CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: September 12, 1955 Released: September 19, 1955

ITALIAN AIRLINES (LINEE AEREE ITALIANE), AT NEW YORK INTERNATIONAL AIRPORT, JAMAICA, NEW YORK, DECEMBER 18, 1954

The Accident

At approximately 1400,[1/] December 18, 1954, an Italian Airlines DC-6B, Italian registry I-LINE, crashed into the pier which supported the left row of slope line approach lights to runway 4 at the New York International Airport (Idlewild). The accident occurred during the flight's fourth instrument approach to the airport. The entire crew of 10 and 16 of the 22 passengers were killed; 4 of the 6 survivors received serious injuries. The aircraft was demolished by impact and sank in Jamaica Bay. An intense fuel fire followed the impact and spread over the water surface and pier.

History of the Flight

Flight 451 is one of four Italian Airlines flights scheduled weekly over the North Atlantic between the Rome-Ciampino Airport, Rome, Italy, and the New York International Airport, Jamaica, New York, with scheduled intermediate stops at Milan, Italy; Paris, France; Shannon, Ireland; Gander, Newfoundland, (technical stop); and Boston, Massachusetts. Scheduled elapsed time for the flight is 23 hours and 50 minutes, of which 20 hours and 45 minutes is flying time.

Flight 451 of December 17-18, departed Rome at 1810 G. c. t. (Greenwich civil time), December 17, 1 hour and 10 minutes behind schedule because of a late connecting flight. The multiple flight crew of 10 consisted of Captain Guglielmo Algarotti, First Officer Vittorio Bortignoni, Second Pilot Francesco Miraglia, Second Pilot Averardo Bracchi, First Flight Engineer Umberto Cheli, Second Flight Engineer Ernesto Leone, Radio Operator Mario Parodi, First Steward Giuseppe Bruckbauer, Second Steward Antonio Tagliabue, and Hostess Ileana Pozzuoli. The stops at Milan and Paris were canceled because of local ground fog and the flight reached Shannon at 2320 G. c. t. There the aircraft was refueled and checked.

Flight over the North Atlantic was uneventful. Routine position reports were made and the flight periodically received and logged en route and destination weather reports. This and the previous segments were described as very smooth, little or no actual instrument flight, and no apparent mechanical difficulties. Arrival and departure times at Gander were 0945 and 1038 G. c. t.

1/ All times referred to herein, except where indicated otherwise, are eastern standard and based on the 24-hour clock.

As the flight neared Boston instrument conditions were encountered but were of little consequence and I-LINE landed at 0928. Nine passengers deplaned and the aircraft was serviced with 804 gallons of fuel, making the total fuel on board approximately 2,415 gallons, sufficient for about 7 hours of flight. The crew filed an IFR (Instrument Flight Rules) flight plan with the Boston ARTC (Air Route Traffic Control) Center through TWA (Trans World Airlines) which performed under contract station operations functions, exclusive of dispatch or control, for the Italian Airlines. No alternate airport was specified in the information furnished TWA. The aircraft was loaded to a gross weight of approximately 90,000 pounds, well under the maximum allowable of 107,000, and the load was properly distributed in relation to the center of gravity of the aircraft. The flight departed Boston at 1013.

After an uneventful instrument flight involving normal Air Route Traffic Control routing and control, Flight 451 reported at 1122 to the Idlewild Approach Control as being over the Mitchell Radio Range Station at 7,000 feet. The flight was then cleared to enter the Scotland holding pattern (located approximately 13 nautical miles southwest of the airport) and was subsequently "laddered down" to the number one position to approach.

Between 1147 and 1159 weather conditions deteriorated below the ceiling minimum of 400 feet for landing on runway 22, the runway then in use. The flight continued to hold.

At 1159 reported weather conditions improved and I-LINE was cleared for an approach to runway 22 using the back course of the ILS (Instrument Landing System). At 1218 the flight reported it had discontinued this approach. It was then issued missed-approach instructions and returned to the Scotland holding pattern. Shortly thereafter weather conditions were again reported below minimums for runway 22. They were then reported as: Ceiling 300 feet, broken, 2,500 feet, overcast; visibility 2-1/2 miles, light rain and fog; wind south-southeast 20 knots.

