

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20591

ALITALIA AIRLINES
McDONNELL-DOUGLAS DC.8.62. I-DIWZ
(ITALIAN REGISTRY)
JOHN F. KENNEDY INTERNATIONAL AIRPORT
JAMAICA, NEW YORK
SEPTEMBER 15, 1970

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 AIRCRAFT ACCIDENT REPORT

Adopted: April 28, 1971

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SYNOPSIS

Alitalia Airlines Flight 618, a Douglas DC-8-62, I-DIWZ, made a hard landing on Runway 04 Right (Runway 4R) at John F. Kennedy International Airport, Jamaica, New York, at approximately 1321 e.d.t., September 15, 1970. The accident occurred following a localizer approach to Runway 4R. The glide slope portion of the Instrument Landing System (ILS) was inoperative. There were no fatalities. The 10 crewmembers and 146 passengers evacuated the aircraft after it came to a stop in a sandy area to the west of Runway 4R. Sixty-nine occupants, 11 of whom were hospitalized, sustained injuries.

The aircraft veered off the left side of the runway and, as it continued in a divergent path, it ground-looped to the left before coming to a stop. The fuselage split open in an area just aft of the wing. Three of the engines separated from the aircraft during the landing rollout.

The Kennedy International Airport weather at 1323 e.d.t. was scattered clouds at 600 feet, measured ceiling 800 feet overcast, visibility 4 miles, fog, temperature 73° F., dew point 68° F., with the wind from 300° at 5 knots.

The National Transportation Safety Board determines that the probable cause of this accident was the use of reverse thrust in flight, contrary to published procedures, with a resultant uncorrectable, high sink rate. The captain's

decision to use reverse thrust and not to execute a missed approach was a reaction under stress occasioned, at least in part, by Air Traffic Control (ATC) instructions which led to positioning the aircraft too high and too close to the runway. ATC vectored the aircraft to the final approach path under IFR conditions and in the absence of an operating ILS glide slope.

Subsequent to the accident and in response to operator inquiries, the Douglas Aircraft Company issued a letter to all DC-8 operators on the subject of in-flight use of thrust reversers. This letter summarized the specific reasons Douglas demonstrated and certificated the DC-8 aircraft using in-flight reverse thrust to a minimum in-flight speed of 190 knots indicated airspeed in the clean configuration only.

I. INVESTIGATION

1.1 History of Flight

On September 15, 1970, Alitalia Airlines Flight 618, a Douglas DC-8-62, I-DIWZ, was operating in regularly scheduled international passenger service from Rome, Italy, to New York, New York.

The flight departed Rome at 0422¹ (1022 local time) on an Instrument Flight Rules (IFR)

¹All times herein, unless specified otherwise, are eastern daylight based on the 24-hour clock.

flight plan nonstop to the John F. Kennedy Airport (JFK), Jamaica, New York, with an estimated time en route of 8 hours 35 minutes.

The flight was routine from Rome to the descent point, a navigational fix approximately 120 nautical miles (NM) northeast of JFK Airport. At the descent point, New York Air Route Traffic Control Center cleared Flight 618 to descend from its assigned altitude of 31,000 feet to 20,000 feet. Subsequent clearances brought the aircraft to 6,000 feet over the Bohemia Intersection (approximately 32 NM northeast of JFK). At this point, the JFK Approach Control assumed radar control and shortly thereafter established positive radar identification. It was during this time period that the crew acknowledged receipt of JFK Automatic Terminal Information Service Information "India," which was as follows:

"The seventeen hundred zulu weather Kennedy six hundred scattered measured ceiling eight hundred overcast four miles fog the winds are two one zero degrees at three and the altimeter three zero one five temperature seventy three expect ILS four right approach landing runway four right. Notice to Airmen glide slope out of service. . . ."

About this point in the flight, the first officer, at the request of the captain, took over the flight controls. He disengaged the autopilot and proceeded to comply with the various vectors provided by the approach controller. At 1307, the controller queried Flight 618 as to its speed and instructed it to increase airspeed from 210 knots to 250 knots. The controller then transmitted the Kennedy Airport weather to all aircraft and advised Flight 618 that it was "on vectors for an ILS four right approach."

Subsequently, Approach Control made the following transmissions to Flight 618 in the sequence and at the times indicated:

(1308:45) "Alitalia six eighteen turn left heading two three zero intercept the Deer Park two two one radial."

(1312:45) "Alitalia six eighteen now reduce to two hundred knots."

(1313:10) "Alitalia six eighteen turn right heading two eight zero descend to one thousand three hundred."

Flight 618 acknowledged for each of these transmissions.

At 1313:30, the JFK final controller assumed radar control and immediately queried Flight 618 as to its speed. The flight replied, "slowing down to two hundred," to which the controller responded, "Roger maintain speed of two hundred knots please." Subsequently, the controller issued additional vectors to the flight and, about 1316:50, transmitted to Flight 618, ". . . and you are still two hundred knots, right?" Flight 618 replied, ". . . two hundred knots, right." At 1318:05, the flight was advised, "Alitalia six eighteen you're three and a half from the marker, turn right zero two zero, cleared ILS four right approach." Flight 618 acknowledged for this transmission and was instructed to 'change to the JFK tower frequency. *The captain describes the sequence of events* that followed in these words: ". . . I invited the 1st Officer to accelerate the aircraft preparation in order to start the final descent since I thought to be too fast to be able to fly the proper slope.

"We accelerated the operations and started the descent till an approximate rate of descent of 1000 ft/min. We did not receive the Outer Marker. We came out of the clouds at about 600 ft with the runway in sight. We appeared to be high and slightly on the right, and I decided to perform a steep approach. I took over the controls and put the four engines at idle-reverse, then selected reverse thrust on Nos. 2 and 3 engines deciding to select forward thrust when on the proper slope.

"Close to the ground I realized that I could not leave the controls to regain forward thrust since I was too busy in rotating the aircraft.

"The touchdown was very hard; the aircraft banked to the right and immediately after started to yaw to the left.

³This is a translation of the captain's original statement in Italian. The translated statement is quoted to avoid misinterpretation.

“We overrun the left runway edge over a soft soil without any possibility to control the aircraft, which continued its run increasing the veer and crossing a service road which protruded over the rest of the terrain.

“At this point the aircraft apparently lost the remaining effect of the landing gear support.

“The impact with the road has increased the veer until the aircraft came to a stop at an angle of about 90° with respect to the motion.

“I ordered to the cockpit crew to perform the emergency evacuation procedure, then I left my seat.

“The emergency evacuation took place in an orderly way and efficiently with the participation of the crew and ground rescue personnel.

“When the evacuation seemed to be complete with no more passengers coming out of the aircraft, I inspected the wreckage to ascertain that nobody could be inside the fuselage or below it incapacitated to escape.”

Air traffic controllers in the JFK control tower observed the aircraft as it broke clear of the clouds at an altitude which they estimated to be 600 to 800 feet above ground level. The aircraft was then observed to cross the runway threshold and land on the main gear and tail at a point approximately 1,700 feet beyond the approach end of the runway. The controllers continued to observe Flight 618 as the fuselage was seen to buckle during the aircraft’s initial contact with the runway. The left wing contacted the ground as the aircraft proceeded down Runway 4R, with smoke and flames coming from an area beneath the fuselage at about the wing roots. Engines Nos. 3 and 4 were seen to separate from the aircraft during the roll-out. Following their separation, the aircraft was observed to veer to the left and depart from the runway at a point the controllers estimated to have been 2,000 feet beyond the initially observed touchdown point. Shortly thereafter, the fuselage was seen to separate into two sections at a point just aft of the trailing edge of the wing. The smoke and flames subsided as the aircraft came to rest in an area of soft, sandy soil to the west of Runway 4R.

