
10. The captain demonstrated poor judgment and did not exercise the prudence and care expected of an air carrier pilot when he failed to make a missed approach.
11. The flightcrew failed to follow company procedures concerning required callouts on final approach.
12. Had the ground proximity warning system been installed, it may have alerted the crew as to the aircraft's altitude above the terrain.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the pilot's failure to execute a missed approach when he lost sight of the runway environment in heavy rain below decision height.

3. RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board has recommended that the Federal Aviation Administration:

"Issue an Airworthiness Directive to require that the seatbelt tiedown rings on all Boeing 727 forward jumpseats be relocated so that the seatbelt will be positioned across the occupant's pelvic girdle at the recommended angle with the seatpan of 45° to 55". (A-76-60.) (Class 11 - Priority followup.)

"Inspect the flight attendant jumpseats on all other air carrier aircraft to insure that the seatbelt tiedowns are positioned properly; where improper installations are found, take immediate action to require that the tiedowns be relocated. (A-76-81.) (Class II - Priority followup.)"

As recommended by the Safety Board in 1971, the FAA issued Air Carrier Operations Bulletin No. 71-9 to emphasize the common errors which are made by flightcrews during the execution of nonprecision approaches and has recommended practices to eliminate these errors. The Safety Board believes that the FAA's recommended practices should apply to precision approaches as well.

Approach and landing accidents continue to occur at an unacceptable rate; this accident, as have many others in the recent past, demonstrates either a disregard for, or a modification of, approved operating procedures and lax flightcrew discipline. The Safety Board has recommended to the Administrator, Federal Aviation Administration, several measures to reduce the number of approach and landing accidents. However, in view of their continued occurrence, the Safety Board reiterates its concern and reemphasizes the importance of flightcrews' adhering more meticulously to approved procedures and regulations.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PHILIP A. HOGUE
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

May 19, 1976

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board was notified of the accident about 2200 on November 12, 1975. The investigation team went immediately to the scene. Working groups were established for operations, air traffic control, witnesses, weather, human factors, structures, maintenance records, powerplants, systems, flight data recorder, and cockpit voice recorder.

Participants in the on-scene investigation included representatives of the Federal Aviation Administration, The Boeing Company, Eastern Air Lines, Inc., the Air Line Pilots Association, the Transport Workers Union, Pratt & Whitney Aircraft Division of United Aircraft Corporation, the National Weather Service, and the Professional Air Traffic Controllers Organization.

2. Public Hearing

There was **no** public hearing in this case; however, deposition proceedings were held December 16 and 17, 1975. Parties represented at the deposition proceedings were: The Federal Aviation Administration, Eastern Air Lines, Inc., the Air Line Pilots Association, the National Weather Services, and the Professional Air Traffic Controllers Organization.

APPENDIX B

CREW INFORMATION

Captain Edward A. Barchard

Captain Edward A. Barchard, 45, holds Airline Transport Pilot Certificate No. 1327749 with ratings in the Boeing 727 and the Douglas DC-9. He was upgraded to pilot-in-command of the Boeing 727 aircraft on November 15, 1972. His first class medical certificate was updated on May 20, 1975, and was issued with a limitation to wear corrective eyeglasses when exercising the privileges of the airman's certificate. He stated that he was wearing the eyeglasses at the time of the accident.

Captain Barchard's last proficiency check was satisfactorily in compliance with 14 CFR 121.441. His last en route competency report was completed satisfactorily in compliance with 14 CFR 440 on December 6, 1974. He had accumulated about 5,986 total flight-hours, 1,724 hours of which were in B-727 aircraft. Captain Barchard had 14 hours 47 minutes of rest time before this flight sequence. At the time of the accident, he had been on duty for 10 hours 57 minutes of which 6 hours 22 minutes were flight time.

First Officer Robert F. Nicholson

First Officer Robert F. Nicholson, 42, holds Commercial Pilot Certificate No. 1484308, with ratings in airplane multiengine land, B-727, and instruments. His first-class medical certificate, issued with waivers for corrective eyeglasses, was updated on May 27, 1975. He stated that he was wearing the eyeglasses at the time of the accident.