While holding, the flight was asked by Approach Control if it would be able to make an approach to runway 4, the ILS runway, considering the tailwind component. The flight accepted runway 4 and was cleared at 1307 for an ILS approach. At 1313 the tower was advised by 451 that the approach had been missed.

The flight was next offered, and it accepted, a GCA (Ground Controlled Approach). This approach was abandoned at 1324, a missed-approach procedure was followed, and the flight returned to Scotland.

At 1327 the Italian Airlines Station Manager, in a message relayed by the tower, asked the flight its remaining fuel, and received the reply that there was three hours of holding fuel. The Station Manager then suggested that the flight hold for 1-1/2 hours and if unable to land to proceed to Washington, D. C. At 1329 the flight acknowledged this message.

At 1349 the flight was again cleared for an ILS approach, the third approach to runway 4 and its fourth to the airport. At approximately 1400 the aircraft struck the left pier. The impact was accompanied by a violent explosion and followed by an intense fire. Tower personnel immediately sounded the crash alarm and initiated emergency procedures.

At the time of the accident weather conditions were reported as: Ceiling 200 overcast; visibility 2-1/2 miles, light rain and fog; wind south-southeast 16 knots. Italian Airlines' minimums for ILS approaches to runway 4 are ceiling 200 feet and visibility 1/2 mile.

Investigation

Investigation at the accident scene disclosed the aircraft struck the left inbound pier. The pier, primarily constructed of heavy wooden piles, extended approximately 2,000 feet into Jamaica Bay with its offshore end 2,530 feet from the approach end of runway 4. The floor of the pier was approximately 14 feet above the water level in the Bay at low tide. At the offshore end a vehicular turnaround was constructed of numerous piles forming each of its four corners, the tops of which were about six feet above the pier floor.

First contact was with the pier only a few feet above the water. At impact the aircraft was moving nearly parallel with the pier toward runway 4. The impact shattered the east half of the end of the pier, breaking and splintering the tops of most of the 11 piles composing the southeast corner. The bulk of the aircraft wreckage then sank in approximately 30 feet of water, mainly along the right side of the pier, over a distance of approximately 1,550 feet toward shore. The nature of damage to the pier, its closeness to the water, and the fact that little wreckage came to rest near the point of impact indicated the aircraft struck without an appreciable rate of descent.

A propeller slash mark made by a blade of the number one propeller was found in the center pile at the offshore end of the pier. This cut disclosed that the number one engine nacelle was nearly centered with that position and the aircraft was slightly nose-up at impact. This propeller axis having been established made it apparent that the number two engine crashed into the southeast corner of the pier. Comparison of the heights of damage marks across the end of the pier revealed that the aircraft was nearly level laterally at the instant of impact.

Following the initial impact the left outer wing panel wrapped around the piling and shattered. The center section of this wing went forward above the pier deck, destroying several light installations before it veered off to the right.

At initial impact the fuselage was to the right side of the pier and thus the main portion of the aircraft continued on making additional contacts with the pier during this travel. These impacts disintegrated the right wing outer panel and forward fuselage. During this time number three and number four engines were torn out. As the remainder of the fuselage moved forward it turned approximately 180 degrees and when about 1,300 feet beyond the initial impact point it was moving backward.

The six surviving passengers were seated at various positions in the main passenger cabin. Two were able to extricate themselves from the wreckage and climb onto the burning pier, but ahead of the fire, enabling them to proceed immediately to safety. The others were forced into the Bay and were rescued by a private boat operator or helicopters dispatched by the New York Port Authority, the New York Police Department, and the Coast Guard. Smoke, fire, and the location of the accident presented great difficulty in rescue activities; however, they were accomplished as quickly and efficiently as possible under these circumstances.

Two areas of fire damage were evident in the wreckage; however, in both instances they clearly occurred following the initial impact.

Recovery operations, undertaken in extremely difficult conditions, produced about 80 percent of the aircraft. The wreckage was laid out for detailed examination, the result of which disclosed no evidence of fatigue cracking, structural failure, or malfunctioning controls prior to impact.

Examination of the components of the landing gear and flaps indicated that at impact the landing gear was fully retracted and the flaps were extended approximately 18 degrees.

Maintenance records of the aircraft covering its entire service life showed that inspections were performed within the specified intervals, all pilot complaints were corrected, and required replacements due to service time had been made. No repetitive discrepancies affecting airworthiness of the aircraft were found.