There were no fatalities. Of the 146 passengers and 10 crewmembers aboard the aircraft, 69 sustained injuries and 11 of these were hospitalized.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	0	0	0
Nonfatal	5	64	0
None	5	82	

1.3 Damage to Aircraft

The aircraft was damaged beyond economical repair.

1.4 Other Damage

There was damage to some runway and taxiway lights.

1.5 Crew Information

All of the flight crewmembers held appropriate certificates issued by the Italian Ministry of Transportation and Civil Aviation. These certificates were in accordance with the bilateral air transport agreement between the United States and Italy, as well as provisions of the Chicago Convention of the International Civil Aviation Organization (ICAO), of which both nations are signatories. All crewmembers were qualified for the flight involved. (For detailed information, see Appendix B.)

1.6 Aircraft Information

(a) Airworthiness and Maintenance

The aircraft was a Douglas DC-8-62, serial No. 46-026, identification letters I-DIWZ, powered by four Pratt & Whitney JT3D-3B turbojet engines.

All of the flight crewmembers indicated that they experienced no malfunction of the aircraft, its engines, or its systems during the flight to Kennedy Airport. The contents of the last three pages of the Aircraft Maintenance Logbook were translated from Italian into English. This information revealed two crew comments relating to separate items on the aircraft. Both of these items were unrelated to the accident and were corrected prior to the departure of Flight 618 from Rome on September 15, 1970.

(b) *Weight and Balance*

The records reflect that the maximum takeoff weight at Rome was 337,365 pounds (153,000 kilos)³, which was within the maximum allowable of 350,000 pounds. The aircraft weight at the time of the accident was approximately 212,245 pounds, which was within the maximum allowable landing weight of 240,000 pounds. The center of gravity was computed to have been within prescribed limits for both takeoff and landing.

(c) *Fuel*

Prior to departure from Rome, the aircraft was serviced with approximately 157,300 pounds of aviation kerosene. Subsequent to the accident, the aircraft was defueled, at which time a total of 4,461 gallons (approximately 30,111 pounds) was removed from the fuel tanks.

1.7 Meteorological Information

The 1400 surface weather chart prepared by the National Meteorological Center showed a warm front oriented east-southeast west-northwest just south of JFK Airport.

The JFK 1251 surface weather observation indicated scattered clouds at 600 feet, ceiling measured 800 feet overcast, visibility 4 miles, fog, sea level pressure 1022 millibars, temperature 73° F., dew point 69° F., wind 190° at 5 knots, altimeter setting 30.17 inches, higher clouds visible.

At 1318:32, the JFK local controller provided Flight 618 with the following wind information: "...wind three-zero-zero degrees at four."

The Weather Bureau aviation terminal forecast that was supplied to the flightcrew prior to departure from Rome was as follows for JFK, Newark, and Philadelphia.:

1100-2000, wind 120° at 12 knots, visibility 4 miles, rain, 800 feet scattered, 1,500 feet overcast, intermittent visibility 2 miles, rain, 800 feet overcast.

1.8 Aids to Navigation

An entry in the daily Facility Maintenance Log of the New York Instrument Flight Rules Room for September 14, 1970, revealed that the glide slope for the Runway 4R ILS would be out of service from September 14 at 1300 hours until September 18, 1970. The purpose of the outage was to permit a change to the glide slope angle from 2.63" to 2.75' for Category II operations. The Distance Measuring Equipment (DME), which operates in conjunction with the localizer as part of the ILS, was in operation on Runway 4R at the time of the accident. The ILS localizer was flight checked after the accident and found to be operating within the prescribed parameters. All other pertinent en route and terminal navigational aids were reported as operating normally.

A Notice to Airmen (NOTAM) issued on September 14 stated that effective at 1300, the ILS glidepath (slope) for Runway 4R at JFK was scheduled to be taken out of service. A Daily NOTAM sheet, published by Alitalia and containing a reference to the glidepath information, was found in the cockpit of I-DIWZ during the investigation.

³One kilogram equals 2.205 pounds.

1.9 Communications

No difficulties in communications were reported.

1.10 Aerodrome and Ground Facilities

Runway 4R is 8,400 feet long, **150** feet wide, with a concrete paved surface. The airport elevation is 12 feet.

At the time of the accident, the runway lights, approach lights, centerline lights, touch-down zone lights, and sequence flashers were operating and set on intensity setting **3**.⁴

1.11 Flight Recorders

Two recorders were aboard the aircraft at the time of the accident: a flight data recorder and a performance recorder. Both recorders receive identical information from a common on board data acquisition system manufactured by Airesearch Manufacturing Company, a subsidiary of the Garrett Corporation. The flight data recorder, Devall Type 1190, S/N 194, is a crash-protected recycling wire recorder of **55** hours duration. The performance recorder, Airesearch Recorder Base, P/N 948014-2, S/N 107-120, is a nonprotected recycling tape unit using IBM-compatible tape, also of **55** hours duration. A total of approximately 40 aircraft and engine parameters are measured and recorded with the performance recorder.

Both recorders were recovered from the wreckage in a completely undamaged condition and were taken to the Airesearch facilities in Los Angeles, California, for processing. Processing was accomplished by an IBM 360 computer and printouts were obtained from both recorders. Comparison of the processed data reflected that both printouts contained identical information, with the exception that occasional lines of data were missed by the computer in processing the data from the wire recorder. However, these

⁴Light intensity settings range from step 1 (low) to step 5 (high).

missing lines were available in the performance recorder printout, so that no data were lost.

The processed data from both recorders reflected that the flight data recorder continued to operate for 8 seconds after the performance recorder stopped. Therefore, the performance recorder data were utilized in preparing the flight recorder data graph up to the last 8 seconds and the flight recorder data were used for the last 8 seconds.

No cockpit voice recorder was installed on the aircraft nor was it required.

1.12 Wreckage

The fuselage structure was complete from FS 0 to FS 1040. A separation began in the fuselage at FS 1040 and continued downward and aft in an irregular tear to FS 1140. This resulted in a complete separation of the fuselage structure.

The lower right side of the fuselage between FS **857** and FS 980 sustained extensive crushing damage when the right main gear folded inward and crushed the gear door upward into the wheel well. The aft portion of the fuselage from FS 1040 to FS 1830 was complete, including the empennage section. This section had sustained minor scraping damage to the lower structure, with the tail skid broken off approximately one-half inch below its base. The separated portion of the tail skid was found near the PAR-1 building.

Both horizontal stabilizers were intact. Each stabilizer jackscrew was intact and 33 threads were exposed on each jackscrew shaft. This measurement corresponds to 2.3" aircraft noseup.

The left wing was complete and intact. The No. 1 engine and most of the pylon had separated from the wing at the pylon-to-wing attach area. The No. 2 engine and pylon were still attached to the left wing. However, this engine had rotated outward approximately 45°, resulting in considerable mechanical damage to the pylon and pylon attachments.

