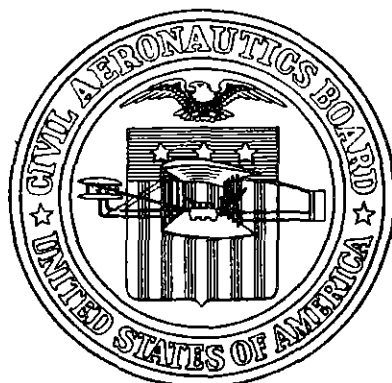


Adopted:

October 8, 1963

Released:

October 10, 1963

AIRCRAFT ACCIDENT REPORT

DOUGLAS DC-7B, N815D
EASTERN AIR LINES, INC.
New York International Airport
Jamaica, New York
November 30, 1962

CIVIL AERONAUTICS BOARD
WASHINGTON, D.C. 20428

C I V I L A E R O N A U T I C S B O A R D
A I R C R A F T A C C I D E N T R E P O R TAdopted: October 8, 1963Released: October 10, 1963EASTERN AIR LINES, INC., DC-7B, N 815D
NEW YORK INTERNATIONAL AIRPORT, JAMAICA, NEW YORK
NOVEMBER 30, 1962SYNOPSIS

Eastern Air Lines Flight 512, a Douglas DC-7B, N 815D, crashed during an attempted go-around following an instrument approach to runway 4R at New York International Airport, at 2145 e.s.t., on November 30, 1962. Of the 51 persons aboard, 21 passengers, 3 crew members and an additional crew member occupying the jump seat did not survive.

Flight 512, regularly scheduled from Charlotte, North Carolina, non-stop to New York International Airport, entered a fog condition near the threshold of runway 4R. A go-around was initiated; however, the aircraft struck the ground in a slightly nose-high attitude and was virtually destroyed by impact and subsequent fire.

The Board determines the probable cause of this accident was the technique employed by the crew during abandonment of the approach under fog conditions not adequately reported.

Investigation

Eastern Air Lines (EAL) Flight 512, a Douglas DC-7B, N 815D, a regularly scheduled passenger flight from Charlotte, North Carolina, nonstop to New York International Airport (Idlewild), crashed at approximately 2145 ^{1/} on November 30, 1962. Flight 512 was attempting a go-around following an instrument approach to ~~runway~~ 4R at Idlewild. Of the 51 persons aboard, 21 passengers, 3 crew members and an additional crew member occupying the jump seat did not survive.

Prior to the time of departure from Charlotte, routine aeronautical information was published by the U. S. Weather Bureau and the Federal Aviation Agency (FAA) relating to Idlewild. The aviation terminal forecast, valid for the period from 1800 on November 30, to 0600 on December 1, predicted partial obscuration, 3 miles visibility in haze and smoke with occasional 2 mile visibility. FAA publications indicated that the landing aids for runway 4R at Idlewild included an Instrument Landing System (ILS); sequenced flashing lights; runway centerline, edge and threshold lights; taxiway lights; approach lights and rotating beacon. The Precision Approach Radar (PAR) was declared by a Notice to Airmen (NOTAM) to be out of service.

The EAL forecast attached to the Dispatch Release of Flight 512 indicated clear skies or scattered clouds for Idlewild.

Flight 512 departed Charlotte at 1941 and proceeded in accordance with an Instrument Flight Rules (IFR) clearance.

1/ All times herein are Eastern Standard based on the 24-hour clock.

While en route to Idlewild, EAL 512 was in radio communication with the Atlanta, Washington, and New York Air Route Traffic Control Centers (ARTCC). The flight was also maintaining radio contact with EAL on company radio.

The Idlewild forecast was amended at 1927 by the Weather Bureau. This amended forecast was to be valid for the period from 1940 to 0600; it called for "ceiling zero obscuration, visibility zero, fog, variable to clear, visibility 1-1/2 miles ground fog." There is no evidence that Flight 512 was advised of this forecast.

Following a chronological sequence, the next events of relevance occurred at the Idlewild Airport. At about 2015 the TEL-autograph transceivers in the FAA control tower cab and IFR room became inoperative. This equipment is utilized to communicate written weather information between the Weather Bureau office and the control tower cab and IFR room. Also, it was discovered that the direct voice communication line (hot line) between the control tower and the Weather Bureau was inoperative.

At 2023 the flight was advised by EAL flight dispatch that "If Idlewild below on arrival, you are cleared to Philadelphia" EAL 512 acknowledged this message and during the ensuing conversation was informed ". . . several other flights diverting to Newark."

Meanwhile, the Idlewild Runway Visual Range (RVR) digital readout displays in the control tower ^{2/} for runway 4R were malfunctioning. The

^{2/} Runway 4R at New York International Airport is equipped with instrumentation which indicates the horizontal distance a pilot should be able to

RVR recorder trace located in the Idlewild Weather Bureau offices was operating satisfactorily. The Weather Bureau personnel who maintained the RVR equipment were informed of the outage at 2030.

By 2045 the flight was in radio communication with the New York ARTCC on VHF frequency 123.6 and was then cleared to the Sandy Hook holding pattern at 11,000 feet. At 2052, an Expected Approach Clearance (EAC) time of 2207 was issued to EAL 512 and acknowledged. At 2057, detailed holding instructions were issued to the flight with the advice: ". . . delay indefinite due to weather." At this time aircraft were landing at Idlewild on runway 22L.^{3/} Shortly thereafter landing traffic was shifted from runway 22L to runway 4R. At 2102 EAL 512 requested the Idlewild weather on company radio. The company advised the flight that the visibility was ". . . now one mile . . . EAL Flight 330 missed approach to

see down the runway from the approach end. This concept of visibility is known as RVR. The primary instrument used to determine RVR is the transmissometer. This instrument consists of a projector and detector, 500 feet apart, located on the right side of the touchdown point on runway 4R, and a digital display and recorder which charts the transmissivity of the atmosphere.

The projector of the runway 4R system is located 500 feet from the runway threshold and 400 feet east of the eastern edge of the runway. The detector unit is located 1,000 feet from the approach end of the runway and 370 feet to the east of the eastern edge of the runway.