Examination of the severely damaged ILS receiver and indicators disclosed no evidence of malfunction or failure prior to impact.

Only a portion of the number four engine was recovered which was insufficient to determine its operating condition. Numbers one and two engines received severe impact damage from striking the pier. Heavy cylinder damage to number one was confined primarily to the lower half, whereas corresponding damage to number two was general around the entire engine. The number three engine sustained water damage. The power sections, main oil screens, and oil pumps from the engines did not disclose any evidence of failure or malfunction prior to impact. Most other components and accessories disclosed severe impact damage characteristic of sudden deceleration.

Only the number three and four propellers were recovered. Most indicative of the power settings at impact were propeller cuts found in the pier made by the number one and number two propellers and the r. p. m. setting of the governor of the number four propeller. This evidence indicated appreciable, probably takeoff, power at impact.

Supporting the evidence of the structures, powerplant, and propeller examinations were the statements of surviving passengers, one a pilot, which indicated they did not hear or see anything unusual relative to the performance of the aircraft. The crew at no time in the many radio communications made with various facilities en route and at the airport mentioned any difficulty.

During the accident period a normal crew was on duty in the Idlewild tower located about one mile north-northwest of the approach end of runway 4. A two-way recording unit made a permanent record of the transmissions between flights and the various control tower positions. A feature of the recorder enabled determination of the elapsed time during and between transmissions.

The radar controller, located in the IFR room several floors below the tower cab, gave radar advisories to all flights making ILS approaches. The purpose of the advisories was to inform the flights of their positions as observed on radar relative to the glide slope, the localizer path, and distance to touchdown. The advisories were given as a responsibility of the controller at various intervals during the progress of the approach. A study of the recorded advisories was made as a phase of the investigation. Its purpose was an effort to reconstruct as accurately as possible the probable flight path of the aircraft during the last approach. (See attachment A.) Considered in conjunction with this study were the explanatory testimony of the radar controller, observations of two eyewitnesses, and testimony of surviving passengers.

It was learned that before the instrument approach was started positive radio contact had been established and the flight had been given the latest weather and altimeter information.

During the initial portion of the ILS approach radar contact was established and as the aircraft approached the four-miles-from-touchdown point it was observed to be somewhat to the right of the localizer path drifting left. Before reaching this position the flight was slightly left of course and lower than normal. During this time it was advised to maintain altitude; the flight continued to descend.

At approximately the three-mile point the radar controller advised the flight that it appeared to be at 500 feet altitude and still descending. He then emphatically advised the pilot to level off.

While the aircraft approached the two-mile point the controller advised the flight as follows, "Item Nan Easy level off, your altitude shows as 200 feet. About to intercept the glide path, 150 feet below glide path." In explanation of this advisory the controller stated that the flight descended to 200 feet, or lower, then it arrested the descent and began to climb.

Investigation disclosed that one of the eyewitnesses apparently observed this portion of the approach. His ground position was about 2-3/4 miles from the touchdown point and nearly aligned with the localizer course. He testified that he saw the flight descend below the overcast to a low altitude, then sharply pull up and climb steeply back into the overcast. The witness did not recall the position of the landing gear.

The controller stated that as he observed the aircraft climbing he gave course information, "Two miles from touchdown, 400 feet left of course, 300 feet left of course." While he was offering this information the aircraft

entered another descent to a very low altitude. He advised, "Your altitude is very, very low pull up. Item Nan Easy pull up unless you have the runway in sight." At this time the controller stated the aircraft began a sharp ascent turning right. The angle of ascent was decreased momentarily, then resumed. The climb continued until the aircraft was at or above the glide path altitude. At this time the controller believed the flight had begun a missed-approach procedure and he continued, "Item Nan Easy I see you're pulling up, 500 feet left of course, a right turn heading 130. . . ."

Upon reaching the peak of the climb the controller then observed the aircraft begin a sharp descent. He then advised, "If you have the runway in sight you're cleared to land." Observing the descent continue he added, "Item Nan Easy check the approach lights. Item Nan Easy you're very low on glide path." The controller saw the aircraft merge with the pier and heard a muffled explosion.

