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CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: November 2, 1951 Released: November 7, 1951

NATIONAL AIRLINES, INC.,—NEWARK, NEW JERSEY, MAY 21, 1951

THE ACCIDENT

At approximately 0408 [1] on May 21, 1951, a Douglas DC-6, N-90896, owned and operated by National Airlines, Inc , made premature ground contact in a swamp, 1,800 feet short of Runway 6 while making an ILS approach to a landing at the Newark, New Jersey Airport Full power was applied almost simultaneously with the contact, the aircraft again became airborne, and the landing was completed on the airport to the left of Runway 6

Moderate damage to the aircraft was sustained when a pipe supporting a GCA reflector was struck during the landing No injuries were experienced by any of the passengers or members of the crew

HISTORY OF THE FLIGHT

National Airlines' Flight 486B was to have originated at Norfolk, Virginia for Newark, New Jersey Due to poor weather conditions, Flight 485B (southbound) had landed at Richmond, Virginia, and alternate airport, rather than at Norfolk The same aircraft and crew, designated as Flight 486B, made the return trip The southbound flight departed New York International Airport, Jamaica, New York, at 2245 on May 20, 1951 A scheduled landing was made at Philadelphia, Pennsylvania, the only intermediate stop, the facilities of Instrument Landing System (ILS) were utilized in the approach The flight proceeded uneventfully to Richmond, landing at 0130, May 21

Flight 486B departed Richmond for Newark at 0258, May 21, 1951 Aboard were twenty-two passengers and a crew of four consisting of Captain Dale H Southard, First Officer William R Webster, Flight Engineer Wilson M Biggers, Jr , and Stewardess Evelyn Morris The gross weight at takeoff, with 2,400 gallons of fuel, was 77,160 pounds This weight was well within the allowable gross of 81,400 pounds and was properly distributed with respect to the aircraft's center of gravity

Airways Route Traffic Control (ARTC) cleared the flight to Newark Airport on an instrument flight plan via Amber Airway 7, to cross Clifton (Virginia) Intersection at 9,000 feet and to maintain that altitude Alternate airports were Pittsburgh, Pennsylvania, and Buffalo, New York

The flight proceeded without incident on top at 9,000 feet No position report was received at Washington, D C , a compulsory reporting point Over Philadelphia at 0348, the flight was further cleared to the Linden, New Jersey beacon (compass locator), cross North Philadelphia at 7,000 feet or above, cross New Brunswick Intersection at 1,500 feet, maintain 1,500 feet and contact Newark Approach Control when approaching New Brunswick Intersection, descend well to the right of the southwest leg of the Newark range

Reporting over New Brunswick Intersection at 0401, clearance was given by Newark Approach Control for a straight-in approach to Runway 6 Approach Control advised that GCA (Ground Control Approach) would be issuing advisories on the 110 3 megacycle localizer frequency An instrument approach was made using ILS, and was monitored by the GCA operator in the Newark Airport tower Flight 486B reported over and passing Linden at 0405 A landing was completed on the Newark Airport at 0408, 110 feet to the left and 1,200 feet from the approach end of Runway 6 The aircraft was in a tail-low attitude as it made the second touchdown Almost simultaneously with touchdown, the outer edge of the left stabilizer struck a 2-inch steel pipe standing 85 inches high The pipe, which supported a GCA reflector, was struck

[1] All times referred to herein are Eastern Standard and based on the 24-hour clock

58 inches above the ground, and impact resulted in shearing off approximately three feet of the elevator and a small section of the stabilizer Large quantities of swamp mud and reeds were found on the wheels, landing gear, and underside of the aircraft The right flap was bent up slightly at a point near the fuselage, the left sense antenna was torn loose, and other minor damage was sustained It was later determined that a premature touchdown had been made 1,800 feet short of the approach end of the runway, in the swamp adjacent to the airport