The projector emits a high-intensity focused light; the detector measures the amount of this light received as a percentage of the amount that would be received through a clear atmosphere and the meter converts this into a measure of visibility. In essence, the transmissometer samples the visibility along the known 500-foot baseline and then extrapolates to determine the visibility over a greater distance. The equipment can be set so that it accounts for changes in setting of the high intensity runway lights, and for the existence of day or night.

^{3/} Runway 22L is the reciprocal of runway 4R.

runway 22." At 2107, the New York ARTCC broadcast the following message on the frequency being guarded by EAL 512: "All aircraft this frequency inbound to Idlewild, the latest weather, time 0205 (2105 EST), partial obscuration; a mile and a half with fog; landing runway four right, RVR inoperative." Subsequently, the New York ARTCC issued a revised EAC time of 2140 to EAL 512, which was acknowledged.

At approximately 2110, EAL 512 called the company radio and stated: "Coming up on Sandy Hook, have an Expected Approach Clearance time of 40 minutes after the hour, altitude 9,000 feet, and understand the visibility is now one and one-half miles." At 2112, while holding at Sandy Hook at 9,000 feet, the flight called company radio and requested Idlewild landing information. The following was transmitted to EAL 512: "The Idlewild Pressure Altitude is 9640, Idlewild U. S. Weather Bureau altimeter is 30.30." EAL responded by stating that his field pressure indicated 30.31.

It should be noted here that five weather observations were recorded by the observer on duty at the Idlewild Weather Bureau office between 2108 and 2153. During that period, the official visibility ^{4/} for Idlewild was that "prevailing visibility" observed by the FAA controllers ^{5/} located in

^{4/} Official visibility can be obtained by either of two methods. One is a visual observation of the prevailing visibility which is discussed in paragraph 2210 of the Weather Bureau publication, Circular N, as the greatest measure of visibility observed throughout at least one-half of the horizon circle. The other method is through use of RVR.

^{5/} In accordance with Circular N and the FAA Manual ATP 7230.1, the visibility observations are to be made by authorized FAA tower controllers when the Idlewild visibility is below four miles. There are exceptions to this rule, including a condition wherein "the tops of the phenomena are below the level of the tower."

the tower cab.^{6/} Control tower operators are required to maintain a log of their observations of visibility. There is no documentary evidence that such log was maintained on the evening of November 30 in the Idlewild tower. There was, however, a Weather Bureau record ^{7/} of both prevailing visibility and surface visibility ^{8/} at Idlewild during the evening of November 30.

At 2124, control of the flight was transferred from New York ARTCC to Idlewild Approach Control and the flight changed to the assigned frequency of 119.7. EAL 512 reported its position as in the Sandy Hook holding pattern. The following information was then transmitted to and acknowledged by EAL 512: ". . . Four Right ILS in use, landing Runway Four Right. Wind calm. The Idlewild weather, sky partially obscured, visibility 1-1/2 miles with fog. Altimeter setting: three zero three one. Precision Approach Radar not available. Middle marker, middle locator, Runway Four Right inoperative; Runway visual range Four Right inoperative." At this same time, EAL Flight 620, a turbojet aircraft,

^{6/} The tower cab is approximately 142 feet above the surface of the runway, the Weather Bureau is located across the street (in the International Arrivals Bldg.), and the Weather Bureau visibility observation point is about 30 feet above the surface of the runway.

^{7/} The WBAN - 10 Form of recorded surface observations.

^{8/} Surface visibility is not described as a method of obtaining "official visibility" in Weather Bureau documents. However, Sec. 2820 of Circular N states that when a Weather Bureau observer obtains a visibility which differs from that official visibility obtained by the tower, the information must be included in the remarks section of the Weather Report as "Surface Visibility."

landed on runway 4R at Idlewild. Shortly thereafter, at 2127, United Air Lines (UAL) Flight 500, a DC-6 aircraft, abandoned an approach to runway 4R due to reduced visibility. The crew of UAL 500 told the Idlewild Approach Control: ". . . that stuff is . . . no more than fifty feet thick and it is really thick . . ." To which the FAA controller responded: ". . . we're almost on top of it here in the seventh floor . . . we can hardly see the ground . . . Good old fashioned ground fog . . ." At the time of this conversation, UAL Flight 712, a turbojet aircraft, landed on runway 4R

At 2130, a broadcast of weather information was made by Idlewild Approach Control on frequency 119.7. It read as follows: "All aircraft copy. Runway Four Right ILS in use. Landing Four Right. Wind northeast six, altimeter three zero three one. Idlewild weather, sky partially obscured, visibility is one and one half miles with ground fog, and, just got out new visibility, it's one mile now. One mile with ground fog. Runway visual range four right inoperative. Middle locator Four Right inoperative, and Precision Approach Radar not available." Following this transmission, American Airlines Flight 996, a turbojet aircraft, landed on runway 4R at 2132.

EAL 512 was laddered down to 6,000 feet in the Sandy Hook holding pattern, and, at 2133, the flight was identified on radar and was given radar vectors to the ILS final approach course. At about this time, the last weather report available to EAL 512 was broadcast by Idlewild Approach Control to all aircraft: ". . . sky partially obscured; visibility one

mile with ground fog; and wind is northeast at six, altimeter setting 30.31." At 2134, American Airlines Flight 910, a turbojet aircraft, landed on runway 4R.

The Idlewild Weather Bureau observer recorded a special weather observation at 2136 which described the official visibility as 3/4 mile and contained the following notation in the remarks section: "surface visibility 1/4 mile." Shortly thereafter, at 2137, Trans World Airlines Flight 46, a turbojet aircraft, landed on runway 4R. At 2139:11, EAL 512 was advised of its position as nine miles southwest of the ILS outer marker and was instructed to contact the tower on 119.1. At 2139:59, Approach Control gave a new weather broadcast of 3/4 mile visibility in ground fog on frequency 119.7. At about 2139, UAL Flight 950, a DC-7 aircraft, landed on runway 4R. This landing was described by Captain L. W. Witlow as: "Just after my First Officer . . . reported to IDL approach control the IDL 4R LOM (outer marker) inbound he remarked 'I can see the glow of the approach lights', shortly thereafter he remarked 'I can see the approach lights but not the runway'. I then looked out and observed the full line of approach lights and the runway lights on the approach end. From that point on, I made a visual approach referring to my ILS instrument so as to stay on the glide slope, which I did until I was definitely over the runway."

