FILE NO. 1-0029

AIRCRAFT ACCIDENT REPORT

EASTERN AIR LINES, INC.
McDONNELL-DOUGLAS DC-9-31, N8967E
AKRON-CANTON REGIONAL AIRPORT, NORTH CANTON, OHIO
NOVEMBER 27, 1973

ADOPTED: NOVEMBER 5, 1974

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20591

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16. Abstract

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The National Transportation Safety Board determines that the probable cause of the accident was the captain's decision to complete the landing at an excessive airspeed and at a distance too far down a wet runway to permit the safe stopping of the aircraft. Factors which contributed to the accident were: (1) Lack of airspeed awareness during the final. portion of the approach, (2) an erroneous indication of the speed command indicator, and (3) hydroplaning.

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SYNOPSIS

An Eastern Air Lines McDonnell-Douglas DC-9-31 crashed at Akron-Canton Regional Airport, North Canton, Ohio, on November 27, 1973, at 2129 e.s.t. The aircraft ran off the end of runway 01 after completing a precision approach and landing, traversed 110 feet of unpaved ground, and plunged over a 38-foot embankment. The aircraft was damaged substantially by the impact, but there was no fire. The 21 passengers and 5 crewmembers sustained various injuries.

The aircraft landed about 2,200 to 2,600 feet beyond the threshold of runway 01. The weather at the time consisted of low ceilings, light rain showers, fog, and 1½-mile visibility.

The National Transportation Safety Board determines that the probable cause of the accident was the captain's decision to complete the landing at an excessive airspeed and at a distance too far down a wet runway to permit the safe stopping of the aircraft. Factors which contributed to the accident were: (1) Lack of airspeed awareness during the final portion of the approach, (2) an erroneous indication of the speed command indicator, and (3) hydroplaning.

1. INVESTIGATION

1.1 History of the Flight

Eastern Air Lines, Inc., Flight 300 (EA 300), a McDonnell-Douglas DC-9-31 (N8967E), was a scheduled passenger flight from Miami, Florida, to Akron-Canton Regional Airport, North Canton, Ohio, via Pittsburgh, Pennsylvania.

In Pittsburgh, the captain received the 2009 1/ Ohio Valley States weather reports which included the following Akron-Canton observation: Scattered clouds at 100 feet, measured ceiling-300 feet overcast, visibility-1½ miles, thunderstorm, light rain showers, fog, wind-300° at 5 kn.

1/ All times herein are Eastern standard time, based on 24-hour clock.

EA 300 departed Pittsburgh at 2110 with 21 passengers and a crew of 5. Their computed takeoff data was based on a gross weight of about 83,000 lbs., and according to the flightcrew, the aircraft performed in accordance with their calculated data and airspeeds. The flight was cleared to, and flew at 6,000 feet. 2/

EA 300 contacted Akron-Canton approach control at 2118. The approach controller stated, "You can have your choice, either the localizer back course one nine approach or the ILS one approach, landing straight. Wind is one six zero degrees variable both sides at eight to one two, altimeter two niner seven four. Weather is indefinite ceiling two hundred, sky obscured, visibility one and one-half miles, light rain showers and fog, and the runway one visual range is more than six thousand feet."

The captain chose the instrument landing system (ILS) front course approach to runway 01 in order to use the electronic glidepath information. The captain and first officer stated that the weather made the use of the back course approach inadvisable, Although the visibility was above the published minimums, they noted that the reported ceiling was below the minimum descent altitude (MDA) for the back course procedure. They also knew that the runway was wet, and that they would be landing downwind. Although neither pilot computed the exact value of the tailwind component before landing, they knew it did not exceed the maximum allowable of 10 kn.

While the flight was being vectored toward the ILS final approach course, the captain authorized a flight attendant to observe the approach from the cockpit jumpseat.

Before clearing the flight for the approach, the approach'controller informed them, "Eastern three hundred, a company DC-9 just took off. Said when he landed (on runway 19), there was some water on the runway, but the braking action was pretty good." The flight acknowledged this message.

At 2125, EA 300 was cleared for the approach and to the tower frequency. A Vref 3/ speed of 115 kn. indicated airspeed (KIAS) had been computed based on an estimated landing weight of 80,000 lbs. The captain flew a manual ILS approach with the flight director in the autoapproach mode.

The tower controller cleared the flight to land, and reported the wind as, "One six zero degrees at niner." (Based on this wind, the tailwind component was 8 kn.). The first officer positioned the flaps at the

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2/ All altitudes and elevations are mean sea level, unless otherwise indicated,

3/ Aircraft landing distance determinations are based upon an approach airspeed which is 130 percent of the stall airspeed (1.3 Vs).

captain's command, and both the captain and the first officer stated that the flaps were extended to the 50° position before the aircraft passed the outer marker (OM), The checklists were accomplished in accordance with company procedures.

The captain stated that the approach was flown within "normal parameters." The approach lights were in view at 400 feet, and the runway lights could be seen at 300 feet, He was satisfied with the approach except for the speed command indicator, which was reading slow. 4/ According to the captain, this occurred about the time the first officer called that the runway was in sight, and the airspeed was 125 KIAS. He made remarks to the first officer about the speed command system's slow indication and a loading problem, and then added thrust momentarily until "the aircraft was in good position for the landing." Before this conversation, the first officer had told the captain that they were "(A bit) fast." The first officer stated that his airspeed indicator at that time indicated 130 to 135 KIAS. He remembered the captain's remarks, and he verified that the captain's speed command pointer was reading slow; however, he did not recall the indications on his indicator at any time during the approach. He confirmed that the captain added thrust, but he stated that the sequence of events occurred before he told the captain that the runway was in sight and while they were still in instrument flight conditions.

About 24 seconds before touchdown, the first officer called "Three hundred feet.. .above the glide slope" and, shortly thereafter, "Minimums ...the airport's on your left." There were no other altitude calls during the approach, and no callouts of airspeed deviations were made during the final part of the approach. Neither crewmember recalled the indicated airspeed just before touchdown.

The flight data recorder airspeed trace disclosed that the indicated airspeed began increasing 35 seconds after the OM was passed. During the final minute of the approach, it increased steadily from 132 KIAS, and attained a maximum of 142 KIAS when the first officer called "Minimums." At touchdown, the airspeed trace was about 139 KIAS.

According to the crew, the aircraft touched down about 1,000 to 1,500 feet beyond the runway threshold and on the centerline; it did not float before the touchdown. The spoilers deployed automatically at touchdown. Normal reverse thrust and brakes were applied immediately after touchdown, and reverse thrust was maintained until the aircraft slowed to between 60 and 70 KIAS. At that time, deceleration seemed to stop. Reverse thrust was increased to maximum continuous thrust (MCT),

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4/ The speed command indicator moves vertically over a scale. The pointer is centered when the computed optimum speed for a maneuver and indicated airspeed correspond. The pointer moves below center when the indicated airspeed is below the computed optimum speed and above center when the speed is higher.

and engine compressor stalls were heard. The captain said that the brakes felt normal, but that the aircraft's response to them was not.

The first officer turned the antiskid system off in response to the captain's command; he then "got on" the brakes with the captain. The captain stated that these actions took place about the point where the runway lights were "just starting to go orange." The first officer stated that the airspeed was about 70 to 80 KIAS. They noted that the airspeed was less than 60 KIAS when the aircraft left the runway.

After the aircraft left the pavement, it traversed about 110 feet of level ground, plunged over a 38-foot embankment, and stopped in a level attitude in a field below. The time was 2129.

Some passengers noticed the lack of deceleration during the landing roll. One stated that the aircraft was beyond the terminal building before it landed. (See Appendix F.) In addition, four witnesses at the airport saw the flight land. Three said that the aircraft touched down at, or beyond, the intersection of runways 01/19 and 05/23. The fourth said that the aircraft landed before it reached that intersection.

The accident occurred during the hours of darkness and at latitude 40°54'58"N and longitude 81°26'32"W.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	0	0	0
Nonfatal	5	21	0
None	0	0	

1.3 Damage to Aircraft

The aircraft was damaged substantially by the impact.

1.4 Other Damage

None

1.5 Crew Information

The crewmembers were qualified and certificated for the flight. (See Appendix B.)

1.6 Aircraft Information

N8967E was certificated and maintained according to Federal Aviation Regulations. (See Appendix C.)

The aircraft's weight and center of gravity at the time of the accident were 80,000 lbs. and 23.8 percent mean aerodynamic chord (MAC), respectively. Both were within specified limits. If the runway is wet and the tailwind component is 10 kn, the maximum allowable aircraft gross weight for a landing on runway 01 is 92,900 lbs.

1.7 Meteorological Information

The following are selected surface weather observations at the Akron-Canton Regional Airport on November 27, 1973.

2055 - Record Special, indefinite 200 feet, sky obscured, visibility-1½ miles, light rain showers, fog, temperature-58°F., dew point-54°F., wind-150° at 10 kn, altimeter setting-29.75 in. Thunderstorm ended 2020, moved northeast, peak wind-310° at 7 kn. 2007. Pressure falling rapidly.

2137 - Special, indefinite 200 feet, sky obscured, visibility-1% miles, light rain showers, fog, temperature-59°F., dew point-54°F., wind-160° at 10 kn, altimeter setting-29.75 in.