Weather conditions at Newark Airport were furnished to the flight by Newark Approach Control shortly before passing New Brunswick, New Jersey This information was Ceiling 300 feet indefinite, overcast, visibility three-fourths mile, fog, smoke, wind east-southeast at ten to fifteen miles per hour, and altimeter setting 29 90 inches National Airlines' minimums for an instrument approach at Newark Airport are 200 feet and one-half mile

THE INVESTIGATION

An analysis of U S Weather Bureau data reflects that at 2230, May 20, 1951, a small tropical storm about 100 miles south-southeast of Cape Hatteras, North Carolina, was moving north-northeast at 10 to 15 miles per hour A ridge of high pressure extended inland north of the storm across Connecticut, lower New York, and Pennsylvania

Prior to departure from New York International Airport on the southbound flight, the pilots were apprised of all weather information The captain also secured pertinent weather information before departing Richmond Flight 486B was conducted under essentially the same conditions that existed during the southbound flight Weather information revealed the existence of an overcast over the entire route to New York, with ceilings ranging from about 1,100 feet to 200 feet and visibility from 10 miles to one-half mile, with the lower ceilings between Philadelphia and New York The cloud cover over the route consisted of two to three layers, with the top of the lower layer ranging from 2,500 to 3,000 feet Drizzle was occasionally falling from the lower cloud deck The alternate airports, Pittsburgh and Buffalo, remained above minimums throughout the flight No aircraft icing was involved during the flight, nor was there turbulence of any importance

During the approach at Newark, and continuing until after the accident, the weather there underwent no change The lower cloud deck was entered at between 2,500 and 3,000 feet Drizzle had stopped in the area, but there were sufficient water droplets in the clouds to require the use of windshield wipers The captain testified that the wipers were turned on during the approach and that they operated satisfactorily Wind direction and velocity were both approximately constant throughout the descent Vertical visibility at Newark Airport was about 300 feet Forward visibility improved with descent from near zero at 300 feet to three-fourths of a mile at the surface

Since the approach was made over a swamp, weather conditions in that vicinity were investigated to determine whether ceiling and visibility would have varied from those observed on the airport It was found that meteorological conditions were not favorable for important weather differences between the swamp area and the airport

As previously noted, the flight from Richmond was conducted under instrument conditions, and was uneventful until an ILS approach was made at destination The Captain, who was flying, stated that the southwest leg of the Newark range was contacted at about New Brunswick Only small corrections were necessary to obtain a correct heading on the ILS localizer The glide path was intercepted and landing check lists were completed

Upon reaching Linden, about six miles from Newark Airport, the GCA operator began issuing advisories to the flight on 110 3 megacycles The operator had advised the flight as follows "Transmit 118 3 " According to the captain, this instruction was misinterpreted by him to mean that GCA would transmit on 118 3 megacycles in this particular instance, rather than the usual 110 3 megacycles Due to this apparent misunderstanding regarding the frequency which GCA would use to transmit advisories to the flight, this approach aid was not utilized by the crew to check the accuracy of the approach As a result, the approach

was monitored by GCA for approximately the last six miles without any of its advisories, according to the captain, being received GCA had no knowledge that the flight was not receiving the information

The ILS approach was apparently normal until the flight reached a point about two miles from intended touchdown A transcription of the GCA advisories verified this The aircraft was slightly to the left on the glide path at times, but deviations were not abnormal At a point one mile from touchdown, the transcription showed the flight low on the glide path and to the left The operator stated that the aircraft disappeared from the elevation scope between the middle marker and the runway It remained in view, however, on the azimuth scope The captain advised that the cross-pointer indicators reflected a normal ILS approach throughout, including the period when passing over the middle marker, located 0 61 of a mile from the approach end of Runway 6 The glide path is 230 feet above the ground at this point, the captain said that altitude was approximately 240 feet and indicated air speed about 135 miles per hour at the middle marker The air speed was not observed to deviate from this figure at any later time by the captain, copilot, or flight engineer