The right wing was complete, but had sustained considerable structural damage at the

wing root lower attach area and the area of the No. 4 auxiliary fuel tank. The wing root area, inboard of the right main gear, was crushed upward and portions of the gear assembly were embedded in the crushed area. The upper right wing surface exhibited compression buckling in the area of the No. 4 auxiliary fuel tank. The Nos. 3 and 4 engines and most of both pylons had separated from the wing.

The left flaps were complete and in an extended configuration. The flap sections had moved to a position beyond full extension and had rolled to a position under the wing. All flap hinges were broken at the flap-to-wing attach point.

The right flaps were complete and in an extended configuration. The flap drive cylinders were extended.

The wing slots were intact and in an open position.

The spoilers were intact and in a fully retracted position.

The right main gear was attached to the wing structure at the trunnion attach points. The gear strut was in an extended position. The retract cylinder piston was bent at the midpoint of the exposed rod on an angle of approximately 90°. The complete gear assembly had been forced into a semiretracted position. The two rear wheels, tires, and brake assemblies had separated from their respective axles.

The left main gear assembly was complete but had separated from the wing at the trunnion attach point and at the fixed side link upper attach point. The separations were typical of overload.

The nose gear assembly was complete but had separated from the aircraft. The separations were typical of overload.

The first indication of a touchdown on the runway surface was a sharply defined score beginning 1,590 feet beyond the threshold of Runway 4R. This score was approximately one-half inch wide and varied in depth to three-

quarters of an inch. The score was located 9 inches to the left of the runway centerline. (See Appendix D for wreckage distribution chart and location of scoring marks on the runway.)

1.13 Fire

There was no evidence of in-flight fire.

Witnesses observed some smoke and fire coming from beneath the center section of the aircraft subsequent to initial impact. However, no fire was observed after the aircraft came to a stop.

1.14 Survival Aspects

Prior to the landing, the crew had turned the "fasten seatbelts" sign on, and the cabin attendants had checked to ascertain that all seats were placed in an upright position. In addition, all of the flight crewmembers had fastened both their seatbelts and shoulder harnesses.

Descriptions of the initial impact varied from a normal landing to a very hard landing. Passengers reported they were forced to the right side of their seats during the initial impact and then were jostled about as the aircraft decelerated.

After the aircraft came to a stop, and the captain had given the flightcrew the order to evacuate, both he and the first officer exited through the cockpit sliding windows by means of the escape ropes. The captain used the left window and the first officer the right window. Upon reaching the ground, they attempted unsuccessfully to open the forward service door. They then proceeded aft and assisted the passengers who were deplaning through the break in the fuselage and by means of the emergency exits (windows) over the right wing.

The navigator, who was seated behind the captain when the aircraft came to rest, proceeded aft where he found the left front main door partially open. He fully opened the door, jumped to the ground, and proceeded to assist

the passengers exiting through the break in the fuselage. The flight engineer followed the navigator to the left front main door and, finding it opened, deployed the escape slide. It is estimated that 20 to 25 passengers seated in the forward cabin section used this slide during the evacuation. The first steward, who was seated in the crew lounge, attempted to open the forward service door. However, he was unsuccessful in this attempt as litter obstructed the door. Following this, he proceeded aft and opened the right side emergency overwing exits. He did not open the left overwing exits because he observed what he believed to be smoke in that area. It was not until some time later that he realized that the reduced visibility in the area of the left wing was due to sand and dust rather than smoke.

When the aircraft came to a stop, the third steward, who was seated in the rear jump seat, opened the left rear passenger door. He inflated the escape slide and, with the second steward, assisted passengers to the slide. It is estimated that 50 persons used this slide.

The first of the fire/rescue personnel and equipment arrived at the crash site approximately 1 minute 30 seconds after the aircraft came to a stop. These personnel assisted in the latter stages of the evacuation. The aircraft evacuation is estimated to have taken a total of 3 minutes.

1.15 Tests and Research

The pitot static and pressure systems were tested. During the test, both the captain's and first officer's airspeed indicators were checked at 255 and 140 knots and compared to the indicator on the test rig. All indicated identical readings. There was no pressure leakage.

The captain's static system had a leak rate of 1,500 feet per minute and the pitch trim compensator static system had a leak rate of 450 feet per minute. Because of the extensive damage to the various static lines in the nose gear area, the Board was unable to determine the cause for these leaks. The first officer's static system and auxiliary system showed no evidence of leakage.

1.16 Other Pertinent Information

(a) *Alitalia DC-8-62 Operations Manual*

A review of the Alitalia DC-8-62 Operations Manual that was in effect at the time of the accident revealed a section on Limitations and Procedures. One of these limitations specified that in-flight reverse thrust must not be used when the flaps are extended. Another limitation stated that 190 knots indicated airspeed is the minimum for the use of reverse thrust in flight.

In addition, an amendment to the Operations Manual discussed the flight procedures when utilizing high descent rates during the final approach. This discussion concluded with the following:

“WARNING: If at 400 feet QFE⁵ the normal approach slope and/or the airspeed stabilization are not obtained PERFORM THE GO-AROUND PROCEDURE.”

(b) *Alitalia Pilot Training Program*

In discussing the pilot training program with appropriate Alitalia personnel, they indicated that the knowledge, observance, and application of operating procedures and limitations are specific matters covered in their pilot training and in-flight check programs. In addition, they stated that it was the overall company flight training philosophy to present instruction in a positive rather than a negative manner. The student, in general, is taught what he should do, not what he should not do. Thus, in providing instruction in the final portion of the approach for landing, emphasis is placed on establishing a normal approach slope and on airspeed stabilization.

⁵Station barometric pressure which, when set in the altimeter, allows for an altimeter reading of zero feet at the airport elevation.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

Evaluation of the evidence obtained during the investigation indicates that the crew of Flight 618 obtained visual reference with Runway 4R about the time the aircraft was passing over the middle marker (three-quarters mile from runway threshold) at a height of approximately 600 feet. At this point, the captain took over control of the aircraft from the first officer and attempted to land.

Upon assuming control, the captain thought that the position of the aircraft was high and slightly to the right of center in reference to the runway. In an effort to place the aircraft in a proper position for landing, he placed all four engine power levers at idle-reverse. He then applied reverse thrust to the Nos. 2 and 3 engines with the intention of using forward thrust when the aircraft had reached the proper point on a preplanned descent path. However, as the aircraft neared the ground, the captain was so fully occupied with rotating the aircraft to a proper landing attitude that he was unable to make the necessary throttle adjustments to apply forward thrust. As a result, the aircraft made a hard landing, contacting the runway surface in a right-wing-down and near-level-fuselage attitude. The aircraft veered off the left side of Runway 4R and ground-looped to the left, just prior to coming to rest in a sandy area to the west of the runway. During the landing roll, the Nos. 1, 3, and 4 engines separated from the aircraft.

The use of reverse thrust at a point in flight just prior to touchdown, with an indicated airspeed of under 190 knots and with flaps extended, was contrary to the limitations specified in the Alitalia DC-8-62 Operations Manual. In addition, the flightcrew did not conform to the company procedures requiring a go-around if a normal approach slope and/or speed stabilization are not obtained during the final portion of the approach.