The official precipitation records for the airport indicated the following rainfall amounts:

Time	Inches
1800 - 1900	0.02
1900 - 2000	0.05
2000 - 2100	0.04
2100 - 2200	0.06

A Beechcraft King Air, N711MC, landed at the Akron-Canton Regional Airport about 5 minutes before EA 300. Before the King Air landed, the approach controller asked the pilot to check the braking action, because he had received two reports of poor braking. A twin Cessna had reported some hydroplaning, and an Allegheny Airlines DC-9 had reported poor braking because of water on the runway. The approach controller also stated that two aircraft had landed since those reports and that they reported no difficulties. The CVR confirmed that this transmission was available in EA 300's cockpit and that intracockpit conversation occurred during that transmission.

The captain stated that he did not recall hearing the transmission. The first officer remembered the reference to the aircraft's call sign, but did not remember the contents of the message.

The King Air's flightcrew did not give a braking action report to the tower, but subsequently stated that they had experienced light rain and a tailwind on the approach, and that they saw the runway at the middle marker (MM). The pilot stated that the runway was wet with puddles of water on it. He used reverse thrust only to stop the aircraft and, therefore, was not aware of hydroplaning.

Two DC-9's landed at the airport before EA 300: Allegheny Airlines Flight 915 (AL 915) at 2028 and Eastern Airlines Flight 573 (EA 573) at 2058.

The pilot of AL 915, a DC-9-31, stated that the weather was near minimums with light to moderate rain and a wind of 130° at 5 kn. He stated that the approach to runway 01 was normal. After touchdown, Maximum reversing and braking was used and considerable hydroplaning was experienced." The pilot reported to the tower that the braking action was "poor."

The pilot of EA 573, a DC-9-14, made two unsuccessful ILS approaches to runway 01. The first approach was abandoned because of the reportedly poor braking action, a high Vref speed of 133 KIAS, and a tailwind, which resulted in a descent rate of "about 1,500 feet per minute." On the second attempt the flight touched down. At touchdown, the crew was informed that the wind was 160° at 10 kn. During a postflight interview, the captain stated, "Since we touched down rather long, 1,500 to 2,000 feet down the runway, coupled with the last wind report, I elected to abort the landing even though the ground spoilers had actuated." A back course approach to runway 19 was then made and the captain had no difficulty stopping his aircraft after landing.

1.8 Aids to Navigation

The ILS at Akron-Canton Regional Airport provides a front course approach to runway 01 and a back course approach to runway 19. The inbound heading for the front course approach is 6°.

There is a low frequency homer located at the OM. The OM and MM are located 3.7 nmi and 0.7 nmi, respectively, from the runway threshold.

The glidepath angle is 2.9°. The minimum crossing altitudes at the OM and MM are 2,416 feet and 1,452 feet, respectively. The published minimums for this approach are runway visual range (RVR) 2,400 feet, or 1/2 mile.

The decision height (DH) is 1,413 feet (200 feet above the runway touchdown zone.)

The published minimum for the ILS back course approach is 3/4 mile visibility. The MDA is 1,560 feet, or 343 feet above the touchdown zone of runway 19. After the accident, the pertinent airport equipment, NAVAIDS, and the ILS were inspected and flightchecked; they operated within prescribed parameters.

1.9 Communications

Not applicable.

1.10 Aerodrome and Ground Facilities

The Akron-Canton Regional Airport was certificated under 14 CFR 139 for scheduled air carrier operations on April 14, 1973. It is served by three runways: Runway 01/19, runway 05/23, and runway 14/32. Field elevation is 1,228 feet.

Runway 01 is 6,398 feet long and 150 feet wide and is paved with ungrooved asphalt. The usable runway beyond the glidepath intersection is 5,458 feet. The runway is equipped with high-intensity runway lights, a high-intensity approach light system with sequence flashers, and a transmissometer. The final 2,200 feet of runway 01 is indicated by high-intensity amber runway lights.

The distance from the south end of runway 01 to its intersection with runway 14/32 is about 1,200 feet, and to its intersection with runway 05/23, about 2,250 feet.

During an inspection of runway 01 on the morning after the accident, rubber deposits were found in the touchdown zones at both ends of the runway; however, no other significant runway surface contamination was noted. Over the major portion of the runway, the tire tracks of EA 300 could not be distinguished from those of other aircraft. The accident aircraft's tire tracks became distinguishable over the last 200 feet of the runway. Within this 200 feet, an area about 3 feet long contained black rubber marks; that area was very close to the end of the runway.

1.11 Flight Recorders

The aircraft was equipped with a Fairchild Model F-5424 flight data recorder (FDR), serial No. 1218. The flight recorder and foil recording medium were undamaged, and all parameters had been recorded.

The last 5 minutes of the recorder traces were read. The altitude information was based upon a barometric pressure of 29.75 in. to convert pressure altitude to mean sea level. No corrections were made to any other parameters. (See Appendix D.)

The aircraft was equipped with a Fairchild A-100 cockpit voice recorder (CVR), serial No. 851. The recorder and tape were *not* damaged. The final 11 minutes were transcribed for this report. (See Appendix E.) Both recorders were installed in the aft section of the aircraft.

1.12 Aircraft Wreckage

The aircraft stopped on a magnetic heading of 360° and about 380 feet beyond the end of runway 01. The wings were intact and remained attached to the fuselage. There was minor spillage of Jet-A fuel. The leading edge slats were found extended fully; the trailing edge flaps on the right wing were found extended fully, while those on the left wing were in an intermediate position. The flap selector handle was found in the 50° detent. The spoilers were down, intact, and attached to the wing. Weeds and grass were trapped between the spoilers and the wing structure. The speed brake lever was in the retracted position.

The fuselage forward of station 996 was intact. Both engine assemblies separated from the aft fuselage section, and the pylons remained attached to the engines. The entire aft fuselage section and empennage, including the auxiliary power unit, separated from the main fuselage at the pressure bulkhead.

The main landing gear was extended and locked, and had folded aft at its attachments. The nose gear assembly was in the extended position and attached to its support structure. The nose gear and ~~airport~~ SUPPORT structure were torn from the fuselage and rotated aft and upward into the electrical and electronic compartment.

Continuity of the rudder, elevator, and horizontal stabilizer controls was destroyed by separation of the empennage from the fuselage. The ailerons, spoilers, and flaps were not movable as a result of ground impact.

The movable reference markers (bugs) of the captain's and first officer's airspeed indicators were set at 116 and 115 kn, respectively.

The upper left altimeter was set at 28.43 in. and indicated 270 feet. The lower left altimeter was set at 29.75 in. and indicated 1,200 feet. The right altimeter was set at 28.43 in. and indicated 300 feet.

All four main gear tires contained patches of reverted rubber. The tire pressure for tires No. 1 through 4 were 135 lbs., 137 lbs., 125 lbs., and 150 lbs., respectively. Brake wear, tire tread depth (except within the patches of reverted rubber), and inflation pressures were within prescribed tolerances.

1.13 Medical and Pathological Information

There were no fatalities. Of the 16 seriously injured persons, 7 sustained vertebral fractures. Other injuries included contusions, lacerations, and sprains.

Most of the passengers and crewmembers were treated at the accident site before being taken to the hospital.

1.14 Fire

There was no fire.

1.15 Survival Aspects

This was a survivable accident; the cockpit and cabin maintained their structural integrity; the tiedown chain-remained intact. Because there was no fire, there was ample time for evacuation and rescue. High vertical impact forces accounted for the separation of the tail section, the damage to the cabin interior, and the injuries sustained by passengers and crmembers.

The flight attendants responded effectively to the emergency. They used their company-issued flashlights, an electronic megaphone, and other emergency equipment to direct the rescue operations. Passengers reported, "a second or two of confusion," followed by an orderly evacuation. The collapse of the overhead racks onto the backrests of the seats during the final impact caused head injuries and interfered with the use of the over-wing exits.

The emergency lights functioned properly, except that the purser was unable to remove the quick-release light unit at the main entry door for use as a hand-held flashlight.

All exits were opened except the captain's sliding window; the captain exited through the rear of the aircraft. The inflatable slide at the galley door operated normally and was used by several people to exit and reenter the aircraft to assist with the rescue. Because of the proximity of the main entry door to the ground, the flight attendant detached the girt bar; therefore, the slide did not deploy when the door was opened. The slide at the tail exit was torn off with the structure that separated from the aircraft. The first officer exited the aircraft through his sliding window. The captain and a flight attendant entered the cabin via the cockpit door and helped supervise the evacuation. Several passengers were immobilized and had to be carried out on backboards. All occupants reportedly were removed from the site within 20 minutes after the accident.

1.16 Tests and Research

1.16.1 Aircraft Components and Systems

The brake system components and the damaged antiskid control box were examined. Two of the four circuit boards tested satisfactorily; however, two boards had cracks and broken transistors which prevented testing. The four transducers, hydraulic fuses, brakes, and brake servo valves also tested satisfactorily.

The components of the pitot system tested satisfactorily. The three pftot heads were clean with no evidence of distortion. The pitot and static drains were clean. Both airspeed indicators were tested, and both operated within limits.

All major components of the speed command system were tested and were found to function properly.

1.16.2 Runway Coefficient of Friction

At the Safety Board's request, the National Aeronautics and Space Administration (NASA) conducted slipperiness and drainage tests on runway 01 using the NASA diagonal braked vehicle (DBV). Three test zones, A, B, and C, were established along the runway, and covered with water to depths ranging from damp to 0.02 in. The following stopping distance ratios (SDR) 5/ were established.