The copilot had been instructed to seek visual reference to the ground, and advised the captain that the approach lights could be seen to the right just as they passed over the middle marker The runway lights were on full brilliance, setting number 5, as were the centerline approach lights and their flasher units The captain said that he then leveled the aircraft off at 200 feet by rearward pressure on the elevator control almost simultaneously with receipt of this information from the copilot, and looked out to check the position of the approach lights He further advised that the glide was being maintained at a descent of approximately 550 feet per minute, with 20 to 21 inches of manifold pressure, landing gear down, and 30 degrees of flaps No additional power was applied at this time The captain saw the approach lights well to the right and stated he elected to execute a missed-approach procedure Immediately returning his attention to flight by instruments, he applied full power and almost instantaneously the aircraft made forceful contact with the ground The copilot stated that he saw the ground coming up rapidly and that he, as well as the captain, applied full rearward pressure to the elevator control just as the aircraft struck Almost simultaneously with this action, he had reached over to push the throttles forward, but power was being applied by the captain The aircraft immediately became airborne and a tail-low landing was made within the boundaries of the airport within the next few seconds

It was found that the touchdown in the swamp was made with the aircraft in approximately level flight attitude Both main landing gear wheels and the nose wheel sank a maximum of 12 inches into the marsh, the wheel marks measured a maximum ground contact of 126 feet This 126 feet refers to wheel marks in the swamp mud itself, and not to the first contact with the swamp grass The first evidence of contact is shown in a swath cut in the swamp grass some 7 or 8 feet high, approximately 45 feet prior to touchdown in the mud, and at an angle about 10 degrees from the horizontal Touchdown occurred 101 feet to the left of the centerline of the approach lights These lights extend in a direct line for 3,000 feet from near the middle marker to the approach end of the runway The landing was completed 1,215 feet from the approach end of the runway and 110 feet to the left of the runway edge All four propellers were placed in reverse pitch during the landing run, and the aircraft was taxied onto Runway 6, 2,671 feet from point of second touchdown

Six ILS approaches were made at Newark Airport between 0230 and 0945 by scheduled aircraft Their pilots stated that all elements of the ILS were functioning normally and that GCA information was accurate In addition, fifteen ILS approaches were made by pilots of another airline about two hours after the incident These approaches were made as a research project and were conducted independently of the accident to Flight 486B They were monitored by GCA and all ground components of the ILS system functioned normally throughout A slight bend to the west was found in the localizer, but it was of small magnitude and did not interfere with the approaches This deflection is well known to pilots who regularly land at Newark, and

has never been the subject of an official complaint by anyone Weather during the period covering all of the above approaches was essentially the same as that experienced by Flight 486B

A flight check of the ILS system was made on May 22, 1951, by the CAA All elements were found to be within tolerances One run was made by flying over the simulated flight path of Flight 486B, and passing directly over the wheel marks in the swamp The localizer cross-pointer indicated about three-fourths of a full deflection to the left at this point Glide path altitude over the wheel marks was 120 feet

Company records reflected that the captain had made twenty actual and five simulated ILS approaches in DC-6 equipment He had made six actual approaches at Newark Company flight test records reflected that Captain Southard had passed all instrument flight checks and on his last check, conducted February 13, 1951, received a grade of "Above Average" on ILS approaches A CAA Aviation Safety Agent was aboard as an observer on this instrument check flight

Records revealed no previous malfunctioning of pertinent aircraft components The aircraft was repaired and test-flown on May 23, 1951, and no malfunctions of any nature were noted Test approaches were made in it by reference to instruments and no abnormalities in either the airborne or ground equipment were found One approach was made at about 200 feet to the left of the localizer course, but with reference to the normal glide path Full deflection of the localizer needle was noted shortly after passing the middle marker, and GCA advised of the off-course position No instruments were altered in any manner between the time of the accident and the test flight Radio equipment and related indicators in N-90896, including ILS, VHF, marker, and ADF receivers were checked and found to be in proper condition Similarly, the altimeters, air speed indicators, and related flight instruments were tested and proved to be within allowable tolerances