A second eyewitness, positioned approximately 1-1/4 miles north of the approach end of runway 4, stated that he saw the aircraft descend below the overcast in what appeared to be a slightly steeper than normal nose-down attitude. He then saw the nose rise quickly to a nearly level position. He said the aircraft at this moment appeared to be slow and seemed to wobble. The aircraft continued to descend throughout his observations until he could no longer see it behind slightly higher terrain. Seconds later he heard a roar of the engines and almost simultaneously saw fire and smoke spout vertically upward. He then heard another roar of the engines.

The surviving passengers varied in their observations. All were in accord that the last approach seemed lower than the others and at one point there was a sensation of an extremely sharp pull-up, followed by a sensation of a pitch down during which power was applied and galley equipment spilled down the cabin aisle. Three passengers, in positions enabling them to observe the main landing gear, stated that during the early portion of the last approach they were sure it was down. Weather conditions were poor and only fleeting glimpses of the water and swamp area could be seen. One passenger seated on the right saw the right line of approach lights at an angle approximating 30 degrees and he guessed about 40 seconds transpired between this observation and the impact which followed.

The approach lighting at the airport at the time of the accident was the slope line approach lighting system. It was installed and commissioned for use in 1949. This system provides two converging rows of bar lights, one row on each side of the centerline leading to the runway. The system is designed using the lights to inform the pilot of his position. The angle at which the lights are viewed informs him whether his position is left, right, or on the centerline to the runway and also whether his position is on, above, or below the glide path. From any of these positions the lights are also designed to indicate the correction, if necessary.

Officials of the Italian Airline testified that prior to the 1950 inaugural flight over the subject route many months were devoted to preparation for the forthcoming operation. Studies were made of the operating procedures and policies used by other airlines in their North Atlantic operations, from which many features were adopted for the Italian flights. Visits were made for the

purpose of examining the airports and facilities involved in the route and the most experienced flight personnel were selected for the operation. Prior to the first flight several nonpassenger trips were made under supervision of experienced North Atlantic flight crews of another airline. The operation into the United States was made in accordance with ICAO recommended standards incorporated in the Italian regulations.

Company officials testified that on a normal North Atlantic flight the captain and one of the other pilots would fly the aircraft to Shannon and then would rest during the Atlantic crossing while the other pilots flew the aircraft. After reaching the more congested areas of the United States the captain again would take the controls until the flight terminated. This procedure afforded each pilot nearly equal rest periods. The bunks on board the aircraft provided them the best rest possible considering it would be under flight conditions and with continuing respective responsibilities for the flight.

Crew training was in most respects patterned after United States carrier programs. Investigation revealed the Italian program included ILS, instrument, and GCA training. In many respects various training phases were given more time than the accepted standards. Company policy required that at least one member of the flight crew speak English fluently. The captain of Flight 451 was able to speak and understand English. A review of the recordings and transcriptions indicated that communications with 451 were conducted in a normal manner and no language difficulties were indicated. Transmission of messages and responses from the flight were prompt, and in accordance with standard practices.

Investigation revealed that the crew of the flight was qualified and experienced; the captain had made 150 flights over the Atlantic, 75 of which terminated at the New York International Airport.

The synoptic weather situation when the flight left Gander consisted of a low pressure system centered over the Great Lakes with an occluded front extending to a secondary low over southern Virginia. This secondary center formed the junction of a warm front which extended east-northeast into the Atlantic ocean and a cold front that extended southward. This system was moving northeast and the position of the warm front was about 225 miles south of New York when the crew was briefed at Gander. This briefing indicated deterioration of the ceiling and visibility in the areas ahead of the front as it moved northward.

Additional factors were a high pressure ridge off the east coast and a steepening pressure gradient between this ridge and the trough to the west. These factors indicated a rapid advection of air from the warmer ocean water northward over the coastal area. A cold low pressure trough aloft somewhat west of the surface trough resulted in a steep pressure gradient eastward into New England. This indicated a strong southwesterly flow to about 20,000 feet and an extensive lifting of warm air over the colder surface air north of the warm front.

At 0945, after the flight departed Boston, a special weather report for Idlewild was transmitted by Station WSY. The reported conditions were: Scattered clouds 1,500 feet, ceiling 7,000 feet overcast; visibility 1 mile, moderate rain and fog; wind south-southwest 23, gusts to 31. This report was received by the flight and copied in the flight radio log. At this time the warm front had progressed northward to approximately 100 miles south to New York City.