As EAL 512 was approaching the outer marker, at 2141, UAL Flight 164 was landing on runway 4R. The captain of UAL 164 described his landing as follows: "Either at or shortly after passing the outer marker the glow of the approach lights was visible through the fog . . . The flight was, until

this point, made in clear air with clear skies above. Lights were clearly visible either on or very near the airport. Prior to reaching the middle marker, the threshold lights were observed . . . Landing was effected at 2141 EST in visibility that I would judge to be somewhat less than 3/4 mile. An accurate appraisal of visibility during the last 20 feet before touchdown was virtually impossible due to the brilliance of the runway lighting." At approximately this time, a Sabena turbojet aircraft, located on the ground at Idlewild one mile northwest of the threshold of runway 4R, was cleared for takeoff on runway 7R. The Sabena crew informed the control tower on VHF radio frequency 119.1 that visibility was " . . . a bit too poor . . ." and requested a delay.

Subsequently, EAL 512 contacted the tower on 119.1 mcs., and advised that it had just passed the outer marker. The local controller then advised EAL 512 that the condenser discharge sequenced flashing lights in the approach light system were being turned on and to inform the tower if the pilot desired them off.

At 2143, the local controller cleared EAL 512 to land. The crew then acknowledged with "OK, dim the flashers." The tower controller replied: "Roger, I have to shut them off." He then turned off the flashers. This was the last radio contact with EAL 512.

EAL Flight 406, a turboprop aircraft, was immediately preceding Flight 512 in the landing traffic for runway 4R. EAL 406 landed at 2144 on 4R. The captain of EAL 406 indicated that approaching the airport the sky was clear and the approach lights could be seen prior to the outer marker.

After passing the outer marker he lost the lights temporarily, but they became visible again before the middle marker. From this point, the runway and threshold lights were also visible; however, fog described as variable, was encountered. He stated that ". . . after landing, we ran into very thick fog at the northeast end of the runway causing a little delay in clearing at the end."

At this time, the RVR recorder trace in the Weather Bureau office indicated the runway 4R visibility was virtually zero. This information was available to the Weather Bureau observer but was not communicated to the tower personnel.

The crew of EAL 512 did not report the runway in sight passing the middle marker, a required report. Two tower controllers observed the red rotating beacon light on the aircraft disappear in a fog condition 1/2 mile from the end of runway 4R. At 2144 the local controller requested that EAL 512 advise when it was clear of runway 4R. There was no response.

Two passengers aboard EAL 512 reported seeing the flaps during the approach. One passenger estimated the flaps to be at approximately the 40-degree position shortly before impact. One passenger saw the landing gear in the down position. Passengers saw colored lights at various altitudes and positions during the approach. Passengers observed the newly painted white bars at the end of runway 4R as the aircraft crossed over the marks at a slight angle from right to left. A passenger saw the blue edge lights of a taxiway on the left side of runway 4R. Passengers perceived the approach to be smooth without noticeable veering, swerving,

or turning. A pronounced engine roar was heard coincident with a settling of the tail.

At approximately 2145, tower personnel observed a bright orange flash emanating from the vicinity of the PAR antenna building which is located approximately 400 feet to the left and 4,200 feet beyond the threshold of runway 4R. Emergency procedures were immediately initiated by the tower personnel. American Airlines Flight 8, which had just reported passing the outer marker, asked " . . . we got a bright light ahead of us, appears near the airport - you got any information?" The tower requested that they overfly the runway and report. While over the runway, American 8 advised " . . . Runway four right appears to be clear, we got a fire in sight down there . . . to the left of the runway."

EAL 512 crashed approximately 2,500 feet beyond the ILS touchdown point ^{9/} on the left side of runway 4R at 2145. After the accident, at 2150, a weather observation was recorded with " . . . visibility 3/4 mile in fog . . . surface visibility 1/8 mile." The landing minimums for EAL 512 were 200 feet ceiling and 1/2 mile visibility. The "surface visibility" observations of the Weather Bureau were not communicated by the FAA tower personnel to EAL 512 on any recorded communications frequency. Tower personnel stated that the Weather Bureau observations for the period 2108 to 2150 were not received by them. The Weather Bureau observer at Idlewild did not recall specifically advising any person in the control tower of the "surface visibility." He said: "I do not remember sending out any observation. The only thing I can say is I do not remember not sending out any observations."

^{9/} See Attachment 1

The first impact marks made by the aircraft were slashes from the Nos. 1 and 2 propellers. These marks were located 3,460 feet from the threshold center of runway 4R, on a bearing of 37 degrees. Computations based on reed cuts and propeller slashes indicate a flightpath impact angle of 2 degrees with a 6-degree bank to the left and an airspeed of 135 knots. A splash mark from the tail skid, commencing 50 feet before the main impact, indicated an aircraft attitude of 3 to 5 degrees nose high.

Breakup of the wings and fuselage occurred on a mound of earth approximately 3 feet high, located 3,600 feet from the threshold center of runway 4R, on a bearing of 37 degrees. The left wing failed near the wing root, between the Nos. 1 and 2 engine nacelles, and at the tip. The left wing fuel tanks ruptured, resulting in ground fire which burned a large area just beyond the mound. The right wing separated at the wing root with portions of the upper and lower fuselage skin fairing and structure still attached.

The aircraft fuselage separated at impact in the vicinity of the aft wing spar with the forward portion coming to rest 90 degrees to the wreckage path. This break occurred approximately at the cabin partition between the forward tourist and aft first-class sections. All survivors, 6 tourist, 18 first-class passengers and 2 stewardesses, exited through the main passenger door, aft emergency exit doors or windows, or through breaks in the fuselage. They reported seeing fire from the wings immediately on impact, followed by fire inside the cabin a few seconds later. As a result of this fire both stewardesses, who had been seated in the aft lounge, were unable to see forward of the galley area by the main loading door.

The nose landing gear was separated from the aircraft; the actuating cylinder indicated it was fully up at impact. The main landing gear was found in the retracted position. There were no landing gear gouge marks along the wreckage swath. All three landing gears on the DC-7 retract in the forward direction, and retraction time is about 7 seconds.