In evaluating the circumstances surrounding this accident, the Board believes that consideration should be given to the factors which would influence an experienced pilot to use the procedures that were employed.

One of the significant factors in this regard was the vectoring procedures utilized by ATC with Flight 618 approaching JFK under IFR conditions and in the absence of an operating ILS glide slope. The absence of this glide slope information meant that the crew had to depend primarily on their DME indicator to provide them with their start-of-descent point. On the ILS approach to Runway 4R at JFK, the start-of-descent point is a DME fix, 4.6 NM from the runway threshold. This fix precedes the outer marker by 1.8 NM. Consistent with usual air carrier practice, Alitalia begins their instrument approach checklist sequence after capture of the localizer course and the glide slope indications.

A review of the altitude printout of the performance recorder showed that the landing gear was not lowered and flaps not extended to 35" until approximately 18 to 20 seconds after the aircraft had passed the 4.6-NM DME fix. The delay in executing this procedure indicates that, in general, the crew's actions were behind the progress of their aircraft. The captain's comment to the first officer to "accelerate the aircraft preparation in order to start the final descent" reveals that the captain became aware of this condition and was attempting to make necessary corrections.

The heading printout of the performance recorder was compared with the vectors issued by ATC. The recorder trace shows that at the time the flight was cleared for an approach (1318:05), the aircraft turned right to its assigned heading of 020° to intercept the localizer course and that, upon reaching this heading, the aircraft turned to the localizer inbound course of 042". Further examination of the heading trace indicated that the aircraft reached the inbound localizer course heading 2 seconds before the start of reception of the outer marker signal. The arrival of the aircraft at the localizer course at this point in the flightpath was not in accordance with ATC vectoring procedures.

Paragraph 672 of the Terminal Air Traffic Control Manual 7110.8A, page 144, states as follows:

“Whenever the reported weather is below the basic VFR minima, or upon pilot request, vector aircraft to intercept the localizer course at least 2 miles from the approach gate and at an altitude not above the glide slope.”

Paragraph 20, page 5, of the same manual defines approach gate as follows:

“That point on the final approach course which is one mile from the approach fix on the side away from the airport or 5 miles from the landing threshold, whichever is farther from the landing threshold.”

In applying these criteria to Runway 4R at Kennedy Airport, the approach gate is that point on the approach course which is 5 miles from the landing threshold. Thus, the localizer course should be intercepted at least 7 miles from the landing runway.

In the case of Flight 618, the heading print-out of the performance recorder indicates that the aircraft passed well to the right of the 7-mile intercept point, as it did not intercept the localizer course until reaching a point 2.2 miles inside the approach gate or 2.8 miles from the landing threshold.

Paragraph 687 of the Terminal Air Traffic Control Manual 7110.8A, page 150, states, in part, as follows: “. . .In any event pilots are expected to make their own speed adjustments after passing the approach gate.”

Between the time period 1313:45 and 1318:05 (flight's receipt of approach clearance), there were three ATC transmissions relating to airspeed. The last of these transmissions “. . .and you are still 200 knots, right?” was made at 1316:50. Whether this transmission was merely a request for the flight's present airspeed or a reminder that the flight should maintain 200 knots is a matter of conjecture. However, regardless of the controller's intent, the flight recorder shows that there was a decrease in airspeed from approximately 200 knots to an airspeed on the order of 186 knots just prior to the 1316:50

transmission. This was followed by a gradual increase in airspeed after the crew acknowledged for this transmission. A continuous speed reduction is not noted on the recorder trace until about the time the flight was cleared for the approach and was 3% miles (radar position) from the outer marker. Thus, at the time Flight 618 received approach clearance, it was not on the localizer course and had excessive airspeed.

In summation, despite the fact that the crew was aware of the inoperative glide slope, the vectoring procedures utilized by ATC, combined with the absence of glide slope information (normally relied upon by the crew to sequence the landing checklist actions properly), resulted in a delay in configuring the aircraft for the landing. As a result, the descent profile was overshot and never actually achieved.

In reviewing the flightpath which was flown by Flight 618, the Board is mindful of the crew's responsibility for the safe handling of its aircraft. The pilot-in-command must abide by ATC clearance and instructions, but not to the extent where the safety of the flight is compromised. If, in the opinion of the captain of Flight 618, such an unsafe condition existed, he should have so informed the approach controller. However, in considering this last point, the Board recognizes that under certain conditions, a foreign carrier pilot making an approach to a U.S. airport may have a language barrier. This barrier may become apparent when the foreign carrier pilot attempts to express himself outside of the normal exchanges of vectors, clearances, and altitude requests. However, there was no evidence to indicate that such a condition may have existed in the case of Flight 618.

In addition, the Board is aware of the company procedures requiring that a go-around be performed and of the alternative that such a procedure offered the captain of Flight 618 when he encountered unfavorable flight conditions during the approach.

Although this alternate course of action was available to the captain, the Board believes that the air traffic control service provided to Flight

618 was a link in the chain of events leading to the accident. The Board is of the opinion that stricter adherence to prescribed procedures by ATC personnel would have assisted the crew in placing the aircraft in a more favorable position from which to start a final approach—that is, positioning Flight 618 on the localizer at least 7 miles from the end of Runway 4R rather than vectoring the aircraft in such a way that it intercepted the localizer at a point approximately 2.4 miles before reaching the outer marker (approximately 2.9 miles from the end of the runway).

The principal operational aspect of this flight, however, was the decision of the captain to attempt to land the aircraft from a position close in and high, in relation to Runway 4R. In considering this aspect, the Board was unable to determine what effect, if any, a desire to complete a relatively long flight as expeditiously as possible may have had on the captain's decision to land. However, it appears that the decision to land was a relatively split second one made under marginal circumstances. Simply stated, the captain believed he could execute a safe landing from the point at which he took over the flight controls from the first officer, although the time available for much maneuvering was limited.

The question of why reverse thrust was used in a flight regime where it is prohibited is also difficult to analyze. One possible reason presents itself. Unlike some of the other large jet aircraft wherein reverse thrust can be used only on the ground, the use of reverse thrust on DC-8 aircraft is an accepted practice during flight with the flaps retracted at airspeeds above the minimum of 190 knots. As part of the DC-8 thrust brake system, the throttles may be placed in reverse while in flight to increase descent rates without an appreciable increase in indicated airspeed. Thus, the use of reverse thrust in flight may not present the psychological block to the pilots of DC-8 aircraft which may be present in the minds of pilots flying other large jet aircraft.

In the case of Flight 618, the captain was, by training and experience, familiar with the use of reverse thrust in flight as a means of rapidly

losing altitude. In addition, he stated he was aware of the limitations placed on the use of the reverse system in flight. However, when the problem of landing presented itself under the pressure of breaking out of the clouds, higher and closer than he would have liked, there was that ready response available for use—reverse thrust. If he had had additional time to examine the validity of this response, he might have considered the overall effect of performing such a maneuver that close to the ground and decided against it. However, under the pressure to make a rapid decision, he acted and, in so doing, was not prepared for the resultant high sink rate and the conditions which required him to use both hands on the control wheel to rotate the aircraft.

One final factor which should be considered in the analysis of this accident is the survival aspect. The flightcrew commenced executing its emergency checklist and engine shutdown procedures as the aircraft veered off the runway. This prompt action on the part of the flightcrew and the assistance provided by the JFK fire/rescue personnel during the evacuation of the aircraft reduced the potential loss of life of catastrophic proportions.