The captain was unable to furnish any reason for the cause of the accident other than possible altimeter lag or errors in the instrument Investigation showed the altimeters were on the correct setting, according to testimony, the settings were checked during the approach upon receipt of information from Newark Approach Control Other members of the crew were likewise unable to offer any explanation for the accident

ANALYSIS

As previously noted, the captain applied back pressure to the elevator control upon approaching an altitude of 200 feet, but at that time added no power It is an aerodynamic fact that during relatively slow flight an increase in angle of attack can result in decreased lift, increased drag, loss of air speed, and loss of altitude In this instance, the aircraft settled without completely stalling It must therefore be concluded that the captain exercised faulty judgment and incorrect piloting technique in not adding power in coordination with the application of up elevator A serious accident was averted by the timely application of full power an instant before the aircraft struck the marsh, thus enabling it to again become airborne and complete the landing on the airport It is probable that it had almost reached the ground during the time required for the captain to transfer his attention from instrument flight to contact flight, and return to instruments

It is known that a pilot can believe himself to be higher than he actually is due to an illusion that the aircraft is flying horizontally, when the nose is higher than imagined [2] However, an aircraft's attitude is well reflected by the indicated air speed, with constant power settings, thus providing a check on sensory perceptions During the change from instrument to visual flight, and at extremely low altitude, this check is vital

Since company flight test records reflected that the captain had satisfied company competency requirements as an instrument pilot, it can be assumed that he should have experienced no difficulty in the transition from an ILS approach to contact flight, nor in executing a missed-approach This assumption seems especially true in view of his experience with actual instrument approaches at Newark and elsewhere Had

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[2] Coquyt, P P , Chief Pilot, Sabena Airlines, "The Sensory Illusions of Pilots", Flight Safety Foundation, Inc , July 1951

he exhibited the competence and good judgment required of an airline pilot, the critical situation in which the aircraft was placed should not have occurred

The fact that the flight was deprived of another approach aid (GCA) due to a misinterpretation of instructions on the part of the pilot might possibly be considered contributory Use of two approach aids rather than only one would have served as insurance that a proper and safe approach was being made The lack of CCA must, however, be considered only of secondary importance for, during an ILS approach, any assistance given to the pilot by a GCA operator is currently considered only an adjunct to the use of the ILS, and is of an advisory nature only The safe conduct of a flight is, of course, the responsibility of the captain Therefore, had he desired GCA assistance, he could easily have clarified the misunderstanding in a single radio contact

Subsequent to the accident, a committee composed of National Airlines' officials and pilot representatives was formed Recommendations were made by the committee with regard to general improvements in flight personnel training, and specific recommendations were submitted which would require Captain Southard to accomplish certain training before again resuming command of an aircraft in company operations [3] As a result of the committee studies, a re-evaluation of procedures—including operations, pilot training, instrument, and route checks—was made by the company A number of revisions and improvements were made in company policies in these fields Check pilot personnel were increased, thus enabling the company to conduct an en route check on every pilot each four months Company policy regarding route checks of pilots was revised to include a more comprehensive evaluation of copilot duties, route checks as now accomplished also include a separate evaluation of the copilot, insuring that both members fully understand that they are equally responsible for the safe conduct of a flight Also, additional importance has been placed on crew coordination under instrument approaches, and particularly under minimum weather conditions and missed approaches

[3] See Supplemental Data, page 11

The following procedures have been standard in company pilot training on six-months instrument checks, but greater emphasis has now been placed on these matters and additional practice provided The company has stressed that a missed-approach is mandatory should the aircraft not be in the proper position on the ILS at the middle marker Additional emphasis has been placed on emergency pull-ups in landing configuration and minimum remaining runway During pilot transition training and instrument checks, the company requires pilots to operate aircraft under maximum performance figures, regardless of available excess runway

FINDINGS

1 The carrier, the aircraft, and the crew were properly certificated

2 The gross weight of the aircraft was within approved limits, and the load was properly distributed with relation to the center of gravity