The flap-actuating cylinders indicated the left flap was set at approximately 20 degrees or "takeoff" position at impact. The right flap actuating cylinders corresponded to an approximate setting of 10 degrees. Examination of the flap actuator on the flight deck indicated a 20-degree flap position had been selected at impact. The right flap bus cable turn-buckle was found broken; however, a laboratory examination revealed that this break could only occur to this type of brass when under a tension load, at a very high temperature. Wing flap control valve cable continuity could not be traced to the cockpit controls because of fire damage.

All four engines received considerable impact damage, with various components being torn loose or broken away. Examination of the engines revealed no evidence to indicate pre-impact failure, operational distress or malfunction. Tests of the propeller governors revealed that engine speeds for Nos. 1, 2, 3, and 4 had been 2,474, 2,445, 2,463, and 2,422 r.p.m., respectively. Propeller shim plate markings indicate blade angles at impact were 37, 37, 36, and 38 degrees, respectively, for the Nos. 1, 2, 3, and 4 propellers. At impact, the approximate horsepowers being produced by engines Nos. 1, 2, 3, and 4 were 2035, 1950, 1993, and 1890, respectively. Normal engine horsepower for a landing approach is approximately 1,000 horsepower per engine.

A few hours after the accident, at 0245 on December 1, 1962, the FAA made a flight check of the complete ILS serving runway 4R. This check disclosed that the front course of the localizer, glide slope, and markers were operable and within required tolerances at that time. A further check was conducted on December 4, 1962. The purpose of this flight was to determine whether or not a Lockheed Electra L-188 on the instrument runway, or taxiing near the localizer antenna, would affect the presentation of instruments in an aircraft making an approach. Three approaches were made under these conditions and no abnormalities were noted in the localizer course from over the outer marker to the runway threshold. The latter test was prompted by concern that an Electra, which had landed approximately one minute before Flight 512, might have interfered with localizer signals.

Eastern Air Lines FAA-approved DC-7B Flight Manual describes the go-around procedure with four engines operating as follows:

- "1. Captain applies or calls for power as required usually METO. NOTE: At airspeeds expected at the start of a go-around, the use of T.O. r.p.m. and power not normally needed. If go-around from balked landing is made with full flaps and gear down and speed reduced to approximately minimum landing, T.O. power and r.p.m. may be necessary.
2. Wing flaps - TAKEOFF position.
3. Landing Gear - UP.

4. Normal CLIMB POWER after landing gear is UP.
5. Wing flaps may be left at TAKEOFF position or retracted at captain's discretion."

The chief pilot of the Douglas Aircraft Company was questioned about the DC-7 performance and acceleration characteristics in various configurations. He stated that power application as low as 2,100 to 2,200 horsepower per engine, instead of METO, at the start of a go-around in the landing configuration, would produce a low rate of climb initially, and a slower transition to a climb. There would be no tendency for the aircraft to roll or yaw if all engines are accelerated evenly. He further stated that with a gross weight of approximately 96,000 pounds and "Using the landing configuration of gear down, flaps full and using all four engines at takeoff power, the angle of climb for a speed of 115 knots would be approximately 3 degrees. That's the noseup, and that would be using the airplane fuselage as the reference line on the horizon . . . at the same configuration, speed at 135 knots the angle would be 2 degrees. For configuration of flaps 20 degrees, and the gear up, using all four engines at takeoff power, the angle with 115 knots would be 9 degrees noseup, and 135 knots would be 8 degrees noseup." If less than takeoff power were used, in the 2100 or 2200 horsepower per engine range, ". . . the angle would be slightly less."

He also stated that with a gross weight of 96,000 pounds, brake horsepower of 2,250 and 2,600 r.p.m. at sea level on a standard day the aircraft would accelerate at a rate of approximately 2 knots per second. Placing

the flaps at 20 degrees, 40 degrees, and finally at 50 degrees flaps and gear down the acceleration would drop to approximately 1.52, 1, and slightly less than 1 knot per second, respectively. He further stated that using an airspeed of approximately 115 knots, at maximum landing weight, "There would be no problem at all to pull it up and rotate it . . . into . . . a balk-landing climb."

Analysis

The investigation revealed no evidence of control system, powerplant, or structural failure. The forces to which the aircraft was subjected when it struck the mound of earth near the point of initial impact, undoubtedly contributed to the extensive breakup of the structure.

The system of weather observation and reporting as it concerned the flight deserve special attention. The U. S. Weather Bureau, the Federal Aviation Agency tower controllers, and the Eastern Air Lines dispatch organization each had duties relating to weather observation and reporting. The system placed the initial responsibility on the Weather Bureau to observe and record the weather information. Since the official Idlewild visibility was less than four miles, the responsibility for taking visibility observations was assumed by the FAA tower controllers. There was an exception in the rules which provided that the responsibility for taking official visibility observations would revert from the tower to the Weather Bureau, when the tower was above the top of the phenomena. However, during the period with which this report is concerned, the tower was observing restricted visibilities which indicated that the top of the phenomena was,

in fact, above the tower. The FAA tower controllers furnish meteorological information to aircraft in flight, particularly in the terminal area. The prime responsibility for furnishing significant weather information to EAL 512 while en route was a duty of the Eastern Air Lines dispatcher.

The information furnished to EAL 512 did indicate that the weather situation at Idlewild was deteriorating. These reports included notification of indefinite delays due to weather; alternate airport information; that company traffic missed an approach and that the visibility was one mile when the flight departed Sandy Hook holding pattern. The information contained in the remarks section of the Weather Bureau observations which indicated that the "surface visibilities" were less than the reported official visibility were not furnished to the crew of EAL 512. Further, the Approach Control broadcast of the 2136 special observation, which included "visibility 3/4 mile in ground fog" was made at 2139:59, or after EAL 512 had been instructed to change to tower frequency.

Owing to the vertical and horizontal separation of the tower cab from the approach end of runway 4R, the tower visibility observation was not representative of the condition along the runway. However, since the tower RVR was considered inoperative, the governing visibility factor applicable to landing minimums of 1/2 mile visibility was that observed by the tower controller. It was on this basis that the airport remained "above minimums" while EAL 512 attempted an approach.