2.2 Conclusions

(a) Findings

1. There was no evidence of failure or malfunction of the aircraft, its powerplants, or systems.
2. The crew was properly certificated and qualified for the flight.
3. The ILS glide slope was inoperative.
4. About the time of the accident, the prevailing visibility at Kennedy International Airport was 4 miles in fog. There were scattered clouds based at 600 feet above the ground with the ceiling measured 800 feet overcast. Approximately 2 minutes prior to the accident,

The surface wind was from 300° magnetic at 4 knots.

5. The aircraft passed over the outer marker, inbound at an altitude of more than 600 feet above the minimum altitude specified on the approach chart used by the crew of Flight 618 for landing on Runway 4R.

6. The aircraft passed over the middle marker at an altitude of more than 400 feet above that specified on the approach chart.

7. ATC did not handle Flight 618 in accordance with the criteria for vectoring aircraft as set forth in the Terminal Air Traffic Control Manual.

8. The flightcrew had visual reference to Runway 4R at a height of about 600 feet at a point where they were passing over the middle marker.

9. At the point where the flightcrew first sighted the runway, the captain took the controls from the first officer. He put all four engines at idle-reverse and added reverse thrust on the Nos. 2 and 3 engines.

10. The decision to land was made under the pressures of haste and without full consideration of the effect the use of reverse thrust would have on the aircraft when applied close to the ground.

11. All mechanical damage sustained was a result of impact with the runway surface.

12. The aircraft veered off the left side of the runway and came to rest in a sandy area. Before the aircraft stopped, the Nos. 1, 3, and 4 engines had separated from the wing.

13. All occupants were evacuated from the aircraft. There were no fatalities.

14. The Alitalia Operations Manual for the DC-8-62 aircraft (limitations section) specifies that in-flight reversing of the engines is prohibited below 190 KIAS, and whenever flaps are extended.

15. The flaps were fully extended and the airspeed was approximately 150 KIAS at the point in flight where the captain placed the engines in idle-reverse and applied reverse thrust to the Nos. 2 and 3 engines.

16. The Alitalia Operations Manual for the DC-8-62 aircraft (Amendment No. 46) specifies that the go-around procedure should be performed if the normal approach slope and/or the –speed stabilization are not obtained at 400 feet QFE.

(b) Probable Cause:

The National Transportation Safety Board determines that the probable cause of this accident was the use of reverse thrust in flight, contrary to published procedures, with a resultant uncorrectable ^{high} sink rate. The captain's decision to use reverse thrust and not to execute a missed approach was a reaction under stress occasioned at least in part, by Air Traffic Control (ATC) instructions which led to positioning the aircraft too high and too close to the runway. ATC vectored the aircraft to the final approach path under IFR conditions and in the absence of an operating ILS glide slope.

3. CORRECTIVE ACTION

The Douglas Aircraft Company issued a letter on December 28, 1970, to all DC-8 operators

stating specific reasons Douglas demonstrated and certificated the **DC-8** aircraft using in-flight reverse thrust to a minimum in-flight speed of 190 knots IAS in the clean configuration only. This letter concluded with the following statement: "Since the landing gear and flaps are available below a speed of approximately 230 knots

IAS and provide adequate deceleration capability below this speed without reducing lift capability, there is no justification for use of reversers inflight below the present established speed limitation." (See Appendix E for copy of letter).

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ OSCAR M. LAUREL
Member

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

April 28, 1971

INVESTIGATION AND HEARING

1. Investigation

The Board received notification of the accident about 1330 e.d.t., September 15, 1970. An investigating team was immediately dispatched to the scene of the accident. Working groups were established for Operations, Air Traffic Control, Human Factors, Systems, Structures, Powerplants, Weather, and Flight Data Recorder. Parties to the investigation included: Alitalia Airlines, the Federal Aviation Administration, Italian Civil Aviation Administration, Pratt and Whitney Aircraft, McDonnell-Douglas, Air Line Pilots Association, and the New York Port Authority.

The on-scene investigation was completed on September 18, 1970.

2. Hearing

There was no public hearing.

CREW INFORMATION

(a) Flight Crewmembers

Captain Giacomo Faggiani, aged 42, had been employed by Alitalia since May 15, 1953. On the date of the accident, he held Italian Pilot License 3rd Grade¹ No. 1801 and was qualified in DC-4, DC-6, Convair, Viscount, DC-8-43, and DC-8-62 type aircraft.

Captain Faggiani had satisfactorily completed his most recent proficiency check on June 12, 1970. His last medical examination was taken on July 13, 1970, and he was declared qualified for the renewal of his 3rd grade pilot license. The captain had a total of 13,310 hours flying time, including 1,362 hours in the DC-8-62 aircraft.

First Officer Romano Nardini, aged 36, has been employed by Alitalia since November 1, 1959. On the date of the accident, he held Italian Pilot License 3rd Grade No. 2134 and was qualified in DC-6, DC-7, Caravelle, DC-8-43, and DC-8-62 type aircraft.

First Officer Nardini had satisfactorily completed his most recent proficiency check on May 12, 1970. His last medical examination was taken on August 18, 1970, and he was declared qualified for the renewal of his 3rd grade pilot license. The first officer had a total of 8,114 hours flying time, including 247 hours in the DC-8-62 aircraft.

Flight Engineer Lamberto Boatta, aged 35, has been employed by Alitalia since July 1, 1957. On the date of the accident, he held Italian Flight Engineer License No. 2023 and was qualified in DC-6, DC-7, DC-8-43, and X-8-62 type aircraft.

Flight Engineer Boatta's last medical examination was taken on July 27, 1970, and he was declared qualified for renewal of his flight engineer license. He had a total of 10,238 hours flying time, including 517 hours in the DC-8-62 aircraft.

Pilot/Navigator Franco Lodi, aged 33, has been employed by Alitalia since August 1, 1969. On the date of the accident, he held Italian Pilot License 3rd Grade No. 3659 and Navigation Officer's License 2nd Class No. 2218. He was qualified in DC-8-43 and DC-8-62 type aircraft.

Pilot/Navigator Lodi's last medical examination was taken on September 5, 1970, and he was declared qualified for the renewal of each of his licenses. He had a total of 1,680 flying hours, including 242 hours in the DC-8-62.

All four flight crewmembers had been off duty at least 36 hours prior to reporting for Flight 618 on September 15, 1970. They had been on duty 10:28 hours, including 8:58 of flight time, at the time of the accident.

(h) Other Crewmembers

First Steward Franco Furiga completed his training on the DC-8-62 aircraft on December 28, 1967.

Second Steward Dario Sacco completed his training on the DC-8-62 aircraft on June 20, 1968.

¹Third Grade is the highest pilot license issued by the Italian Government and is the equivalent to the U.S. Airline Transport Pilot Certificate.

Third Steward Pietro Vacatello completed his training on the DC-8-62 aircraft on January **30, 1969**.

All three of the stewards had been off duty at least 24 hours prior to reporting for Flight 618 on September 15, 1970.