Test Zone	Feet from Threshold	Rubber Deposits	SDR
A 6/	1,865 to 2,580	None to spots	1.31
B	2,580 to 3,580	None to spots	1.60
B to C	3,580 to 4,400	Spots to medium	1.61
C	4,400 to 5,400	Medium to heavy	1.80

A wet runway slipperiness reference for civil aircraft operations may be determined from the Federal Aviation Regulations for aircraft landing certification (14 CFR 21.125) and aircraft landing operations (14 CFR 121.195). This reference slipperiness level is equivalent to an SKR of 1.92.

According to a NASA Langley Research Center study, runway water depth during a landing determines the type of hydroplaning phenomena that could occur. Tests indicate that an aircraft is susceptible to both viscous hydroplaning and reverted rubber hydroplaning (when the wheels are locked) when water depths range from damp to 0.05 in. All three types of hydroplaning (dynamic, viscous, and reverted rubber 7/) may

5/ SDR is the ratio of the wet runway stopping distance to the dry runway stopping distance for an aircraft of the same weight, speed, and configuration.

6/ Test Zone A included an asphalt patch at the intersections of runways 01 and 05/23.

7/ Dynamic hydroplaning is the result of the hydrodynamic lift forces developed by a tire moving across a fluid-covered surface. Viscous hydroplaning or skidding is the result of the reduction of the friction coefficient caused by the lubrication properties of a thin fluid between the tire and the runway. Reverted rubber hydroplaning occurs from an increase in tire print pressure as a result of prolonged viscous or dynamic hydroplaning to the point that the tire melts and reverts to its original unvulcanized state.

occur with 0.05 to 0.10 in. water on the runway. The speed of the airplane must exceed the tire dynamic hydroplaning speed (approximately 9 times the square root of the tire pressure) for dynamic hydroplaning to occur.

1.16.3 Performance Data

At the Safety Board's request, the McDonnell-Douglas Aircraft Corporation furnished stopping distances for the DC-9-31 aircraft, The following parameters remained constant for all computations: Field elevation-1,228 feet, temperature-15° C, aircraft landing weight-80,000 lbs., slats extended, and 50° flaps. An 8-kn tailwind component was applied to all computations. Ground spoilers were assumed to be deployed automatically and fully extended 1 second after touchdown. When brakes were included in the deceleration data, braking began 1 second after touchdown, and full brakes were applied 2 seconds later. The variable conditions and the results are set forth below.

Condition 1 assumed that the runway was dry. The aircraft crossed the runway threshold at an altitude of 50 feet, at 1.3 Vs (115 KIAS), and landed at 1.25 Vs (110 KIAS). Forward thrust remained at idle throughout the landing roll. Based upon these criteria, the ground stopping distance was 1,818 feet. A landing speed of 139 KIAS increased the stopping distance to 2,964 feet.

Condition 2 was set up to investigate the effect of 80 percent N1 8/ reverse thrust on the ground stopping distance on a wet and dry runway. An SDR of 1.71 was applied to approximate the wet runway braking conditions. It was assumed that the thrust levers were pulled into the reverse detents 3 seconds after touchdown and that 80 percent N1 was attained 8 seconds after touchdown. The following data were computed:

Conditions	Stopping Distance (feet) Dry	Wet
(1) 80 percent N1 reverse thrust and braking	2,540	3,678
(2) 80 percent N1 reverse thrust and no braking,	5,697	5,697

1.17 Other Information

1.17.1 Eastern Air Lines Company DC-9 Flight Manual Procedures

Eastern Air Lines requires the pilot not flying the aircraft to make the following calls on all approaches:

8/ A measurement of thrust expressed in terms of a percentage of the rotational speed of the N1 (low pressure) compressor.

1) At 1,000 feet above field elevation, call out altitude, airspeed, rate of descent. On instrument approaches, he will also call out the result of flag scan.

2) At 500 feet above field elevation, call out altitude, airspeed, rate of descent. On instrument approaches, he will also call out the result of flag scan.

3) Call out significant deviations from programmed airspeed and desired descent rate.

4) For instrument approaches, call out DH or minimum descent altitude.

5) Call out "runway in sight--right/left or straight ahead."

According to Eastern Air Lines DC-9 training procedures, once the runway is called "in sight" only airspeed deviations should be called to the pilot's attention during the remainder of the approach. The company recommended that these speeds be called out as variances from the Vref or "bug" speed, for example, "bug plus" or "bug minus" the amount of variation.

The Eastern Air Lines DC-9 flight manual states, in part, "After touchdown, apply reverse thrust smoothly but quickly, using 80 percent N1 as desired maximum; however, maximum continuous thrust (MCT) may be used if conditions require maximum stopping effort. As speed decreases to approximately 70 knots, reduce power to prevent surging. Idle reverse thrust should be used until forward thrust is required to taxi."

With regard to airspeed control procedures during landing approaches, the flight manual states in part: "The speed 1.3 Vs, reference speed (Vref), is used to determine FAR landing distance and is used as target speed on final approach." The flight manual also discusses factors which affect the Vref speed, such as headwind component and gust factors, and how these should be managed. The discussion closes with the following statement: "Over the threshold, only the gust factor should be maintained above Vref."

Eastern Air Line's airspeed control procedures require that a target speed of Vref + 5 KIAS flown on the final approach. The additional 5 KIAS is to compensate for unknown, or undetermined, wind effect and is to be bled off slowly in order to cross the runway threshold at Vref.

1.17.2 Speed Command System

Speed command deviation pointers are located on the right side of the captain's and first officer's flight director indicator. They indicate deviation from optimum speed for the low-speed modes of flight and aid the pilot in maintaining a safe margin above the stall speed. The fast-slow pointers receive electrical signals from a speed command computer, which receives information from an accelerometer, vertical gyro, an angle of attack transducer, the right flap transducer, slat relays, the flight director controller, throttle switches, and the air/ground oleo relay.

With an aircraft weight of 80,000 lbs., landing gear extended, and flaps and slats fully extended, the pointer would center at an indicated airspeed of Vref + 3, or 118 kns. At lesser flap settings or higher gross weights, the pointer would center at correspondingly higher indicated airspeeds. A malfunction of a slat relay would cause the instrument to center at a higher indicated airspeed without a warning flag (about 20 KIAS at this aircraft's configuration).

Eastern Air Line's training curriculum for the speed command system was, for the most part, limited to the presentation afforded the pilot during the takeoff, the go-around maneuver, and engine-out maneuvers. With regard to the final approach, the company taught that the airspeed indicator was the primary instrument for airspeed controi that scheduled airspeeds should be maintained, and that the speed command was a backup reference instrument. It did not teach the effect which variances of gross weight or center of gravity locations would have on the speed command system's fast-slow presentation. There was no presentation or possible malfunctions which could alter the speed command reading, without a display of the warning flag. The only malfunction demonstrated in the flight simulator resulted in the display of warning flags. The captain's and first officer's depositions corroborated that this was the extent of their training on the system.

1.17.3 Flight Attendant Stations

The flight attendant's presence in the cockpit was not precluded by the provisions of 14 CFR 121.547, and based on the number of passenger seats on the aircraft, only two flight attendants were required in the passenger cabin.

The third flight attendant was assigned to the flight to assist in a meal service between Miami and Pittsburgh, and as such, was designated as the "extra" attendant. According to the company's flight attendant manual, the extra attendant shares the duties of the other flight attendants and will occupy the forward jumpseat with the senior flight attendant on takeoff and landing.

A company flight attendant supervisor stated, however, that the manual does not expressly preclude a flight attendant from occupying the cockpit jumpseat during a takeoff or landing, and that the captain had the authority to authorize a flight attendant to sit in a seat other than that to which she was assigned.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

When the flightcrew was offered a choice between a front course ILS approach to runway 01 or the back course approach to runway 19, they had received adequate weather information to make the selection. Based on the reports they had received at Pittsburgh and en route, they knew about the ceiling, the rain, and the surface winds at Akron-Canton. Therefore, the captain knew that his choice of the front course approach not only would require landing on a wet runway, but also would subject his aircraft to the effects of a tailwind that approached the aircraft's maximum allowable component.

Before clearing EA 300 for the approach, the controller told the flight that a company DC-9 had reported that there was water on the runway and that the braking action on runway 19 was "pretty good". Before that report, a twin Cessna and an Allegheny Airlines DC-9 had reported poor braking and hydroplaning, but these reports were 1 hour old. There was no further corroboration of the Allegheny DC-9's report, thus, the information given to EA 300 was the latest data available to the controller.

The captain's and first officer's recollections of the indicated airspeeds during the key moments of the descent vary. The captain stated that his reaction to the slow indication on the speed command indicator occurred just after passing the MM, whereas, the first officer placed this event between the OM and MM. Correlation of the CVR and FDR data disclosed that the speed command indication was mentioned just after the OM was passed and after the first officer called that they were fast. According to the first officer, the indicated airspeed at that moment was 132 KIAS. The FDR trace, at that time, indicated 132 KIAS. Therefore, the Safety Board concludes that the captain noted the slow reading of the speed command system between the OM and MM.

The target airspeed for the approach was Vref + 5 KIAS (120 KIAS), and the runway threshold was to be crossed at Vref. The FDR disclosed that the lowest recorded indicated airspeed on the approach was 132 KIAS, and that occurred about 15 seconds after the OM was passed. The airspeed remained at 132 KIAS for about 16 seconds, and then began to increase steadily until it reached 142 KIAS, about 5 seconds before touchdown. The landing speed was 139 KIAS.