There were two indications of poor visibility which the crew of EAL 512 should have heard during their approach. The crew of an aircraft

clearing the runway reported experiencing visibility of 50-60 feet. In addition, the jet flight awaiting departure from runway 7R requested a takeoff delay for weather improvement. These transmissions all took place on tower frequency, which EAL 512 had been instructed to monitor shortly prior thereto. However, if the crew of EAL 512 was aware of these reports, the knowledge that company traffic had landed immediately ahead of them, at 2144, could have offset any apprehension they may have had regarding the successful completion of their approach.

Since the captain of EAL 406, which landed immediately ahead of EAL 512, stated that he saw the approach, runway, and threshold lights from the middle marker, and since the pilot of EAL 512 requested that the "flashers" be dimmed, it is presumed that he was encountering similar weather conditions. During the approach, EAL 512 should have been at 197 feet above the field elevation over the middle marker. A decision must have been made at this point either to complete the approach or go around. Although the transcript of recorded communications did not reflect passage of the middle marker or the captain's intention at that time, it is concluded from the testimony of surviving passengers that the captain elected to continue his approach and effect a landing. From the middle marker to the runway threshold, altitude and airspeed were reduced in preparation for the landing. As the aircraft continued to descend, a rapid deterioration of visual reference was encountered in thick fog. This fog was similar to that observed by crews awaiting takeoff on runway 7R, and by crews that landed on runway 4R. When visual reference was lost, the pilot elected to go around.

Attached to this report is a drawing depicting the probable flight profile of EAL 512 which indicates that:

1. The aircraft was on the glide path at the middle marker with its gear down, flaps at 30 degrees, airspeed at 130 knots, descending at 574 feet per minute and a constant power of 100 BMEP at 2,450 r p.m., or 1,040 brake horsepower per engine.

2. As the runway threshold was approached, flap extension from 30 degrees to 40 degrees was initiated at an altitude of approximately 75 to 80 feet. The extension of flaps from 30 degrees to 40 degrees required 2 seconds, during which time the aircraft decelerated approximately 1 knot to 129 knots. A slight deviation above the glide slope occurred when the crew, seeing the threshold and some of the runway lights, began to execute a visual approach

3. After crossing the threshold, the aircraft continued along a flightpath of 1-1/2 degrees slope downward and about 6 degrees to the left of the runway heading for 8-3/4 seconds. During this period, there was a rapid deterioration of visual reference when thick ground fog was encountered. At the end of this period, the aircraft had decelerated to a speed of 124-1/2 knots and had descended to an altitude of approximately 25 feet above the ground. After perceiving the fog and evaluating the situation, the crew of EAL 512 elected to abandon the approach. Without increasing the r.p.m., slightly more than climb power was applied, and the landing gear was retracted coincident with retraction of the flaps to 20

degrees. The nose of the aircraft was rotated upwards to between 3 to 5 degrees above the level position. The missed approach procedure was initiated about 1,000 feet beyond the ILS touchdown point, to the left of the runway, altitude about 25 feet.

Execution of the missed approach procedure by the crew of EAL 512 necessitated a transition to instrument reference due to the loss of visual reference. This had to be accomplished at an extremely low altitude. There was little time or margin for error if the maneuver was to be successfully accomplished.

The DC-7B aircraft in the landing configuration can be transitioned from the landing attitude to a climb without loss of altitude. In order to accomplish this, takeoff power, or even climb power, with aircraft rotation to approximately a 3-degree noseup attitude is required. The retraction of flaps to 20 degrees during such a transition requires an aircraft rotation to approximately a 9-degree noseup attitude, in order to compensate for the loss of lift as the flaps are retracted. Surviving passengers did not experience the pronounced change in attitude which would have resulted from aircraft rotation to 9 degrees noseup during the crew's execution of the missed approach. The ground impact splash from the tail skid confirmed a 3- to 5-degree noseup attitude.

The amount of power application and the degree of aircraft rotation used by the crew of EAL 512 should have been adequate to accomplish the pull-out, had the flaps and gear remained extended. However, inasmuch as flap and gear retraction was effected prior to establishing a positive

rate of climb, either one of two actions by the crew would have precluded the aircraft settling into the ground:

1. Additional aircraft rotation, commensurate with the power utilized
2. Use of the remaining power available.

The Board concludes that additional aircraft rotation was not effected due to a lack of immediate instrument orientation, and that additional power was either not requested, or delayed because of other duties.

Probable Cause

The Board determines the probable cause of this accident was the technique employed by the crew during abandonment of the approach under fog conditions not adequately reported.

Recommendations

Following this accident the Board sent recommendations to the Federal Aviation Agency and the United States Weather Bureau. These recommendations and the responses thereto were as follows:

1. It was recommended that the Air Traffic Control procedures require the transmission of all operationally significant weather information in terminal areas to approaching aircraft. The FAA, by letter dated January 8, 1963, stated that the necessary procedural changes were being prepared.
2. It was recommended that the RVR instrumentation in the recently commissioned IFR room of the Idlewild tower was inadequate. Also, the Board requested a study of the physical arrangements in all towers where PAR is installed. On January 11, 1963, the FAA stated that corrective

action was being taken and that a new program would permit installation of five RVR indicators in a tower facility.

3. It was recommended that an alternate method be developed to determine runway visibility when the RVR is inoperative. This was to be accomplished by utilizing runway observers, certificated by the Weather Bureau. On January 14, 1963, the ~~FAA~~ stated that this procedure would be implemented on a trial basis in New York, Chicago, and Los Angeles. The Weather Bureau indicated concurrence with the recommendation on January 8, 1963.

4. The Weather Bureau was informed that the staffing plan of the Weather Bureau Airport Station at Idlewild was inadequate to maintain proper surveillance of all the weather recording devices available. On January 8, 1963, the Weather Bureau indicated that corrective action would be taken.

5. It was recommended that the Weather Bureau amend their methods of observing and reporting prevailing weather when "partial obscurations" are present. The Weather Bureau indicated concurrence with this recommendation on January 8, 1963.

6. The FAA was informed that there was a period of time on the evening of this accident when no record of tower visibility observations was retained. It was recommended that the responsible activities should be recording and reporting the same values of visibilities at all times and that there should be a written record of all tower visibility observations.

on February 4, 1963, the FAA stated that operations procedures were being developed to accomplish this end.