Investigation revealed that the crew did not receive a formal weather briefing at Boston as was customary for Italian Airlines crews; however, at 1015 the latest weather report for Idlewild was received from WSY and again copied by the flight. The reported conditions were: Ceiling measured 800 feet, broken clouds, 6,000 feet overcast; visibility 2 miles, light rain and fog; wind south-southeast 21 with gusts to 30. At this time the following terminal forecast was also broadcast: Ceiling 600 feet, overcast; visibility 2, light rain and fog; wind south-southeast 25 with gusts to 45; occasionally becoming ceiling 200 feet, overcast; visibility 1 mile, heavy rain and fog.

At approximately 1300 the warm front passed Idlewild with warm moist air flowing over a relatively cold land and water surface. The strong surface winds produced turbulent mixing and as a result rather definite ceilings of a few hundred feet with fairly good visibility were maintained. After 1300 the surface wind velocity diminished somewhat. This resulted in less turbulent mixing in the lower layers and was reflected in a lowering of the reported ceiling to 200 feet overcast with 2-1/2 miles visibility at the time of the accident.

Ceiling and visibility observations used in the reports for the Idlewild Airport incorporate the use of electronic equipment. Ceiling reports were based on ceilometer readings obtained from a rotating beam ceilometer located on the left inbound pier, at the accident site. Visibility observations were made from the Weather Bureau located approximately two miles from the accident scene. A transmissometer, an electronic means of measuring visibility, was located along runway 4 near the approach end; however, this instrument, owing to its design, does not measure accurately when visibility is above 1-1/2 miles. For this reason the instrument was not used in observations during the accident period although it was operating. Investigation disclosed that during this time the transmissometer record continued to indicate more than 1-1/2 miles visibility.

Several airline captains who made ILS approaches and landings between the first and last approaches of the Italian flight stated that in the normal breakout area they found weather conditions equal to or better than reported. There was little turbulence and the bottom of the overcast was fairly well defined. One captain stated, however, that conditions left of the localizer course seemed somewhat worse than reported. Another captain, the last to approach before the accident, stated that when he was above and between the approach lights on the glide path he was unable to see them. These witnesses also stated that while

descending along the approach path there was a decided wind shift from left to right. This condition required commensurate drift corrections as the wind shift level was traversed. This factor, according to these witnesses, together with the eight-knot downwind component, was an important factor to contend with in a successful approach and landing. Statements of these pilots confirmed the investigation which found the approach radio facilities operating normally.

Analysis

Weather conditions during the accident period were greatly influenced by the velocity of the surface wind. The resultant turbulent mixing probably kept the ceiling and visibility from deteriorating to near zero. After 1300 the wind velocity decreased somewhat and the effect was reflected in the subsequent reports. Since electronic equipment for measuring the conditions was located at and near the accident site, the reports were especially applicable to this area, the normal breakout area during an ILS approach to runway 4. The general weather movement was from the offshore area over the measuring equipment. The reported conditions therefore should also have been quite representative of those immediately beyond the piers. Still farther out along the approach path evidence indicates poorer conditions. Less turbulent mixing over the smoother water surface in this area lends credence to this possibility.

During the first three approaches the crew adhered to the established minimum altitude and apparently maintained some margin above it. The decision to discontinue these approaches was an exercise of the captain's judgment when he was not entirely satisfied to continue. It is believed that the tailwind component and wind shift encountered during the approaches to runway 4 were important factors which influenced these decisions. The tailwind component caused other airline flight crews some difficulty and one expressed it as, "It made me feel I had done a day's work." Although landings were being made downwind this was necessary because no other runway was equipped with ILS and weather conditions prevented the use of runway 22. This factor also probably caused the pilot to use a slower indicated airspeed during the last approach.

Evidence indicates that on the last approach the pilot began a descent before intersecting the glide path and continued to descend, although repeatedly advised by the radar controller to level off. Altitudes throughout the approach indicate the ILS glide path indicator would have shown a full scale fly-up indication. This evidence strongly suggests that the pilot was not attempting to follow the glide path but decided to descend until visual reference was established. The pilot apparently descended below the overcast in the area between the outer and middle markers, probably in an attempt to proceed visually below the overcast to the runway. While attempting to do so, however, he may have encountered a drifting fog which was not recorded. Such procedure is not in accord with good operating practice and the reasons for it in this instance have not been definitely ascertained.