During the approach, the crew discussed the high indicated airspeeds and slow indications on the speed command indicator. Since there was no change in aircraft configuration and since the descent rate remained substantially unchanged, the airspeed increase confirmed the captain's statement that he added thrust in response to the slow speed command reading. He stated that the additional thrust was maintained until the landing was assured. This assessment could not have been made until he had the runway in sight. Thus, it was apparent that the additional thrust was applied about 30 seconds after OM passage and was maintained until after the first officer called the runway in sight, 1 minute 22 seconds later. During that interval, the airspeed increased about 10 KIAS.

The company's training curriculum on the speed command system did not include a discussion of possible malfunctions that could cause an erroneous speed command indication without causing the warning flag to be displayed. However, they did teach that the airspeed indicator was the primary instrument for control of airspeed and that the target speed, based upon the estimated landing weight, was to be flown on final approach. The captain knew that the speed command system would portray the optimum speed for the maneuver being performed, and that it was based on aircraft configuration and gross weight. He also knew that his Vref speed of 115 KIAS was predicated on an 80,000-lb. landing weight. The slow indication occurred at about 130 to 135 KIAS, and it could not have been valid unless the aircraft's gross weight was about 100,000 to 105,000 lbs. Although the captain mentioned "a loading problem" in connection with the speed command reading, he also stated that he had not noted any significant variations between their computed takeoff data and aircraft performance at Pittsburgh; consequently, an error of this magnitude should have made the captain suspicious of the operation of the speed command rather than aircraft loading. Instead, he chose to react to the speed command reading without requesting a crosscheck of his instruments with those of the first officer. The components of the speed command system functioned normally when tested; therefore, the reason for its slow reading remains undetermined.

The evidence indicated that, once both pilots had the runway in sight, the prescribed company airspeed control procedures were not followed. This is substantiated by the fact that neither pilot recalled noting the airspeed during the final moments of the approach, although it was about 25 KIAS above Vref. The lack of airspeed awareness also explains the captain's statement that the approach and landing appeared normal to him--so normal that he never considered rejecting it.

The automatic actuation of the ground spoilers identified the touchdown point on the CVR. From that point, the tape terminated in 26 seconds. Therefore, the ground distance traversed by EA 300 was computed using the FDR airspeed trace for those 26 seconds. The computation was based on average indicated airspeed selected at the midpoint of 1-second intervals. The 8-kn tailwind component was then added to the indicated airspeed to determine a ground velocity. The computed ground distance traversed by the aircraft was 4,503 feet. The aircraft stopped 6,777 feet beyond the threshold of runway 01. Based on these figures, EA 300 touched down 2,275 feet beyond the threshold of runway 01.

The distance from the OM to the runway threshold was 22,481 feet, and the elapsed time from marker passage to touchdown was 1 minute 40.5 seconds. During that time, the flight traversed a ground distance of about 25,130 feet, which indicates that the aircraft landed about 2,648 feet beyond the threshold. This estimate was based on average true airspeeds selected over 10-second intervals. An 8-kn tailwind component was added.

These computations support the statements of the passenger and the witnesses who said that the aircraft landed at or beyond the intersection of runways 01 and 05/23. The Safety Board concludes that the aircraft landed about 2,200 to 2,600 feet beyond the threshold of runway 01, which left 3,800 to 4,200 feet of usable runway in which to stop the aircraft.

The NASA tests disclosed that at water depths ranging from damp to 0.02 in., the average SDR over the last 3,000 feet of the runway was about 1.71. Although the exact amount of water on the runway could not be determined, an approximate SDR at the time of landing can be derived from the available evidence.

The average deceleration rate of EA 300 was about 6 feet/second^2. Over the last 400 feet of the runway, where evidence of viscous and reverted rubber hydroplaning was found, this rate decreased to 3 feet/second^2. This rate was achieved by applying brakes shortly after touchdown, using 80 percent N1 reverse thrust over the first portion of the landing roll, and full reverse thrust over the latter portion. Deceleration rates were computed from the manufacturer's wet runway stopping distances. The following table represents a comparison between these rates and EA 300's performance as noted above.

Condition	Deceleration rate (ft./sec^2)
Brakes + 80 percent N1 reverse thrust	10.16
Brakes + forward idle thrust	6.66
No brakes + 80 percent N1 reverse thrust	3.98
EA 300	6.00

Based on these rates, and statements by the flightcrew describing the braking conditions, the Safety Board concludes that the runway conditions at the time of EA 300's landing equaled, or probably exceeded, an SDR of 1.71.

If the aircraft had been flown according to recommended company procedures, it would have landed about 1,000 feet beyond the runway threshold. Applying an SDR of 1.71 and an 8-kn tailwind, the wet stopping distance without the use of reverse thrust would have been 3,109 feet, for a total distance of 4,109 feet. Thus, if the recommended approach speeds had been adhered to, even with the long landing, the aircraft might have been stopped between 5,309 and 5,709 feet beyond the threshold. Therefore, the long landing was not the primary causal area.

Based on an SDR of 1.71, the 147-kn landing velocity (139 KIAS + 8-kn tailwind) increased the wet stopping distance without reverse thrust from 3,109 feet to 5,068 feet. Therefore, based on the estimated touchdown points, it was impossible to stop the aircraft on the runway without the use of reverse thrust.

Company procedures authorize the use of MCT reverse thrust "if conditions require maximum stopping effort." The fact that the captain did not apply full reverse thrust until well into the landing roll further substantiates that the landing appeared normal to him. According to the manufacturer, 80 percent N1 reverse thrust would reduce the landing roll to 3,678 feet. Therefore, if the aircraft touched down at 2,200 to 2,600 feet from the runway threshold, it might have been possible to stop with 120 to 520 feet of runway remaining, provided the reverse thrust was applied as set forth in the stated parameters, and provided it operated at its maximum effectiveness throughout the application. The compressor stalls that occurred when the captain applied MCT reverse thrust compromised the effectiveness of the reverse thrust and may have rendered it totally ineffective, as evidenced by the fact that during the time it was increased to MCT, the deceleration rate deteriorated to less than the rate computed for 80 percent N1 reverse thrust only. It is apparent that the manner in which the landing was accomplished placed the aircraft in a position in which stopping was dependent upon the added effects of reverse thrust.

Although it was established that the deceleration rate of the aircraft was less than that expected on a runway with an SDR of 1.71, it could not be determined whether this was the result of dynamic hydroplaning, the interaction of actual SDR and the antiskid system, or a combination of both. To the extent that conditions for dynamic hydroplaning existed, the fact that the landing was made at a velocity 40 kn above the theoretical tire dynamic hydroplaning speed, resulted in a considerable increase in the duration of the aircraft susceptibility to this type of hydroplaning.

There is no doubt that viscous and reverted rubber hydroplaning occurred during the latter portion of the landing roll. The evidence disclosed that the decrease in the deceleration rate during the final portion of the landing roll was practically simultaneous with the first officer's acknowledgement of the captain's command to turn off the antiskid system, and with the beginning of the tire marks on the runway. Since both pilots stated that they were on the brakes at the time, the deactivation of the antiskid system probably produced a locked wheel skid, and the deterioration of braking performance.

Considering the runway conditions, the tailwind, the aircraft's excessive landing velocity, and the touchdown point, the captain should have questioned the feasibility of bringing the aircraft to a safe stop within the confines of the runway. He had control over every facet of the approach and landing, and the decision to go around could still be made even after the wheels contacted the runway. Therefore, the Safety Board concludes that although hydroplaning and its effects contributed to the accident, the captain's decision to complete the landing under the existing adverse conditions was the primary factor in this accident.

With regard to the flight attendant, it appears that her presence in the cockpit had no effect on the manner in which the crew executed the approach. However, the Safety Board stresses that the operator as well as the pilot-in-command should be fully cognizant of their respective responsibilities for assuring that persons admitted to the flight deck have assigned functions to perform and that they are authorized by Federal regulations and company procedures.

2.2 Conclusions

a. Findings

1. The flighterew was certificated and qualified to conduct the flight.

2. The aircraft was certificated and maintained in accordance with FAA rules and company procedures.

3. The captain was aware of the tailwind and wet runway when he decided to make a front course approach to runway 01.

4. The flight acknowledged reception of a report stating that there was some water on the runway, and that a company DC-9 had reported that braking action was "pretty good" on runway 19.

5. The Safety Board was unable to determine the cause of the erroneous indication on the speed command indicator.

6. The indicated airspeeds on the approach were 17 to 27 KIAS above the computed Vref.

7. The aircraft landed about 2,200 to 2,600 feet beyond the runway threshold, leaving 3,800 to 4,200 feet of paved surface on which to stop.

8. The stopping distance required under the existing runway conditions without the use of reverse thrust was 5,068 feet.

9. Hydroplaning occurred during the landing roll.

b. Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the captain's decision to complete the landing at an excessive airspeed and at a distance too far down a wet runway to permit the safe stopping of the aircraft. Factors which contributed to the accident were: (1) Lack of airspeed awareness during the final portion of the approach, (2) the erroneous indication of the speed command indicator, and (3) hydroplaning.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

November 5, 1974

APPENDIX A

INVESTIGATION & HEARING

1. Investigation

The Safety Board was notified of the accident at 2330 e.s.t., on November 27, 1973. An investigation team went immediately to the scene. Work groups were established for operations, air traffic control, witnesses, weather, human factors, structures, powerplants, systems, maintenance records, cockpit voice recorder, and flight data recorder. Parties to the investigation included: Eastern Air Lines, Inc., Federal Aviation Administration, McDonnell-Douglas Corp., Air Line Pilots Association, and International Association of Machinists.