7. It was recommended that the "Remarks" portion of weather reports be broadcast to aircraft. The FAA informed the Board that a priority project had been initiated to standardize the transmission of weather information from ATC facilities to airmen in flight.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD
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Vice Chairman

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/s/ G. JOSEPH MINETTI
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S U P P L E M E N T A L D A T A

Investigation and Hearing

The Civil Aeronautics Board was notified of this accident immediately after its occurrence at 2145 on November 30, 1962. Investigators were dispatched immediately to the scene to conduct an investigation in accordance with the provisions of Title VII of the Federal Aviation Act of 1958, as amended. A public hearing was ordered by the Board and held at the International Hotel, New York International Airport, New York, on January 14-17, 1963.

Air Carrier

Eastern Air Lines, Inc., holds a current certificate of public convenience and necessity issued by the Civil Aeronautics Board to engage in the transportation of persons, property, and mail. It also possesses a valid air carrier operating certificate issued by the Federal Aviation Agency.

Flight Personnel

Captain Edward J. Bechtold, age 43, was employed by Eastern Air Lines on April 26, 1945, and had accumulated a total of 15,644 hours flight time, of which 2,700 hours were in DC-7 type aircraft. He held a currently effective FAA airline transport certificate No. 350329 with numerous ratings, among which was the Douglas DC-7. His last line check in DC-7B aircraft was with a company check pilot on May 10, 1962. His last proficiency check in DC-7B aircraft was on June 14, 1962. Records indicate he satisfactorily passed a first-class FAA flight physical on August 27, 1962, without waivers.

Pilot Julius A. Wagner, age 45, was employed by Eastern Air Lines on March 15, 1951, and had accumulated a total of 9,042 hours flight time. He

had accumulated a total of 1,610 hours flight time in DC-7 type aircraft, of which 71 hours were as pilot-in-command. He held a currently effective FAA airline transport certificate No. 66171 with numerous ratings, among which was the Douglas DC-7B. His last line check was in a Lockheed 1049 on June 12, 1962. His last proficiency check in DC-7B aircraft was on January 26, 1962. Records indicate he satisfactorily passed a first-class FAA flight physical on May 11, 1962, without waivers.

Pilot Engineer Robert L. Voorhees; age 31, was employed by Eastern Air Lines on August 26, 1957, and had accumulated a total of 4,080 hours flight time. He had accumulated a total of 149 hours as pilot-engineer and 718 hours as a pilot in DC-7 aircraft. He held a currently effective FAA flight engineer certificate No. 1539829. He also held an FAA single and multi-engine land commercial pilot certificate No. 1349561. He received his last proficiency flight check on September 27, 1962, which was his original qualification on DC-7B aircraft. Records indicate he satisfactorily passed an FAA-second-class physical on February 1, 1962, without waivers.

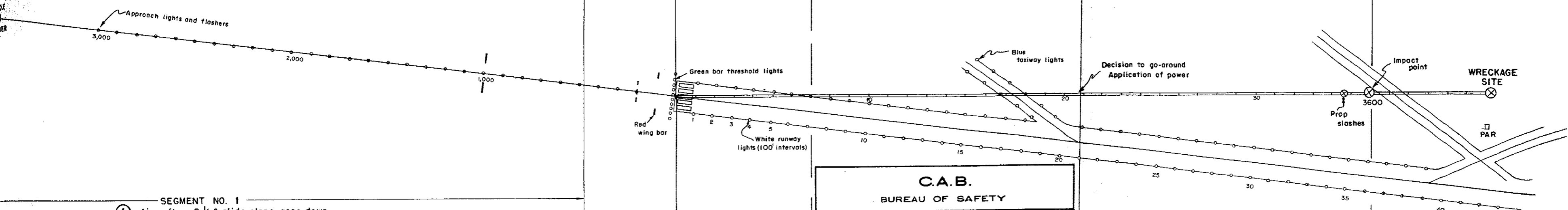
Flight Attendant Helen L. Fournier was employed by Eastern Air Lines on April 16, 1962. She completed training on fire-fighting, emergency evacuation and ditching on May 2, 1962, and emergency procedures on DC-6/7Bs on May 7, 1962. She satisfactorily passed a company medical examination in April, 1962.

Flight Attendant Patricia J. Richards was employed by Eastern Air Lines on June 24, 1961. She completed training on fire-fighting, emergency evacuation and ditching on June 21, 1961, and emergency procedures on DC-6/7Bs on October 30, 1962. She satisfactorily passed a company medical examination in June, 1961.

Aircraft

N 815D, a Douglas DC-7B, manufacturer's serial No. 45084, owned and operated by Eastern Air Lines, Inc., 10 Rockefeller Plaza, New York, New York, was manufactured in September, 1956, and had a total flying time of 18,411:06 hours of which 281:91 hours had been accumulated since the last major inspection. The aircraft was powered by four Wright model 972TC18DA-3/4 engines with Hamilton Standard, model 34E60-363 propellers. Engine times were as follows:

<u>Engine Position</u>	<u>Time Since Overhaul</u>	<u>Total Time</u>
1	1,426	16,886
2	92	19,142
3	1,707	15,635
4	645	19,452



- SEGMENT NO. 1
- ① Aircraft on $2\frac{1}{2}^\circ$ glide slope, gear down, flaps 30° 130 KTS, descending 574 FPM (2450 RPM, 100 BMEP, 1040 BHP/ENG)
 - ② Envelope depicts flight path on and slightly above glide slope.