When the aircraft broke out below the overcast in the vicinity of the outer marker, the pilot possibly saw the surface of the water and swamp without seeing the approach lights and reacted quickly, pulling up into the

overcast. In order to arrest the ascent, or again descend to establish visual contact, it is believed the pilot lowered the nose of the aircraft and in so doing got very low. As a result he apparently again pulled up sharply, the aircraft drifting slightly left. The ascent seemingly continued, during which the aircraft lost airspeed and began turning right. The nose of the aircraft was then lowered and power was applied. The landing gear was probably retracted at some time during this series of events. These movements of the aircraft are strongly supported by the testimony of the surviving passengers, the second eyewitness, and the path of the aircraft as observed by the radar controller.

The final descent obviously continued until the aircraft was a short distance from the pier but too close to avoid it.

During the Board's investigation and analysis of this accident careful consideration was given the possible misinterpretation of the approach lights or an illusion associated with them. Evidence regarding misinterpretation or illusion would be primarily the testimony of the crew. This was not available for consideration, the entire crew being fatally injured. The Board recognizes these as possible factors;[2/] however, from all the available evidence the Board was unable to determine whether or not the lights were a factor.

Although the entire crew was lost and actual rest periods are unknown there is no reason to believe that normal rest procedures were not followed. It is nevertheless believed fatigue was a factor in this accident. It was not only present as a result of the time en route, approximately 22-1/2 hours, but mostly a result of the additional extended 2-1/2-hour period devoted to the four approaches and the high mental and physical demands made upon the pilots. The element of fatigue is strongly suggested especially during the last approach. Fatigue is evidenced by the pilot's poor adherence to the localizer path, the last descent to a very low altitude before the sharp pull-up, and the evidence of abrupt control action. It may also be noted in some degree in the pilot's slow response to the wind shift and the probable loss of airspeed which caused the sinking descent before the aircraft struck the pier. These factors lend credence to the belief that the pilot's efficiency and normal ability were seriously impaired by fatigue.

Findings

On the basis of all available evidence the Board finds that:

1. The carrier, the aircraft, and the crew were certificated by the Italian Government.

2. The carrier possesses a foreign air carrier permit issued by the Civil Aeronautics Board for the route.

3. The gross takeoff weight was less than maximum allowable at the departures over the route.

2/ For discussion see Aviation Week, issues of January 31, February 21, and April 11, 1955.

4. The aircraft departed Boston with fuel for approximately seven hours of flight.

5. No formal weather briefing was received at Boston; however, the flight received adequate weather information en route.

6. The flight made four instrument approaches to the Idlewild Airport, one to runway 22 and three to runway 4.

7. The three approaches to runway 4 were made with a downwind component approximately 8 knots.

8. There were no language difficulties between the flight crew and control personnel.

9. Prior to the last approach weather and altimeter information was given the flight.

10. The weather information was adequate for the normal ILS breakout area.

11. Radar advisories were given the flight during the ILS approaches and during the last approach the flight was repeatedly advised that it was low with respect to normal ILS altitudes.

12. The last approach was apparently made without using the ILS glide path.

13. The radio navigational and landing facilities for the airport were functioning normally.

14. When the aircraft struck the pier it was nearly level laterally, slightly nose-high, and without appreciable descent.

15. Approximately 80 percent of the wreckage was recovered, the examination of which revealed no structural or mechanical failure of the power units, propellers, airframe, controls, or instruments prior to impact.

16. The crew reported no mechanical or other difficulty.

Probable Cause

The Board determines that the probable cause of this accident was an erratic approach which resulted in a descent to an altitude too low to avoid striking the pier.

A contributing factor to this accident was pilot fatigue due to the particular and difficult circumstances.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ROSS RIZLEY

/s/ JOSEPH P. ADAMS

/s/ JOSH LEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

SUPPLEMENTAL DATA

Investigation and Hearing

The Civil Aeronautics Board was notified of this accident through its New York Office at 1415 e. s. t., December 18, 1954, and an investigation was immediately initiated pursuant to the provisions of Section 702 (a)(2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was ordered by the Board and held in New York City, New York, on February 17, 18, and 19, 1955.