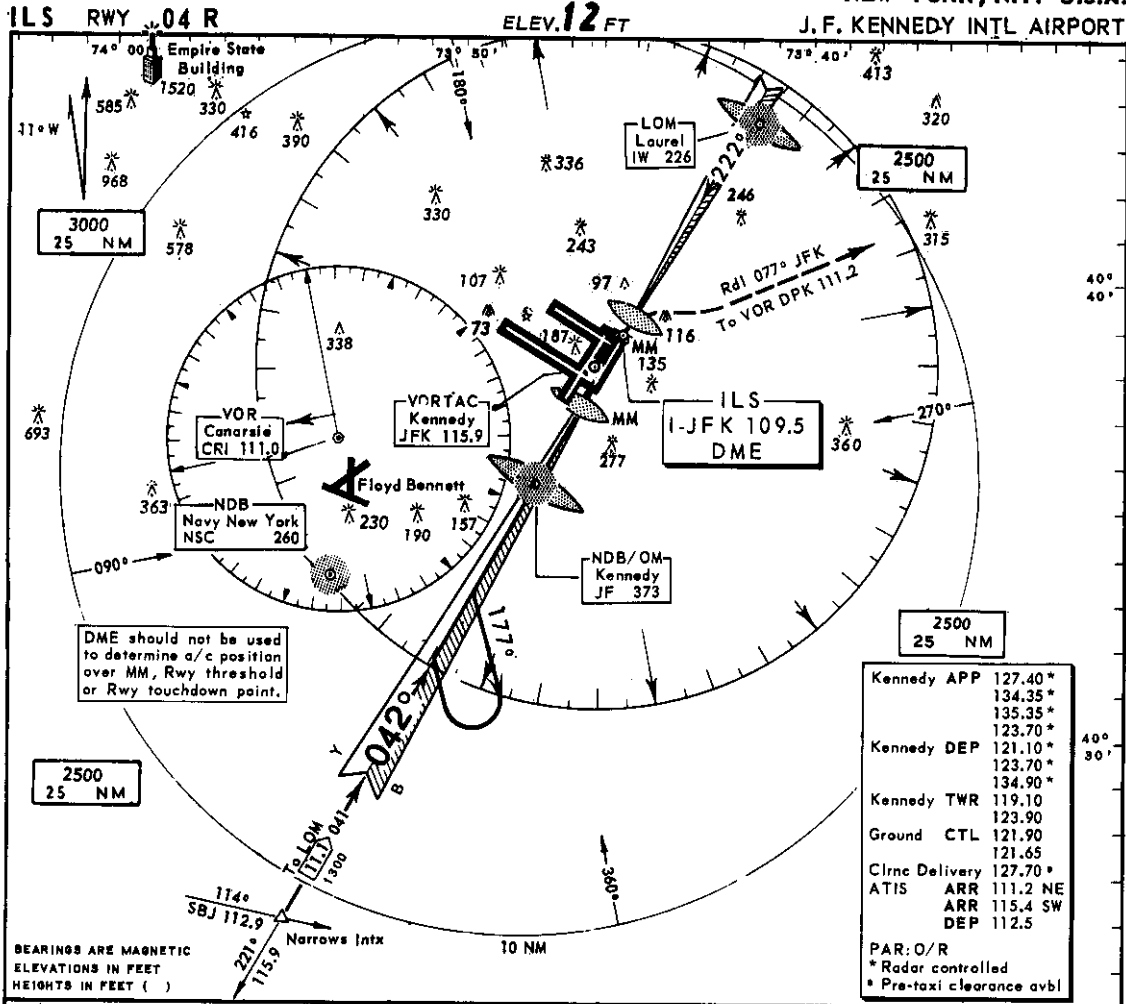
First Stewardess Ellen Bolinger completed her training on the DC-8-62 aircraft on March 23, 1970. She had been off duty approximately 20 hours prior to reporting for Flight 618 on September 15, 1970.

Second Stewardess Maria Brigati had been off duty at least 24 hours prior to reporting for Flight 618 on September 15, 1970.

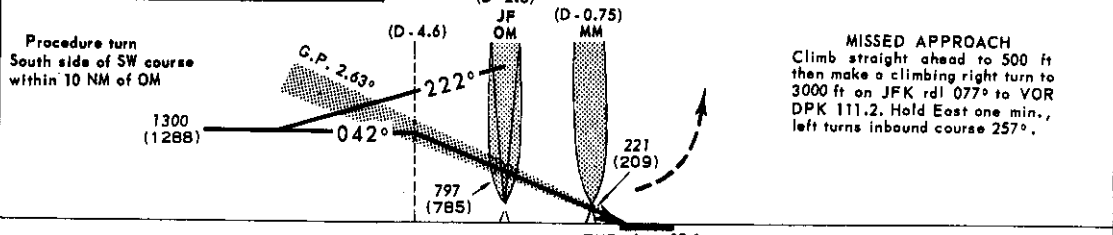
Third Stewardess Giuliana Della Giacoma completed her training on the DC-8-62 aircraft January 23, 1970. She had been off duty approximately 20 hours prior to reporting for Flight 618 on September 15, 1970.