2. Hearing.

There was no public hearing. Depositions were taken on July 31, 1974.

a

APPENDIX B

CREW INFORMATION

Captain William H. Hill

Captain William H. Hill, 40, was employed by EAL on February 18, 1957. The captain held Airline Transport Pilot Certificate No. 1275591 with an airplane multiengine land rating, and commercial privileges in airplane single engine land. He was type rated in Convair 240/340/440, Lockheed Electra, and DC-9 aircraft. He had a First-class medical certificate dated September 4, 1973, and was required to wear glasses for reading.

The captain had checked out on the DC-9 aircraft on July 1, 1971. He had 10,881 flight-hours, 736 of which were in DC-9 aircraft. During the previous 90-day, 30-day, and 24-hour periods, he had flown 135 hours, 41 hours, and 2 hours 42 minutes, respectively. His last two proficiency checks were on September 15, 1973, and April 17, 1973. His last line check was May 9, 1973, and he had completed recurrent ground training on September 24, 1973.

The captain had been off duty about 53 hours before reporting for the flight. At the time of the accident, he had been on duty 4 hours, 15 minutes, of which 2 hours, 42 minutes were flying time.

First Officer Andrew R. McQuigg

First Officer Andrew R. McQuigg, 28, was employed by EAL July 29, 1968. He had a Commercial Pilot License No. 1721270 with an instrument rating. He had airplane multiengine land, single engine land, and glider aircraft ratings. His First-class medical certificate was issued on June 15, 1973, with no limitations.

He had upgraded to the DC-9 aircraft on October 31, 1973. He had accumulated 7,000 flight-hours, 23 of which were in the DC-9 aircraft. During the previous 90-day, 30-day, and 24-hour periods, he had flown 85 hours, 26 hours, and 2 hours 42 minutes, respectively. His last proficiency check and ground school training were completed on October 31, 1973; these completed his DC-9 upgrading curriculum.

He had been off duty about 111 hours before reporting for the flight. At the time of the accident, his on-duty and flight times were the same as the captain's.

The flight attendants were qualified according to FAA and company regulations, requirements, and procedures.

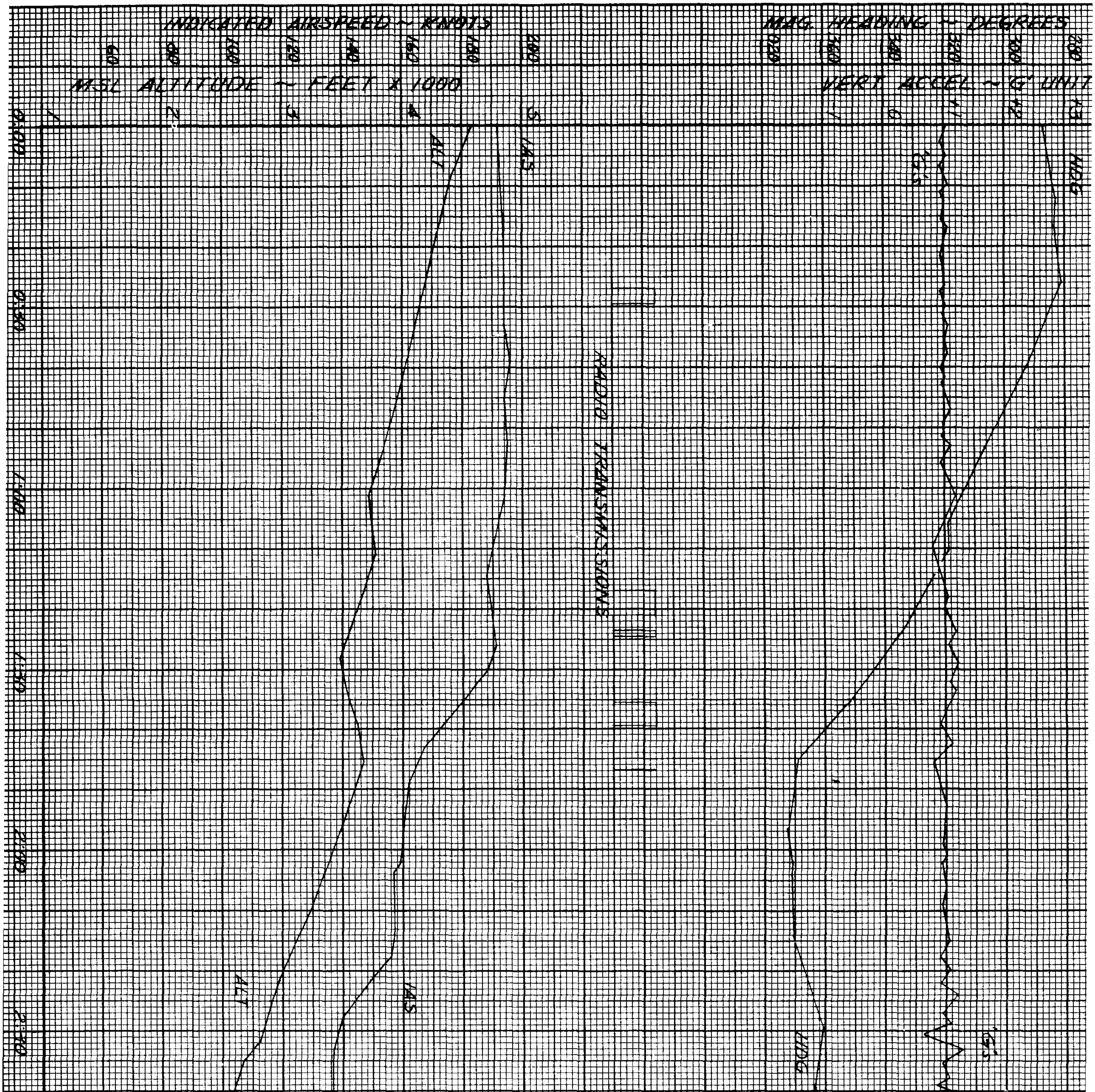
APPENDIX C

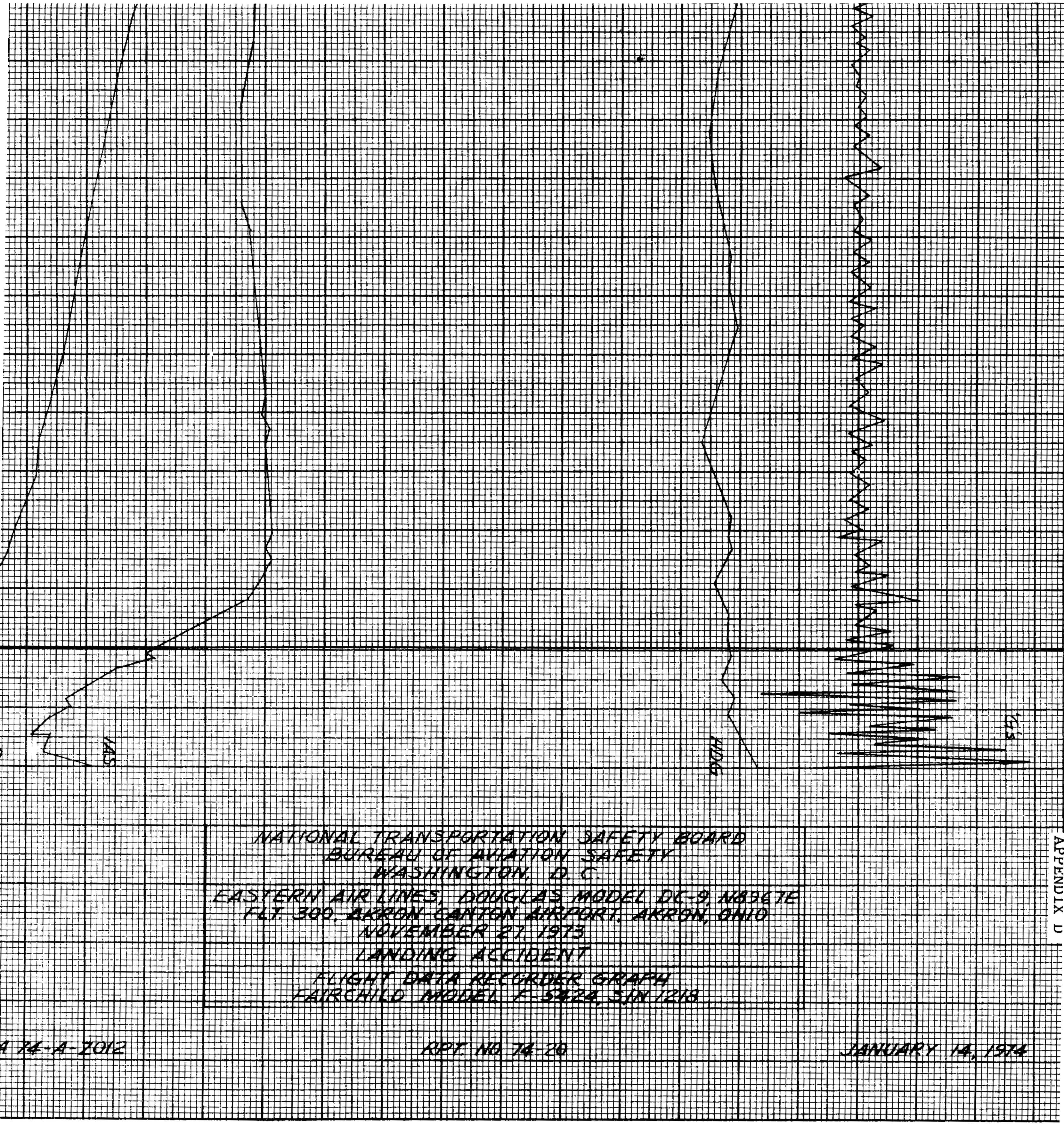
AIRCRAFT INFORMATION

N8967E, a DC-9-31, was manufactured in August 1968, and registered to Eastern Air Lines, Inc., on August 23, 1968. A standard airworthiness certificate was issued for the aircraft on August 13, 1968. The aircraft had accumulated 15,615 flight-hours at the time of the accident.