First Officer Nicholson's last flight proficiency check was completed satisfactorily on April 7, 1975. He had accumulated about 5,831 total flight-hours, of which about 2,939 hours were in B-727 aircraft. First Officer Nicholson's rest time, as well as his duty time and flight time on this trip, were the same as Captain Barchard's time.

Second Officer Jiles L. Robinson, Jr.

Second Officer Jiles L. Robinson, Jr., 35, holds Commercial Pilot Certificate No. 1641970, with ratings in aircraft single engine land and instruments. He also holds Flight Engineer Certificate No. 1808743. His first-class medical certificate, issued with waivers for corrective eyeglasses, was updated on September 15, 1975. He stated that he was wearing the eyeglasses at the time of the accident.

Second Officer Robinson's last flight proficiency check **as** a flight engineer was completed satisfactorily **on** March 24, 1975. He had accumulated about **3,880** flight-hours, of which about **950** hours were in **B-727** aircraft. Second Officer Robinson's rest time, as well as his duty time and flight time **on** this trip, were the same as the other two flightcrew members.

APPENDIX C

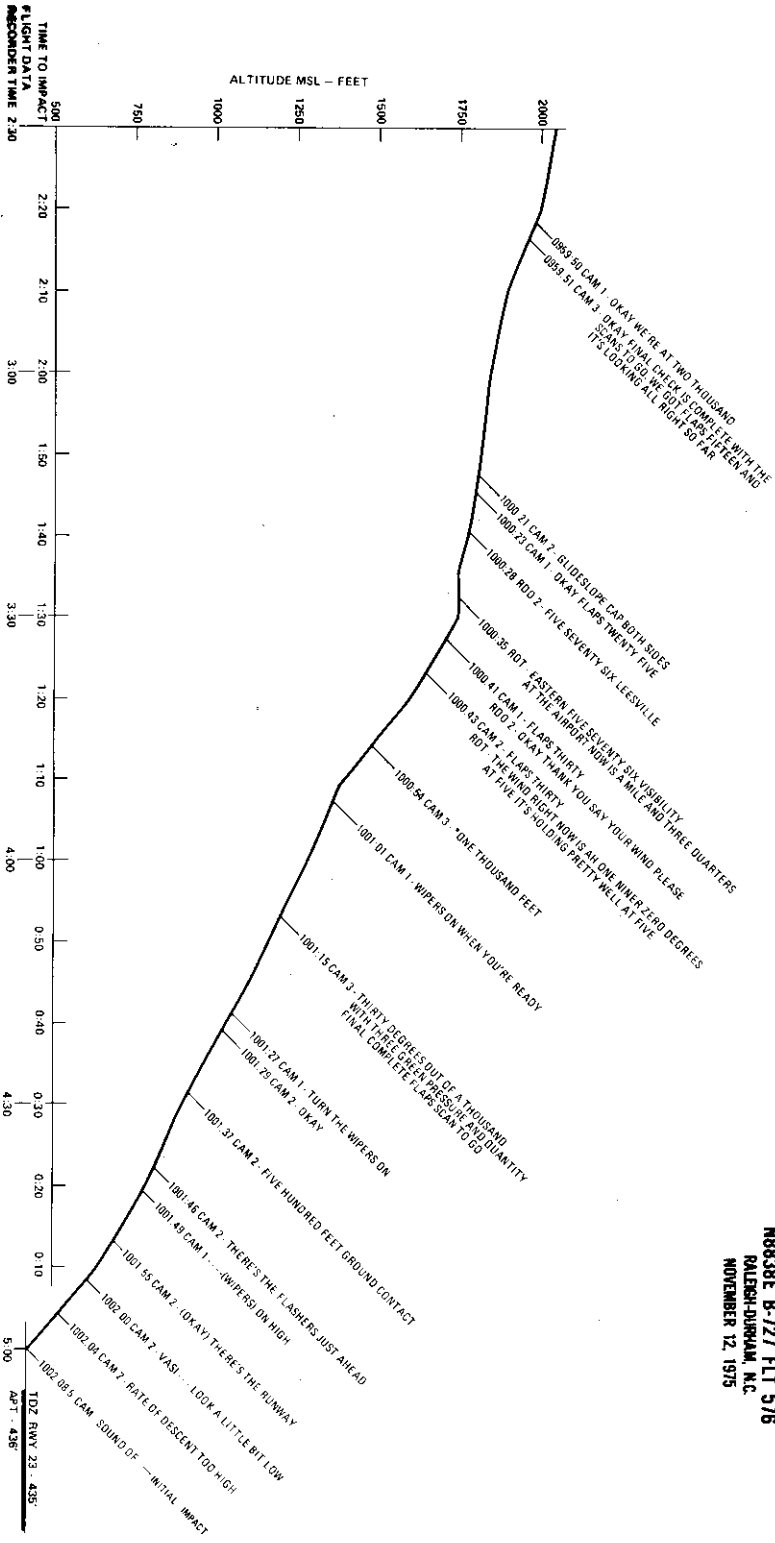
AIRCRAFT INFORMATION

Boeing 727-225, Serial No. 20381, N8838E, was registered to Eastern Air Lines, Inc. It was certificated and maintained according to procedures approved by the Federal Aviation Administration. At the time of the accident, the aircraft had flown 15,969.57 flight-hours; 571 hours had been flown since the last major phase check.

Engines: Three Pratt & Whitney JT-8D-7

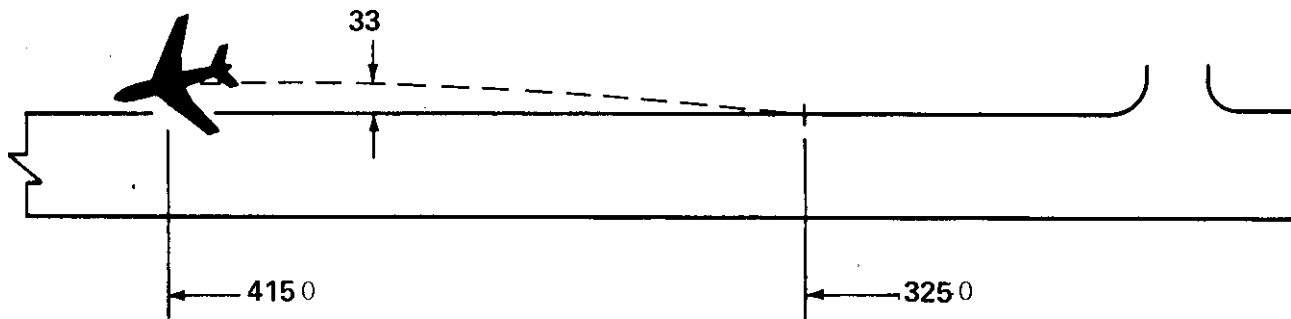
	<u>Date of Manufacture</u>	<u>Serial No.</u>	<u>Total Time</u>	<u>Hours Since Last Overhaul</u>
No. 1	9/10/68	655082	19,208	4,517
No. 2	3/25/66	653413	27,227	16,172
No. 3	3/13/64	648783	29,705	9,868

- LEGEND:
- CAM COCKPIT AREA MICROPHONE VOICE
 - OR SOUND SOURCE
 - RDD RADIO TRANSMISSION FROM AIRCRAFT
 - ROT FALEIGH - DURHAM TOWER
 - 1 VOICE IDENTIFIED AS CAPTAIN
 - 2 VOICE IDENTIFIED AS FIRST OFFICER
 - 3 VOICE IDENTIFIED AS SECOND OFFICER
 - UNINTELLIGIBLE WORD



NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

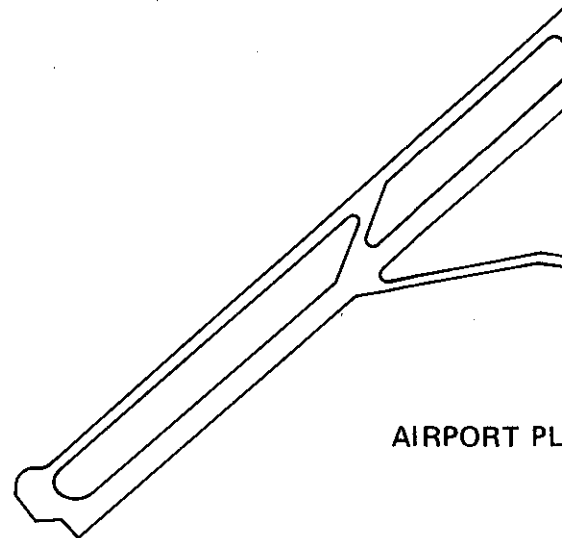
DESCENT PROFILE
EASTERN AIRLINES
N8838E B-727 FLT 576
RALEIGH-DURHAM, N.C.
NOVEMBER 12, 1975



AIRCRAFT LEGEND

- a Support - Main Landing Gear Door to Strut Attach.
- b Left Inboard T.E Aft Flap (9.5 Ft. Inbd.)
- c Mid Flap - Left T.E. Inbd.
- d Left T.E. Inbd Mid Flap, Outbd Half
- e Portion of Wing T.E. Structure Spoiler and Support Beam
- f Lower Right Wing Access Door Near Main Gear
- g Handrails (10 Ft Apart) Airstairs
- h Airstair Control Access Panel
- i Right Main Landing Gear Extension Actuator