APPROACH CHART
ILS RWY 04 R

NEW YORK, N.Y. U.S.A.
J. F. KENNEDY INTL AIRPORT

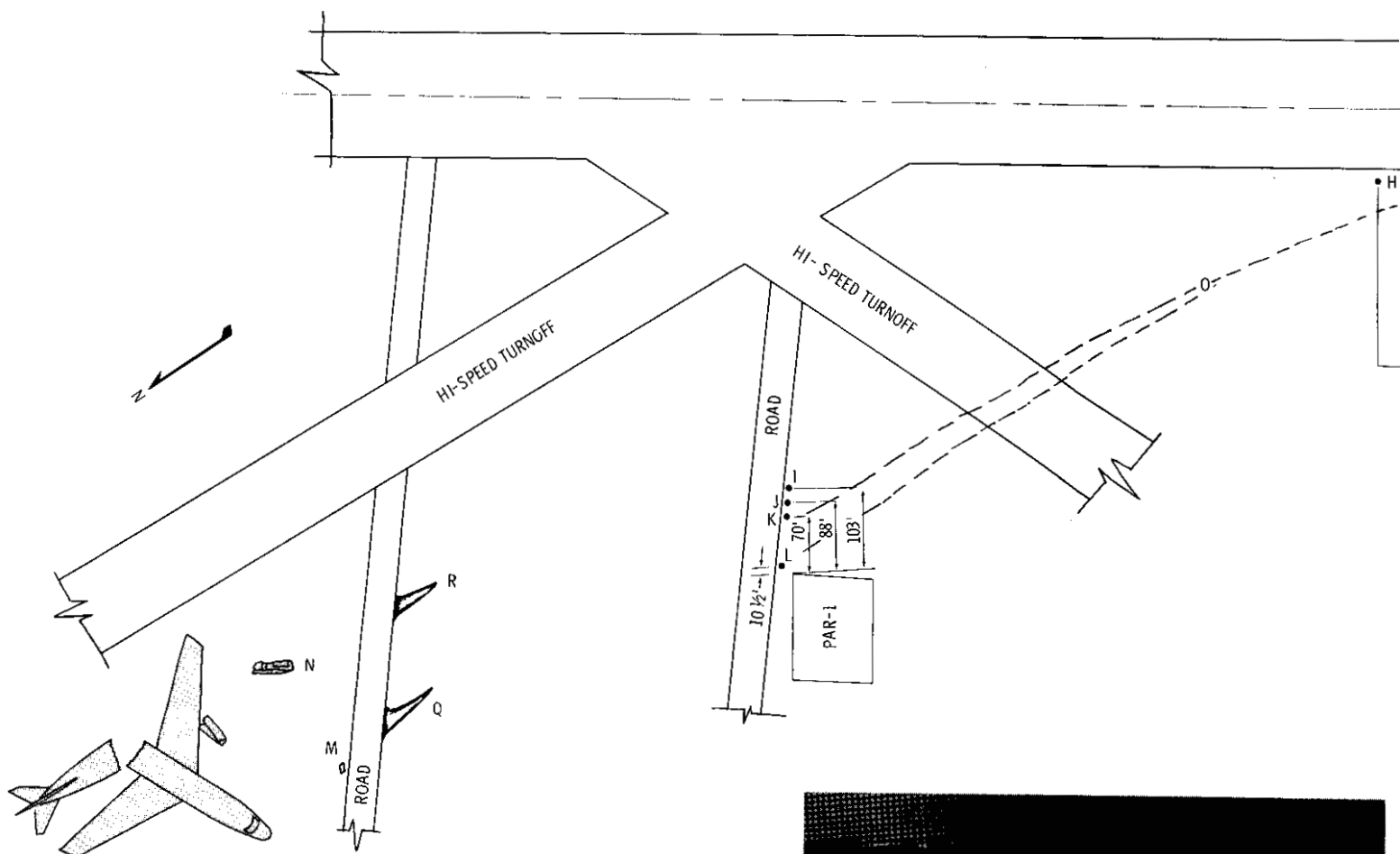


INITIAL APPROACH: MEA or TRANSITIONS.



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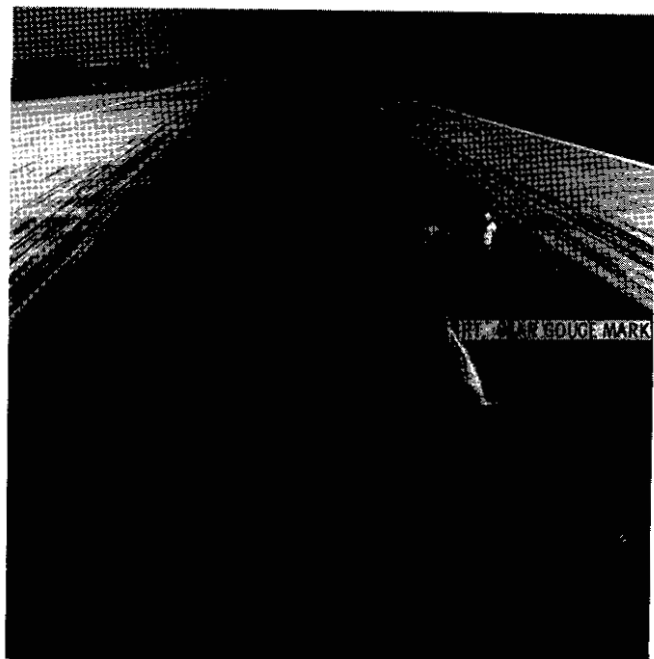


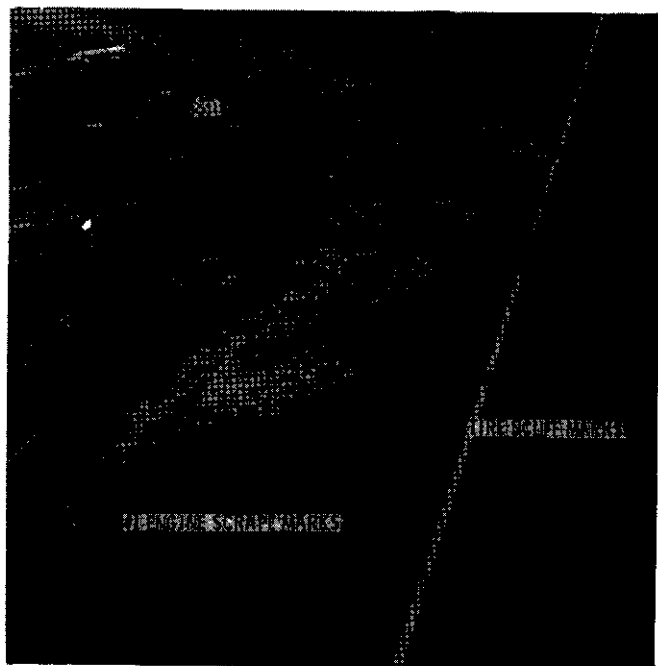
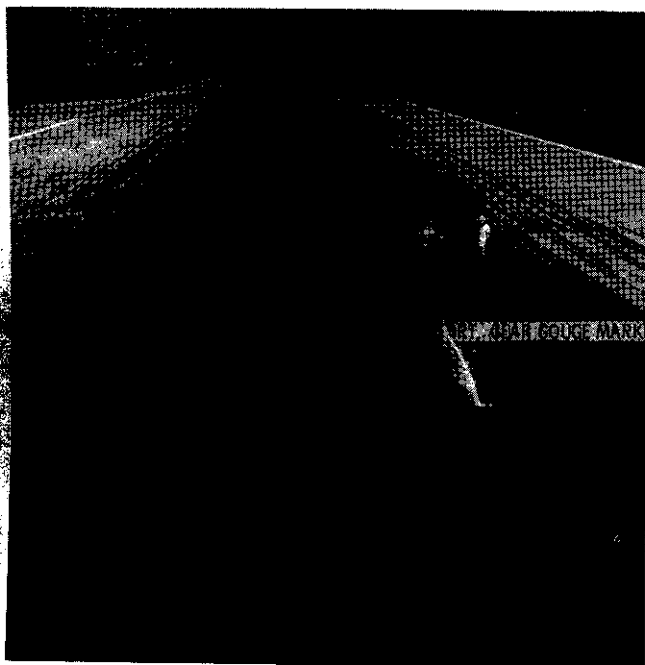
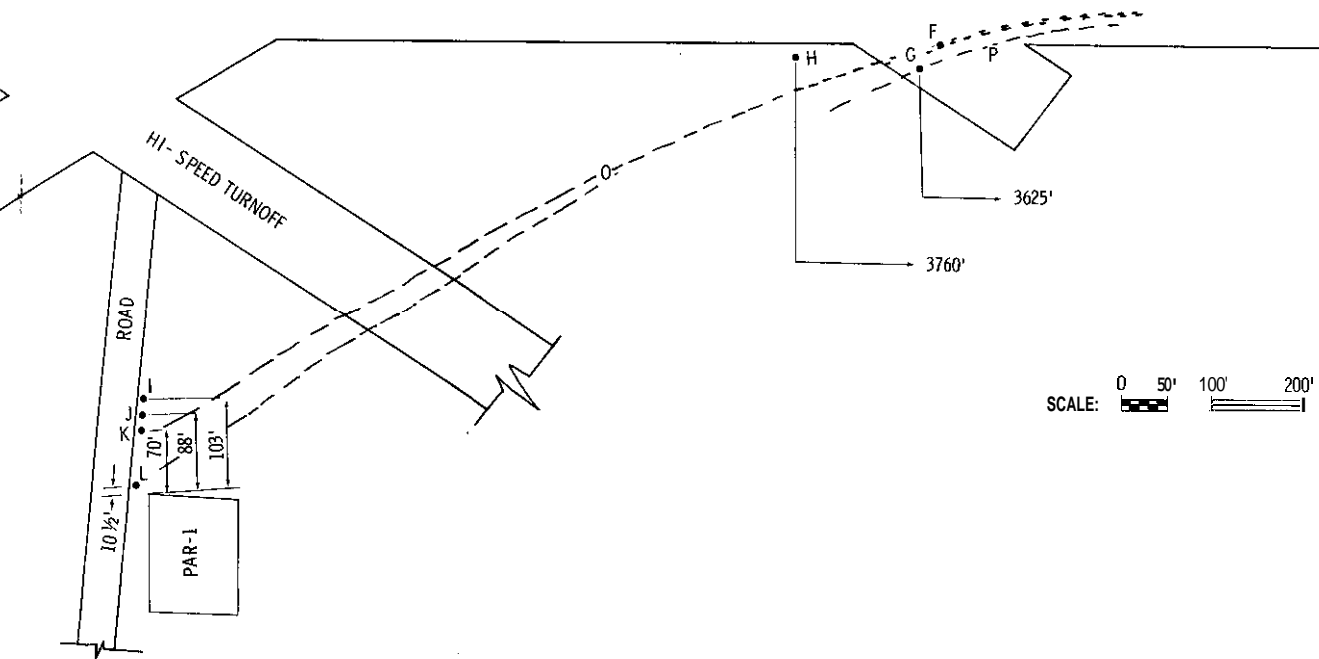
MAIN WRECKAGE AREA