Aircraft and component records showed that all inspections and overhauls had been performed within prescribed time limits and that the aircraft had been maintained according to company procedures and FAA regulations. All applicable airworthiness directives had been complied with as of November 27, 1973.

The aircraft was equipped with two Pratt and Whitney JT-8D-7 engines. The No. 1 engine, serial No. 656882, had 14,008 hours since overhaul, and the No. 2 engine, serial No. 648991, had 13,927 hours since overhaul.


INDICATED AIRSPEED ~ KNOTS
60
80
100
120
140
160
180
200
MSL ALTITUDE ~ FEET X 1000
1
2
3
4
5
MAG. HEADING ~ DEGREES
VERT. ACCEL ~ 'G' UNITS
-1
0
+1
+2
+3
ALT
IAS
G's
HDG
RADIO TRANSMISSIONS


IAS
HDG
G's
NATIONAL TRANSPORTATION SAFETY BOARD
BUREAU OF AVIATION SAFETY
WASHINGTON, D. C.
EASTERN AIR LINES, DOUGLAS MODEL DC-9, N8967E
FLT. 300, AKRON CANTON AIRPORT, AKRON, OHIO
NOVEMBER 27, 1973
LANDING ACCIDENT
FLIGHT DATA RECORDER GRAPH
FAIRCHILD MODEL F-5424, S/N 1218
A 74-A-Z012
RPT. NO. 74-20
JANUARY 14, 1974

APPENDIX E

TRANSCRIPT OF ADDITIONAL PERTINENT COMMUNICATIONS FROM COCKPIT VOICE RECORDER DOUGLAS MODEL DC-9-31, N8967E, EASTERN AIRLINES FLIGHT 300, AKRON-CANTON REGIONAL AIRPORT, NORTH CANTON, OHIO NOVEMBER 27, 1973

LEGEND

CAM	Cockpit area microphone voice or sound
RDO	Radio transmissions from N8967E
-1	Voice identified as Captain
-2	Voice identified as First Officer
-3	Voice identified as ~~unknown~~ flight attendant
-?	Voice/source unidentified
APC	Akron-Canton Approach Control
711 MC	King Air 711 Mike Charlie
*	Unintelligible word or words
#	Nonpertinent word
%	Break in continuity
( )	Questionable text
(( ))	Editorial insertion
---	Pause

Note: Times expressed in ~~central daylight~~ eastern standard time using the time of final impact as 2129:00.0 c.d.t.

INTRA-COCKPIT TIME & SOURCE	CONTENT	AIR-GROUND COMMUNICATIONS TIME & SOURCE	CONTENT
		2118:06.6 RDO-2	Approach good evening, Eastern ah, three hundred with you at six thousand
		2118:12.6 APC	Eastern three hundred, Eastern three hundred, Akron-Canton approach, ident, and you can have your choice, either the localizer backcourse one nine approach or the ILS one approach landing straight-in. Wind, one six zero degrees variable both sides at ah, eight to one two. Altimeter two niner seven four, the weather is an indefinite ceiling, two hundred, sky obscured, visibility one and one half miles (in) light rainshowers and fog and runway one visual range is more than six thousand feet
2118:39.1 CAM-2	One?		
CAM-1	One		
		2118:40.6 RDO-2	We'll take the ILS for the front course to one
		2118:43.1 APC	Okay, continue inbound to Briggs and expect the ILS approach
		2118:46.0 APC	Seven eleven Mike Charlie, four miles from outer marker, turn right three four zero, cleared for the ILS approach

INTRA-COCKPIT TIME & SOURCE	INTRA-COCKPIT CONTENT	AIR-GROUND COMMUNICATIONS TIME & SOURCE	AIR-GROUND COMMUNICATIONS CONTENT
2118:49.6 CAM-2	Did you get all t (John)? ((Begins at time of word " " in APC transmission above))		
CAM-1	Uh huh		
2118:51.6 CAM-2	Whatever he said		
		2118:52 1 711 MC	Okay, right to three forty, cleared for the approach, Mike, Charlie
CAM-1	Yeah		
CAM-2	Sounded like some legal talk (I don't know)		
		2118:55.6 APC	Mike Charlie, when you land could you check the braking action we had one report, well two reports earlier of braking action. One was a Twin Cessna had some hydroplaning and a DC-9 reported braking action poor due to water on the runway. But we've had a couple of aircraft land since and ah, they didn't say anything about it at all
2118:58 6 CAM-3	I was gonna say, if you're gonna make a funny approach, I wanna get off now ((begins with first word "had" in APC transmission opposite))		
CAM-2	You're gonna do what if so how?		
CAM-1	Ah --- put this back on the		
CAM-2	Other one		
CAM-1	One fifteen, yeah		
2119:10.1 CAM-2	Say again?		

INTRA-COCKPIT TIME & SOURCE	CONTENT	AIR-GROUND COMMUNICATIONS TIME & SOURCE	CONTENT
2119:11.1 CAM-3	I said if you're gonna make an approach and you can't see, I wanna get off	2119:11.1 711 MC	Okay, we'll do that
		2119:12.6 APC	Thank you
CAM-1	All right		
CAM-2	Well listen		
CAM-3	Yeah?		
2119:16.6 CAM-1	Are you gonna ride up here or you gonna sit back there?		
		2119:18.6 ?	* *
CAM-3	I wanna get off, period ((laughter))		
CAM-1	Oh --- all right		
CAM-2	You wanna ride up here and watch?		
CAM-3	Can I?		
CAM-2	Ask (John)		
CAM-1	Yeah		
CAM-3	Can I?		
CAM-?	* *		
CAM-2	Sit down		
CAM-1	Keep your feet off the seats		

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
CAM-3	Let me get my purse		
CAM-2	Your purse?		
CAM-3	I want to get a butt		
CAM-?	Sound of laughter		
CAM	Sound of click ((similar to door latch movement))		
CAM-1	You got one		
CAM-2	Laughter		
CAM-1	I shouldn't have said that, right?		
CAM	Sound of click ((similar to door latch movement))		
CAM-2	Naw, I don't think so		
2119:37 1 CAM-1	All right		
		2119:37.6 ?	And ah, five two five's out of ten
2119:41 1 CAM-2	They must be out of their mind, the # who wants to, who in the # wants that # back course --- I mean you know, Jesus Christ	APC	(Thirty-two four, so long)
2119:47.1 CAM-1	I don't even want a backcourse on a clear day		

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM-2	Yeah
CAM-1	You know how to handle that thing, right?
CAM-3	Right, I did it once
CAM-2	Here, pull these two together, honey, now this goes (through here)
CAM-3	Oh, I'm in the way
CAM-2	Got it?
CAM-3	Yeah
CAM-3	* *
2120:07.1 CAM-2	Let me try those markers again
CAM-1	What was your problem honey?
CAM-3	* *
CAM-1	Here you go, put a foot up
CAM-3	I can't reach it
CAM-2	Oh you can't
CAM-3	No
CAM-1	Oh sure

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
2119:[illegible] 1 ?	One oh eight, squawking five forty-seven
2120:09.1 RDO-2	Sound of morse code identifier

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM-2	I'm sorry
CAM-2	Let her get 'em up herself
CAM-1	All right
CAM-2	Yeah
2120:25.6 CAM-2	Now they're pointing --- close
CAM-1	Okay
2120:31.1 CAM-2	Fifteen miles to Briggs
CAM-1	Right
CAM-2	Be about twenty-four from the airport
CAM-1	Right

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
2120:20.6 APC	King Air one one Mike Charlie contact tower one eighteen point three you're about a half mile from the outer marker
2120:26.6 711 MC	Mike Charlie, call the tower, good night
2120:29.1 APC	Good night, sir
2120:35.6 ?	* *

INTRA-COCKPIT

TIME & SOURCE	CONTENT
2120:45.6 CAM-2	Is your boyfriend a pilot * ?
CAM-3	Naaah
CAM-2	No?
CAM-3	No he's a *, a factory worker * *
CAM	Sound of stabilizer trim actuation
2120:57.1 CAM-1	Well, let's see what we got for cabin temp
CAM-2	I been screwing around with that, they're probably boiling back there
CAM-1	All right
CAM-2	Now it's a hundred and thirty and they shouldn't mind that
CAM-1	Laughter
CAM-2	Listen to 'em screaming back there, they love it
CAM-1	Right, just like a sauna bath
CAM-2	Laughter
CAM-2	Now Eastern's working harder for your dollar by burning you