ALL DISTANCES IN FEET



AIRPORT PL

250

RUNWAY
NO. 14

RIGHT
MAIN
GEAR

ENGINE

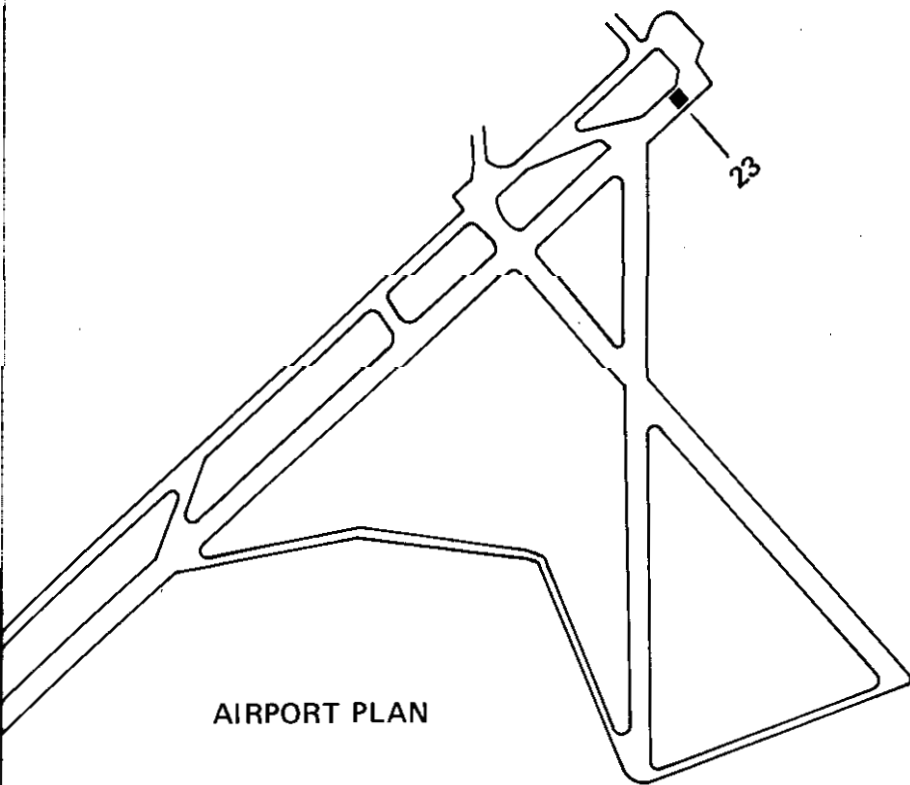
NO. 3

108

1276

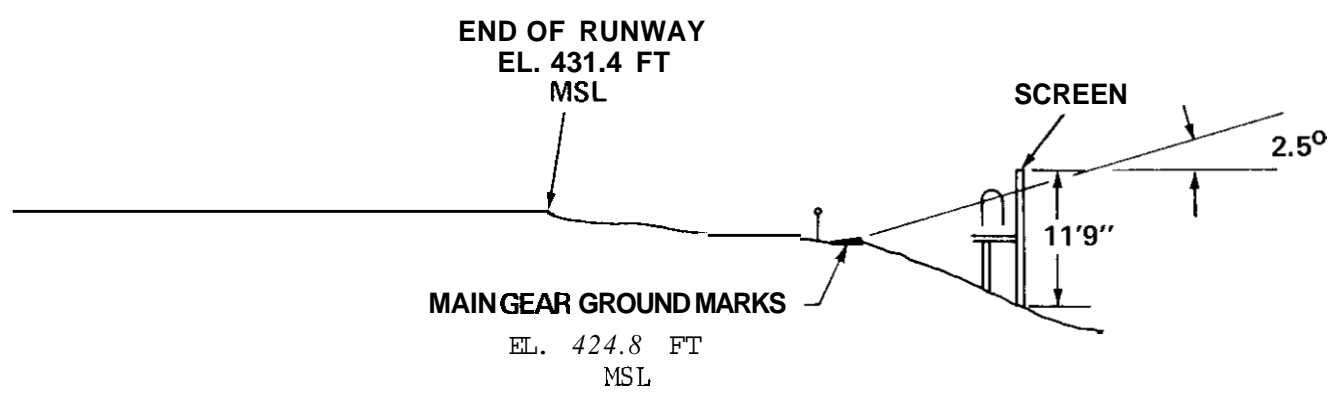
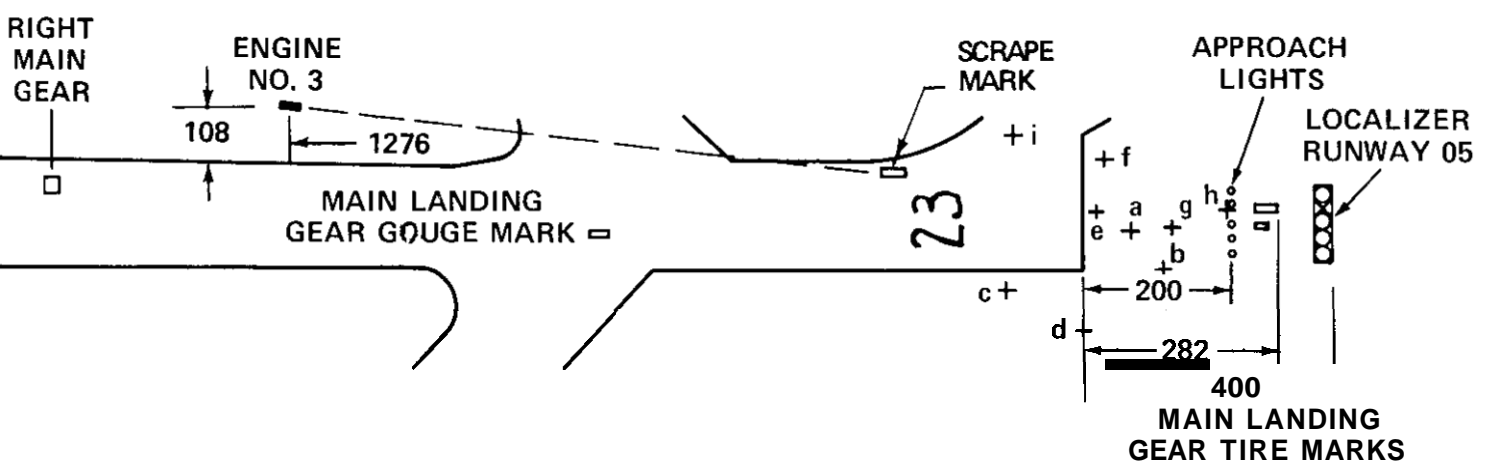
MAIN LANDING
GEAR GOUGE MARK

LEFT
MAIN
GEAR



AIRPORT PLAN

M/



NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C.

WRECKAGE DISTRIBUTION CHART
EASTERN AIRLINES FLIGHT 576
Raleigh-Durham N.C.
12 November 1975