Air Carrier

Italian Air Lines is the national airline of Italy. It was organized February 11, 1947, and maintains its principal offices in Rome, Italy. The carrier holds a Foreign Air Carrier permit, Docket 4333, amended by Docket 6670, adopted by the Board May 25, 1950, and signed by the President June 16, 1950. Operations over the United States are authorized in accordance with Foreign Air Carrier Operations Specifications, Number 1106, issued by the Civil Aeronautics Administration. Service into the United States was begun in July 1950.

Flight Personnel

Captain Guglielmo Algarotti, age 52, was employed by Italian Airlines July 12, 1947. He was currently certificated by the Italian Government as a pilot and navigator. Captain Algarotti possessed 14,734 flying hours of which 3,356 were in the DC-6B. He had made 151 Atlantic crossings.

First Officer Vittorio Bortignoni, age 35, was employed by the carrier September 1, 1947. He was a currently certificated pilot and navigator by the Italian Government. First Officer Bortignoni possessed 7,546 flying hours of which 3,670 hours were in the DC-6B.

Second Pilot Averardo Bracchi, age 39, was employed by Italian Airlines March 1, 1950. He was a certificated pilot and navigator by the Italian Government. Second Pilot Bracchi possessed 4,674 flying hours with 890 hours in the DC-6B type aircraft.

Second Pilot Francesco Miraglia, age 35, was employed December 16, 1952. He was a certificated pilot and navigator under Italian regulations. He possessed 2,005 flying hours with 1,260 hours in the DC-6B.

Radio Operator Mario Parodi, age 47, was employed December 1, 1946. He held a current radio certificate.

Flight Engineer Umberto Cheli, age 48, had been employed by the carrier for 8 years. He held a valid flight engineer certificate issued by the Italian Government. He possessed 6,900 flight hours of which 3,000 were in the DC-6B.

Flight Engineer Ernesto Leone, age 48, was employed November 16, 1952. He had a valid flight engineer certificate issued by the Italian Government. Flight Engineer Leone had accumulated 1,580 flying hours.

Steward Giuseppe Bruckbauer, age 32, was employed April 10, 1952.

Steward Antonio Tagliabue, age 24, was employed April 10, 1954.

Hostess Ileana Pozzuoli, age 26, was employed May 1, 1952.

The Aircraft

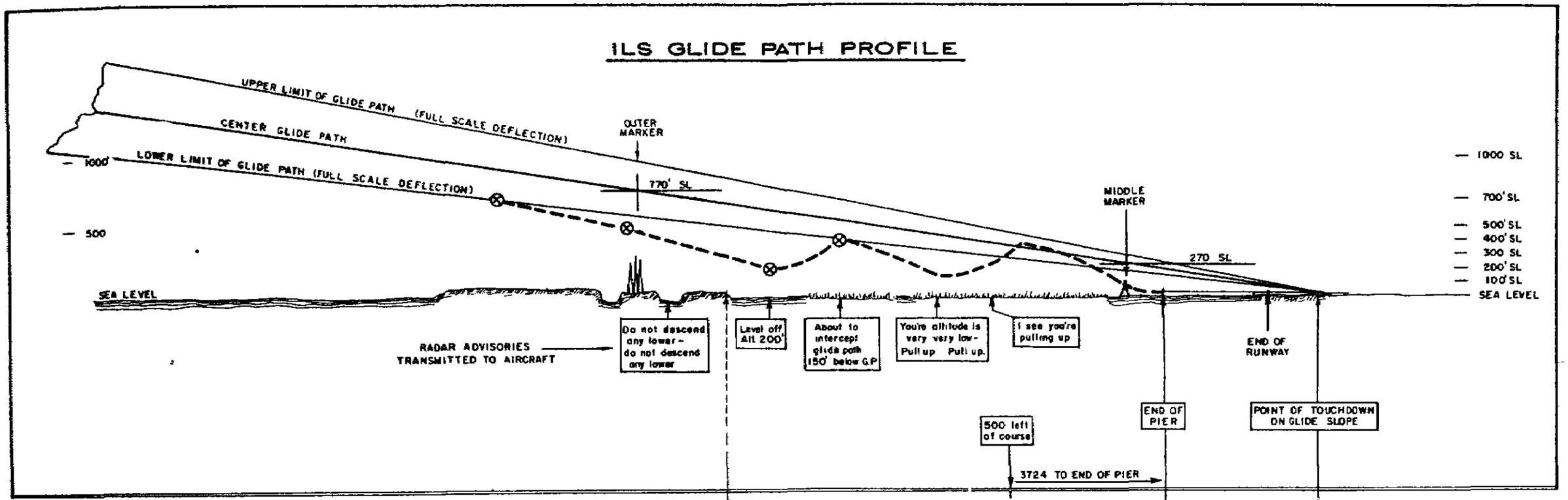
A Douglas DC-6B, serial number 44418, Italian registry I-LINE, was owned and operated by Italian Airlines. The aircraft was manufactured June 24, 1954, and delivered to Rome July 3, 1954. Since manufacture the aircraft had accumulated a total of 1,412 hours at the time of departure and had received the last number three inspection immediately prior to this departure. All scheduled inspection and maintenance items were signed off at the time and there was no record of repetitive discrepancies affecting the airworthiness of this aircraft. The aircraft was equipped with Pratt and Whitney engines, model R-2800-CB17 and Hamilton Standard 43E60 propellers.