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
CAM-1, 3	Laughter		
2121:21.1 CAM-1	If the crew's gotta sweat, the passenger's gotta sweat, by golly		
CAM-2	That's right		
		2121:26.6 ?	One oh eight, up to sixteen thousand
CAM-2	I've been scared before (11) but never like this		
CAM-1	Yeah me too		
CAM-2	But so long a time		
CAM-2	Okay, ah --- I wonder if he'd consider letting us down, would you like a little lower?	2121:31.6 APC	Eastern five seventy-three Akron-Canton departure, radar contact, turn left heading three one zero, join Victor forty, resume normal navigation climb and maintain six
2121:44.6 CAM-1	Yeah, I'd like lower		
		2121:45.6 RDO-2	Eastern three hundred, (would) like lower

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM	Sound of click
CAM-2	He forgot about (us)
CAM	Sound of clicks
2121:59.1 CAM-1	Pumps are high, in-range checklist
2122:01.6 CAM	Sound of stabilizer trim actuator signal
CAM	Sound of click
2122:03.6 CAM	Sound of stabilizer trim actuator signal
CAM	Sound of clicks
CAM-2	Fuel system set for landing
CAM-2	* **
CAM-2	((Reads in-range checklist))
2122:16.1 CAM-2	All done, skipper
CAM-1	All right. You do a # of a job

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
APC	Eastern three hundred, Akron-Canton descend and maintain three thousand
2121:52.6 RDO-2	Okay, down to three thou---
APC	Eastern five seventy-three, how was the braking action on nineteen when you landed?

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM-1	Humming
CAM-(1)	* see if I can find a way (here) for (him) * * *
CAM-1	Humming
CAM-3	Are we going in on ILS or something like that.
CAM-1	Ah, something like that, yeah its %
CAM-3	Something like that?
CAM-1	Yeah, it probably won't resemble anything you've ever seen(on an) ILS
CAM-2	Laughter
CAM-3	It doesn't look that bad
CAM-1	All right
CAM-1	Beautiful
2123:00.1 CAM-1	Did you ever notice when you need those # spoilers, they're never there?

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
RDO-2	Ident signal ((incomplete sequence)]
2122:26.6 APC	Yeah, that's okay, I was just wondering if there was still water on the runway at all
	((No transmissions heard from EA 573 on RDO-1 or RDO-2))
2122:37.6 APC	Okay Eastern three hundred, did you copy that
2122:46.6 APC	Ah, Eastern three hundred, a company DC-9 just took off. Said when he landed nineteen there was some water on the runway but braking action was pretty good
RDO-2	Thank you very much

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM	Sound of clicks
CAM-3	The what?
CAM-1	Laughter
CAM-1	Whooh
CAM-2	Two people doeing what?
CAM-2	He's kidding
CAM-1	What kind of car?
CAM-2	Heh heh
CAM-2	Station wagon
CAM-3	* * (I want a *
CAM	Sound of squeak and clicks
CAM-1	Humming
2123:37.1 CAM-1	Oh partial obscuration, in other words, we'll be able to see it till we get down to the ground
CAM-2	Yeah, that's the story of my life
2123:51.1 CAM-2	Four miles from Briggs
CAM-1	Why don't we get (* *back here)

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
APC	Ah, say again, what's off the end of the runway?

Note: ((An APC and other aircraft heard over RDO-2 during this period))

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
CAM-2	(Okay)		
2124:05.1 CAM-1	Where's my highway? That's what I'm looking for		
CAM-3	*		
2124:08.6 CAM-2	I got an Esso road map right here, captain. It's got all the airports on it		
CAM-1	I got a road map, but I don't have the highway I wanted *		
CAM-1	Oh well		
2124:22.1 CAM-?	Well, i looks like any other city		
		2124:23.1 APC	Eastern three hundred then right heading three two zero
		RDO-2	Right to three twenty, Eastern, ah, three hundred
CAM-1	The tower is what? one oh nine something or other		
CAM-2	One zh-- zero nine point five. Six degrees inbound		
CAM-1	All right		
CAM-2	Marker at twenty-five hundred		
2124:39.6 CAM-1	Six and twenty-five thou-- * it inbound		

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM-1	I hate to see --- that evening = -- ((singing))
CAM	Sound of clicks
2124:50.1 CAM-2	Why don't they fix these things # things
CAM-3	Okay
CAM-1	Cleared for the approach he said?
CAM-2	PA system, funny
CAM-2	No
CAM-1	He didn't say?
CAM-2	He turned - - he told us to turn right
CAM-1	Ohh.'
2124:59.1 CAM	Sound of stabilizer actuator signal
CAM-2	* * *
CAM-3	Nah
CAM-2	* * *right 4, huh? * * *
CAM-3	I a 't know ((laughter))

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM	Sound of clicks
2 :30 1 C L	Let's h the gear a , please
CAM-2	* *
2125:33.6 CAM	Sound of hea5 click
CAM	Sound of increase in ambient noise

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT
2125:07.6 APC	Eastern three hundred, five miles from outer marker, turn right heading three four zero, cleared for ILS runway one approach, contact tower one one eight point three
2125:16.1 RDO-2	Okay, right to three forty and cleared for the approach, Eastern, ah, three hundred, say again the tower frequency?
APC	One eighteen point three
RDO-2	Eighteen three, good night
APC	Good night
2125:35.1 RDO-2	Akron tower, good evening Eastern, ah, three hundred, ah, turning inbound do the localizer
2125:39.6 TWR	Eastern three hundred, Akron-Canton tower, cleared to land, wind one six zero degrees at --- niner
2125:45.6 RDO-2	All right

INTRA-COCKPIT

TIME & SOURCE	CONTENT
CAM-1	((Laughter)) that was funny
CAM	Sound of click
2125:50.6 CAM-2	And the markers are turned on if that's what you'd like
CAM-1	All right
CAM	Sound of heavy clicks
2125:55.6 CAM-1	Landing final checklist
CAM-2	And the no smoking on
CAM	Sound of click
CAM-2	Once ar and two beads
2126:02.6 CAM-(1)	What happened, how come I m * * *
CAM-2	Ignition control override
CAM-2	Radar's up and off
CAM	Sound of clicks
CAM-1	*
CAM-2	Gear down three green, annunciator panel checked
2126:13 1 CAM-2	Spoilers

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT

INTRA-COCKPIT TIME & SOURCE	CONTENT	AIR-GROUND COMMUNICATIONS TIME & SOURCE	CONTENT
2126:15.6 CAM-1	They're armed		
2126:17.6 CAM-2	Flaps, slats, flags scanned. On the glideslope, what about that?		
		2126:26.6 RDO-2	Sound of localizer ident -.-, .., -.-., .-, -.-, ((I-CAK))
CAM-?	*		
CAM	Sound of click		
2126:36.1 CAM	Sound of altitude alert warning		
CAM-1	(I) heard that		
2126:38.0 CAM	Sound of clicks		
CAM-1	I hate to see the evening % ((singing))		
2126:49.6 CAM-1	Just like the simulator, ain't it?		
		2126:52.6 RDO-2	Sound of outer marker ((peak amplitude))
CAM-1	Outer marker, all's well		
CAM-2	Sounds like you're working on something huh, John?		
CAM-1	Good show		
2126:58.1 CAM-1	Okay, keep a sharp eye out		
CAM	Sound of clicks		

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
CAM-2	I will --- sight us an aircraft, an airport or something bi		
2127:05.6 CAM-1	You're right about the vi a		
CAM-2	Yeah		
2127:14.1 CAM-2	(A bit) fast		
CAM-2	* *		
2127:21.1 CAM-1	Slow with that speed		
CAM-?	* *		
CAM	Sound of clicks		
2127:41.1 CAM-1	That # speed command is some kinda bad		
CAM	Sound of clicks ((being with word "bad" above))		
2127:47 1 CAM-2	Stick with my system		
CAM-1	Yeah ((laughter))		
2127:49.1 CAM-1	Still a little high and fast though, but that's not, that, that's not the problem		
CAM-2	Yeah		

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
CAM-3	Sound of female voice		
CAM-1	*a loading problem		
2128:09.1 CAM-2	Three hundred feet --- above the glideslope		
2128:15.6 CAM-2	Minimums --- the airport's on your left		
CAM	Sound of click		
CAM	Sound of 1 frequency buzz a clacks		
2128:28.6 CAM	Sound of loud click		
2128:33.1 CAM	Sound of touchdown ((sound of high pitch squeal usually heard at time of DC-9 touchdown))		
2128:33.6 CAM	Sound of click		
2128:34.2 CAM	Sound of click		
2128:35.0 CAM	Sound of three or four low amplitude clicks		
2128:35.3 CAM	Sound of clunk		

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2128:36.1 CAM	Sound of clunk		
2128:37.4 CAM	Sound of click ((sound of engine noise begins to increase))		
2128:38.4 CAM	Sound of click		
2128:[illegible]8 9 CAM	Sound of two clicks		
2128:39.4 CAM	Sound of clunk		
2128:40.1 CAM	Sound of click		
2128:40.4 CAM	Sound of click		
2128:40.7 CAM	((Sound similar to brushing type sound))		
2128:41.4 CAM-?	Fan---tastic		
2128:42.4 CAM	Sound of heavy clunk		
2128:42.7 CAM	Sound similar to crashing noise		
2128:43 4 CAM-2	We're not stopped yet		