- SEGMENT NO. 2
- ① Areas where flaps extended to 40°
 - ② Altitudes varying from 50 to 115 feet above runway threshold
 - ③ Power assumed constant at 100 BMEP

C.A.B.
BUREAU OF SAFETY

COMPUTED ENVELOPE OF PROBABLE FLIGHT PATH OF A DC-7 AIRCRAFT UTILIZING GROUND OBJECT DAMAGE, WITNESS INFORMATION, AND DC-7 PERFORMANCE DATA OBTAINED IN THE INVESTIGATION OF EASTERN AIRLINES DC-7B N815D ACCIDENT, NEW YORK INTERNATIONAL AIRPORT NOVEMBER 30, 1962

PERFORMANCE DATA FURNISHED BY: DOUGLAS AIRCRAFT CO. Scale: 0 200' 400'

- SEGMENT NO. 3
- ① General area of deceleration to anticipated touchdown speed

SEGMENT NO. 4

Decision to Go-around Application of power Power applied 2150 BHP/ENG
Flaps retracted to 20°
Gear retracted

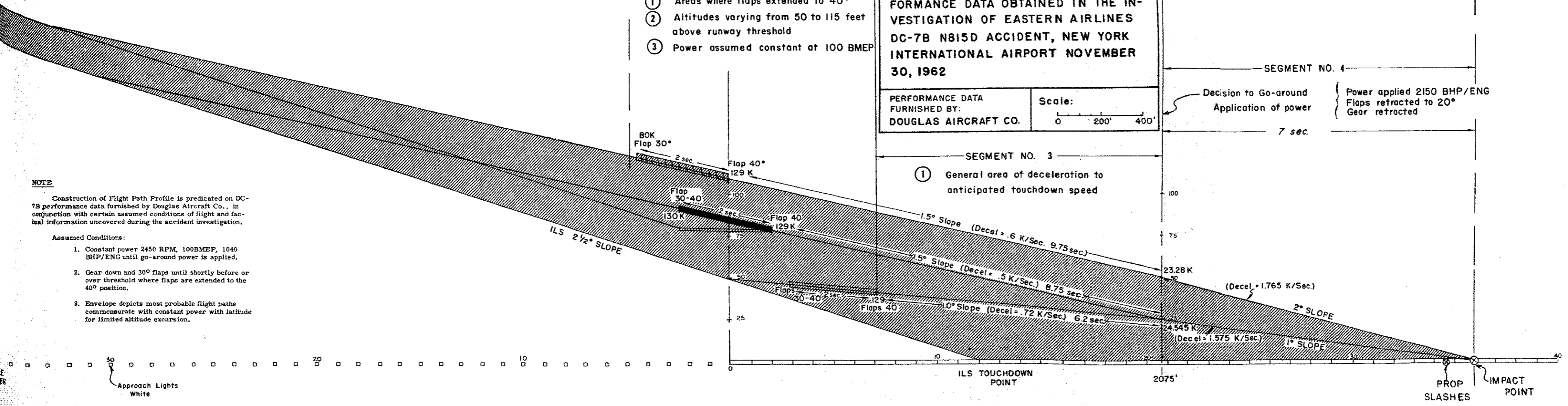
7 sec.

NOTE

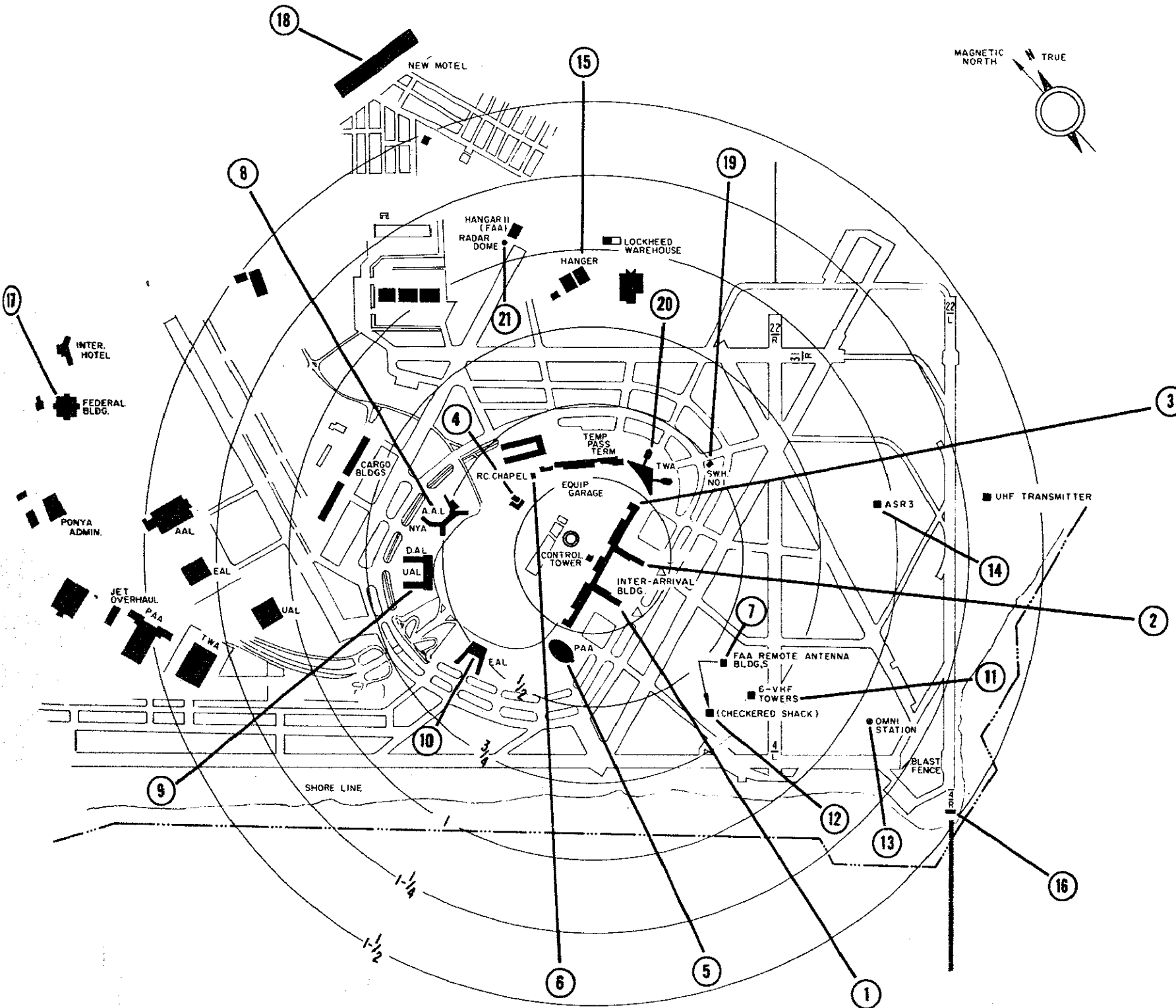
Construction of Flight Path Profile is predicated on DC-7B performance data furnished by Douglas Aircraft Co., in conjunction with certain assumed conditions of flight and factual information uncovered during the accident investigation.