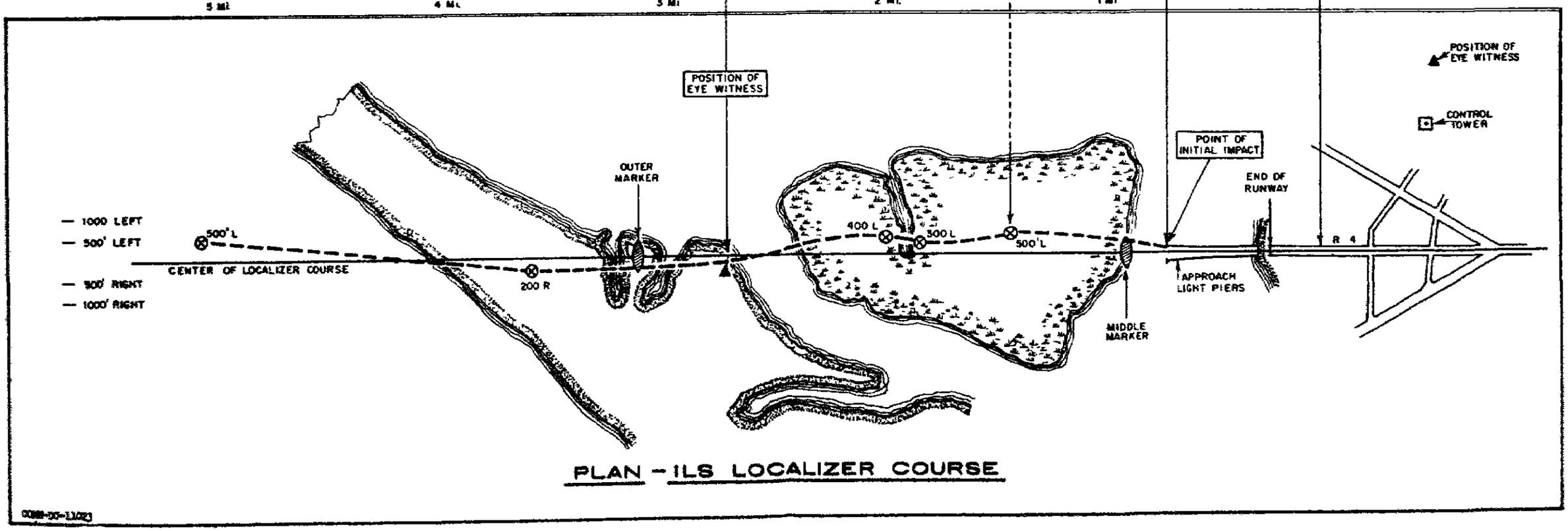
ATTACHMENT A

PROBABLE FLIGHT PATH AND POSITIONS OF AIRCRAFT ILINE (LAI FLIGHT 451)
DURING LAST APPROACH TO R-4 NEW YORK INTERNATIONAL AIRPORT
DECEMBER 18, 1964

Approximate Positions and Flight Path are Based on Data Obtained from Transcription of Radar Advisories

ILS GLIDE PATH PROFILE





PLAN - ILS LOCALIZER COURSE