INTRA-COCKPIT		AIR-GROUND COMMUNICATIONS	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
2128:44.0 CAM	Sound similar to crashing noise		
2128:44.5 CAM	Sound similar to crashing noise		
2128:44 6 CAM-3	What?		
2128:45 6 CAM	Sound similar to crashing noise		
CAM	Sound similar to crashing noise		
2128:46.1 CAM-1	We're not stopped		
2128:46.9 CAM	Sound of click		
2128:47.2 CAM	Sound similar to crashing noises		
2128:47.6 CAM-2	You're not gonna stop		
2128:47.6 CAM-1	Anti-skid on		
2128:47.7 CAM	Sound similar to crashing noises		
2128:48.3 CAM	Sound similar to crashing noises		

INTRA-COCKPIT

TIME & SOURCE	CONTENT
2128:48 5 CAM	Sound similar to crashing noises
2128:48 8 CAM	Sound similar to crashing noises
2128:49.3 CAM	Sound similar to crashing noises
2128:49.9 CAM-2	One hundred
2128: 3 CAM	Sound similar to crashing noises
2128: 8 CAM	Sound similar to crashing noises
2128:51 7 CAM-1	Anti-skid (up)
2128:51.9 CAM-2	Anti-skid (off)
2128:53 0 CAM-?	It's going off
2128:53.2 CAM	Sound similar to crashing noises
2128:54.7 CAM-?	It's going off the end
2128:55 CAM	Sound similar to crashing noises

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT

INTRA-COCKPIT

TIME & SOURCE	CONTENT
2128:57.5 CAM-?	(Let's do something)
2128:58.6 CAM	Sound of low frequency monotone begins
2128:59.7 CAM	Sound similar to heavy crashing noise
2129.00.0 CAM	End of Recording

AIR-GROUND COMMUNICATIONS

TIME & SOURCE	CONTENT

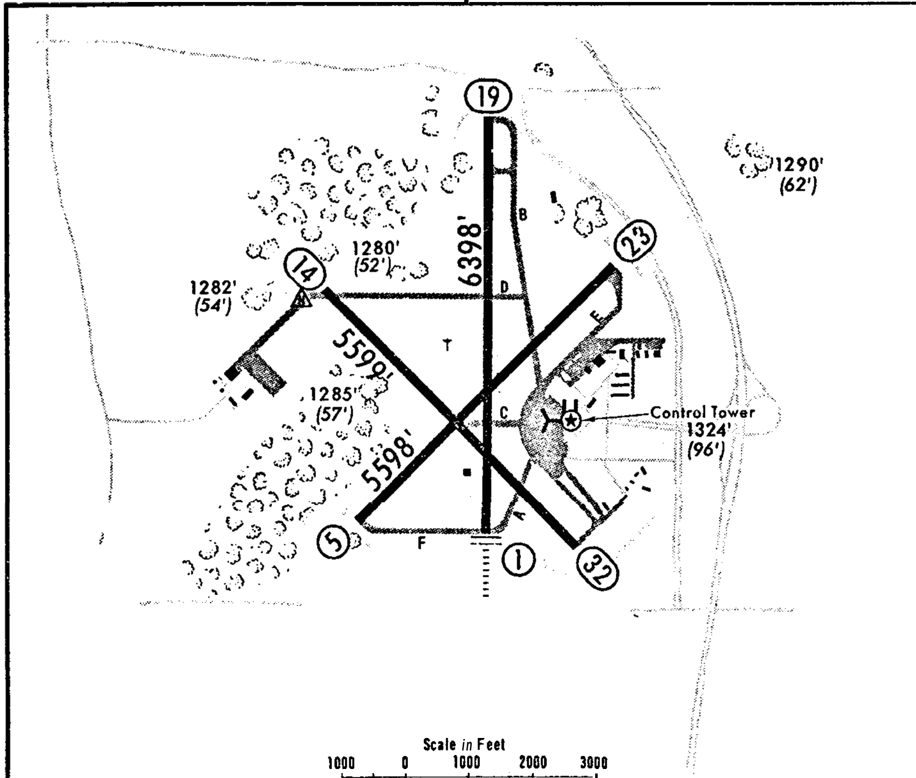
APPENDIX F

AKRON, OHIO
AKRON-CANTON REG'L APT.
Elev 1228' 40° 55' N 81° 27' W

(21-1) MAY 11-73 Jeppesen Approach Chart

NOTE: Customs on prior request.

VOT 110.6



ADDITIONAL RUNWAY INFORMATION

RWY	LIGHTING	LANDING BEYOND Threshold	LANDING BEYOND Glide Slope	TAKE-OFF	WIDTH
1	HIRL HIALS SFL RVR		5458'		150'
19	HIRL VASI-L				
5	MIRL				150'
23	MIRL REIL VASI-L				
14 / 32	MIRL				150'

(USEABLE LENGTHS: LANDING BEYOND Threshold, Glide Slope; TAKE-OFF)

	AIR CARRIER TAKE-OFF SCHEDULED: 15 Min Piston 30 Min Turbine	TAKE-OFF	ALTN FILED WITHIN: 2 Hr 3 & 4 Eng — Altn Apt & Non-Skd	TAKE-OFF ALTN NOT FILED — All Carriers	ALTERNATE CEILING-VISIBILITY ILS Approach	Other Approach
2 Eng Tailwheel	RVR 24 or 1/2	RVR 50 or 1	■ RVR 50 or 1	Landing Weather Minima	600-2	800-2
2 Eng Tricycle	RVR 16 or 1/4				Non-skd 3 & 4 Eng Jet 700-2	
3 & 4 Eng		RVR 16 or 1/4				

■ FAR Part 135 Operators: Rwy 1 RVR 24.

CHANGES: VASI added rwy 19.

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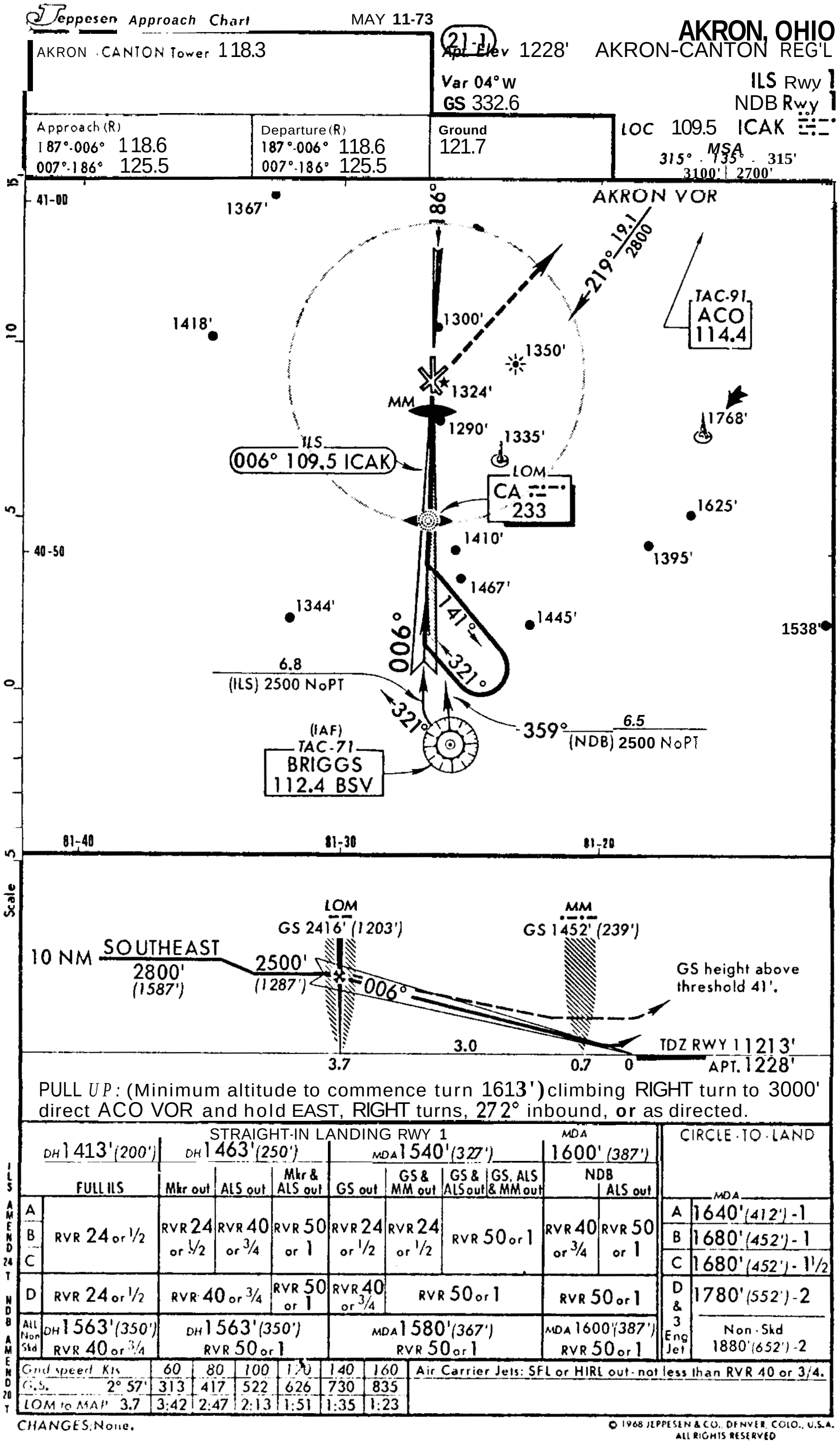
APPENDIX G



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