Assumed Conditions:

1. Constant power 2450 RPM, 100BMEP, 1040 BHP/ENG until go-around power is applied.
2. Gear down and 30° flaps until shortly before or over threshold where flaps are extended to the 40° position.
3. Envelope depicts most probable flight paths commensurate with constant power with latitude for limited altitude excursion.



U.S. WEATHER BUREAU VISIBILITY CHECKPOINTS

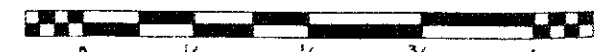


TYPE OF CHECKPOINT AND ITS DISTANCE AND DIRECTION FROM STATION

1. Gate 15-1/16 mile S.E.
2. Gate 20-1/8 mile S.
3. Gate 2-3/16 mile N.E.
4. Power House 1/4 mile
5. PANAM Bldg. 1/4 mile
6. Old Terminal, Chapel 3/8 Mile N
7. FAA Remote Antenna Bldg. (Checked Shack) 1/2 mile S.
8. American Airlines Bldg. 1/2 mile N.W.
9. United Airline Bldg. 1/2 mile N.W.
10. Eastern Airline Bldg. 1/2 mile W.
11. 6 VHF Towers 5/8 mile S.
12. FAA Remote Antenna Bldg. (Checked Shock 5/8 mile S.
13. Omni Station 3/4 mile S.
14. Checked Shock ASR 3 Radar 7/8 mile S.E.
15. Hangars 7/8 mile NNE.
16. End of Pier 1-3/8 mile S.
17. Federal Bldg., Hotel 1-3/4 mile N.W.
18. New Hotel 2 mile N.
19. Switch House 3/8 mile S.E.
20. TWA "Finger" 1/4 mile E.
21. Hangar II Radar Dome 1 mile N.

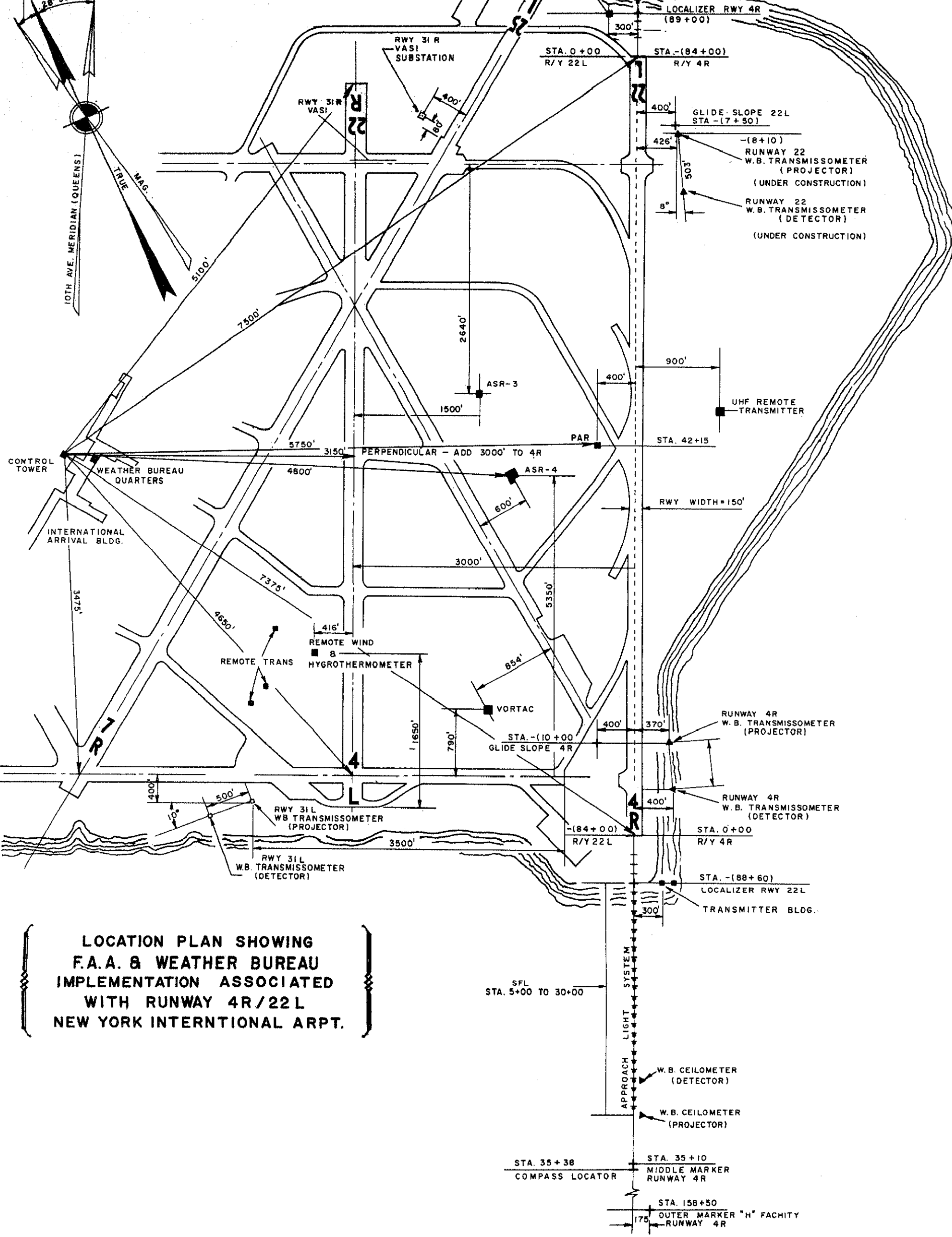
Note: N=Night Time Check Point

NEW YORK INTERNATIONAL AIRPORT LOCATION PLAN



SCALE
(MILES)

MAG. DEC. 11° 42' W
1960 ISOGONIC VALUES
28° 59' 13.5"



LOCATION PLAN SHOWING
F.A.A. & WEATHER BUREAU
IMPLEMENTATION ASSOCIATED
WITH RUNWAY 4R/22L
NEW YORK INTERNATIONAL ARPT.