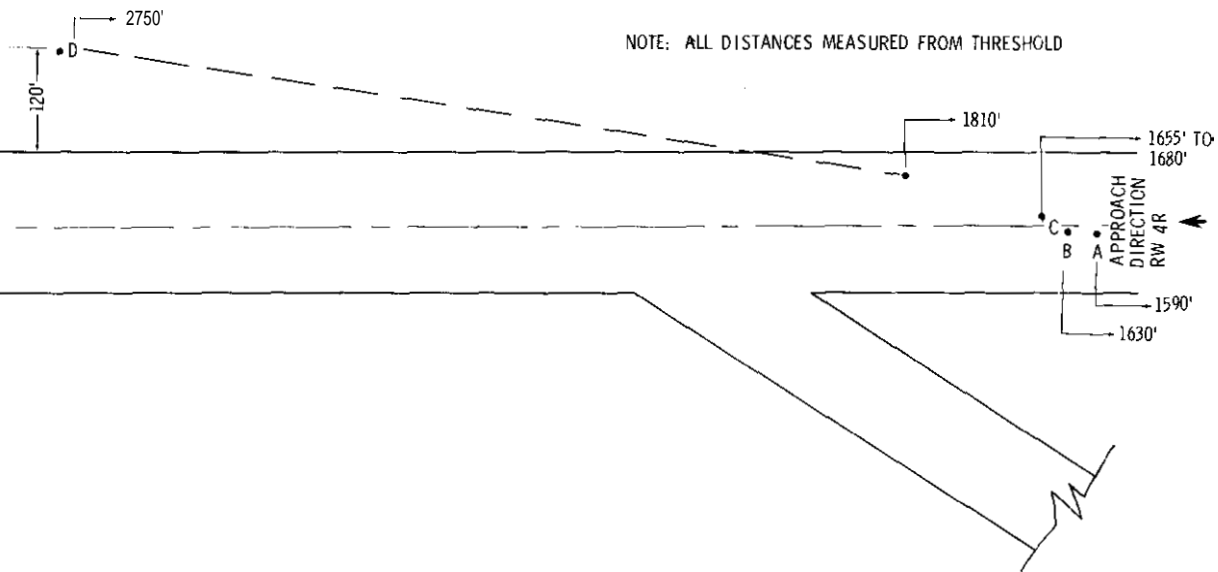
Long. 73° 47' 15" W Lat. 40° 38' 45" N

LEGEND

- A. FIRST INDICATION OF SCORE
- 6. SECOND INDICATION OF SCORE
- C. GOUGE IN RINWAY
- D. NO. 3 AND 4 ENGINE LOCATION
- E. FIRST INDICATION OF ALUMINUM SCRAPING
- F. AIRCRAFT LEFT RUNWAY
- G. FIRST INDICATION OF RIGHT MAIN GEAR
- H. FIRST INDICATION OF NOSEGEPK
- I. REMAINS OF TAIL SKID
- J. RIGHT MAIN GEAR
- K. LEFT MAIN GEAR
- L. NOSE GEAR
- M. NOSE GEAR LOCATION
- N. NO. 1 ENGINE LOCATION
- O. SERIES OF TRACKS IN TERRAIN
- P. NO. 1 PYLON SCRAPE
- Q. GOUGE IN EDGE OF ACCESS ROAD RESULTING FROM NOSE GEAR IMPACT
- R. RIGHTMAINGEAR IMPACT INDICATION







NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C.

WRECKAGE DISTRIBUTION CHART
ALITALIA DOUGLAS DC-8, I-DIWZ
J.F. KENNEDY INTERNATIONAL AIRPORT, N.Y.
September 15, 1970

RESCUE MARKS

KNOW YOUR DC-8

LETTER NO. 44

DATE 28 December 1970

TO ALL DC-8 OPERATORS
FROM: C. L. STOUT, DIRECTOR – FLIGHT OPERATIONS
DOUGLAS AIRCRAFT COMPANY

SUBJECT: INFLIGHT USE OF THRUST REVERSERS

This letter is prepared in response to recent operator inquiries concerning inflight use of thrust reversers, particularly with respect to the use of reversers below a speed of 190 knots or with the wing flaps extended.

In general, thrust reversers were installed on **DC-8** aircraft for (1) ground deceleration after landing, (2) emergency descent, (3) to increase the normal enroute descent rate, and (4) deceleration during cruise operation. The thrust reversers were designed in lieu of a spoiler speed brake deceleration device and may be deployed inflight in the airplane clean configuration. Normally, speed brakes, regardless of design, are not intended for use when the wing flaps or landing gear are extended, since adequate speed control of the aircraft is available through these devices.

Specific reasons why the reversers should not be used during approach or in combination with the wing flaps and/or gear extended may be summarized as follows:

1. Stalls conducted during test flights with reversers in the reverse detent reflected an increase in stall speed. This was accompanied by a high sink rate and a marked loss of altitude during recovery due to the cycle time involved in going from the reverse detent to an effective forward thrust.
2. When flaps and reversers are used in conjunction with each other, there is a large loss of lift due to aerodynamic interaction between the reverse air flow and the flaps.
3. If reversers are used during an approach and one or both reversers on one side fail to retract, the resulting rolling and yawing moments generated could provide controllability problems. This condition coupled with the time lag in achieving effective forward thrust could be of very serious consequence.

For these reasons Douglas demonstrated and certificated the aircraft using inflight reverse thrust to a minimum inflight speed of 190 knots IAS in the clean configuration only. Since the landing gear and flaps are available below a speed of approximately **230** knots IAS and provide adequate deceleration capability below this speed without reducing lift capability, there is no justification for use of reversers inflight below the present established speed limitation.

/s/ C.L. stout
Director, Flight Operations