3 The weather at the time of the accident was above the prescribed CAA minimums for a standard ILS approach to Newark Airport

4 During the final stages of the approach, the captain leveled off at low altitude without applying the additional power required to prevent the aircraft from descending at a greater than normal rate

5 The aircraft made premature contact with the ground during final approach but continued to a landing on the airport

6 There was no malfunctioning of any ground or airborne equipment

PROBABLE CAUSE

On the basis of all available evidence, the Board determines that the probable cause of this accident was faulty judgment and improper piloting technique on the part of the captain while executing an ILS approach, resulting in forceful contact with the ground prior to reaching the airport

BY THE CIVIL AERONAUTICS BOARD

/s/ DONALD W NYROP
/s/ OSWALD RYAN
/s/ JOSH LEE
/s/ JOSEPH P ADAMS
/s/ CHAN GURNEY

Supplemental Data

INVESTIGATION AND HEARING

The Civil Aeronautics Board was promptly notified of this accident by a telephone call from a National Airlines representative, made at 0445, May 21, 1951 An investigation was immediately initiated in accordance with 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 was held in the Federal Building, New York International Airport, Jamaica, New York, on June 6 and 7, 1951

AIR CARRIER

National Airlines, Inc , is a Florida corporation, with its general offices located at 3240 N W 27th Avenue, Miami, Florida The company is engaged in the transportation of persons, property, and mail under certificates of public convenience and necessity issued by the Civil Aeronautics Board It also possesses both scheduled and non-scheduled air carrier operating certificates issued by the Civil Aeronautics Administration Scheduled operations are conducted by National Airlines between the terminal points of Havana, Cuba, Miami, Florida, New Orleans, Louisiana, New York, New York, Norfolk, Virginia, and intermediate points

FLIGHT PERSONNEL

Captain Dale H Southard, age 37, was employed by National Airlines, Inc on December 2, 1942 At the time of the accident, he was the holder of a valid airman certificate with an airline transport rating for 7200 horsepower and under In addition, he held instrument and flight instructor ratings Captain Southard had logged a total of 8,273 20 flying hours, of which 723 32 were in DC-6 equipment, and had a total of 780 14 hours of instrument flying time He received a route check on August 21 and 22, 1950, his last six-months instrument check was accomplished on February 13, 1951, at which time he was also checked on ILS Company records reflected that Captain Southard had executed 20 actual ILS approaches in DC-6 aircraft, and five simulated approaches Six actual ILS approaches had been made at Newark He was promoted to DC-6 captain on August 5, 1950, and accomplished a first class CAA physical examination on May 30, 1951

Examination and analysis of the incident resulted in certain committee recommendations being made with regard to re-training of Captain Southard and these recommendations were adopted by the company He was required to serve as a copilot for 90 days with three different line captains, and if necessary, to be given additional training on DC-6 equipment upon completion of this service Following this, Captain Southard was to be given a six-months check by two different check pilots, followed by three route checks by three different check pilots Should Captain Southard complete this curriculum in a satisfactory manner, he was then to be returned to regular line service as a captain At the time of this report, Captain Southard had satisfactorily a complished the committee's recommendations to the three route checks The second of the six-months checks was observed by an Aviation Safety Agent of the CAA Additionally, the committee recommended that the captain be placed on a reduced pay status during this period This was approved by the company

On September 6, 1951, the CAA notified Captain Southard that a violation report had been initiated, indicating violation of Sections 60 12, 61 272, and 61 282 of the Civil Air Regulations and Section 610(a) of the Civil Aeronautics Act of 1938, as amended [4] However, in view of the action taken by National Airlines as a result of the incident, he was additionally advised that no further action in this matter was contemplated by the CAA

William R Webster, age 27, the copilot, was employed by National Airlines, Inc , on January 2, 1951 On the date of the accident, he was the holder of a valid airman certificate with a commercial rating, with

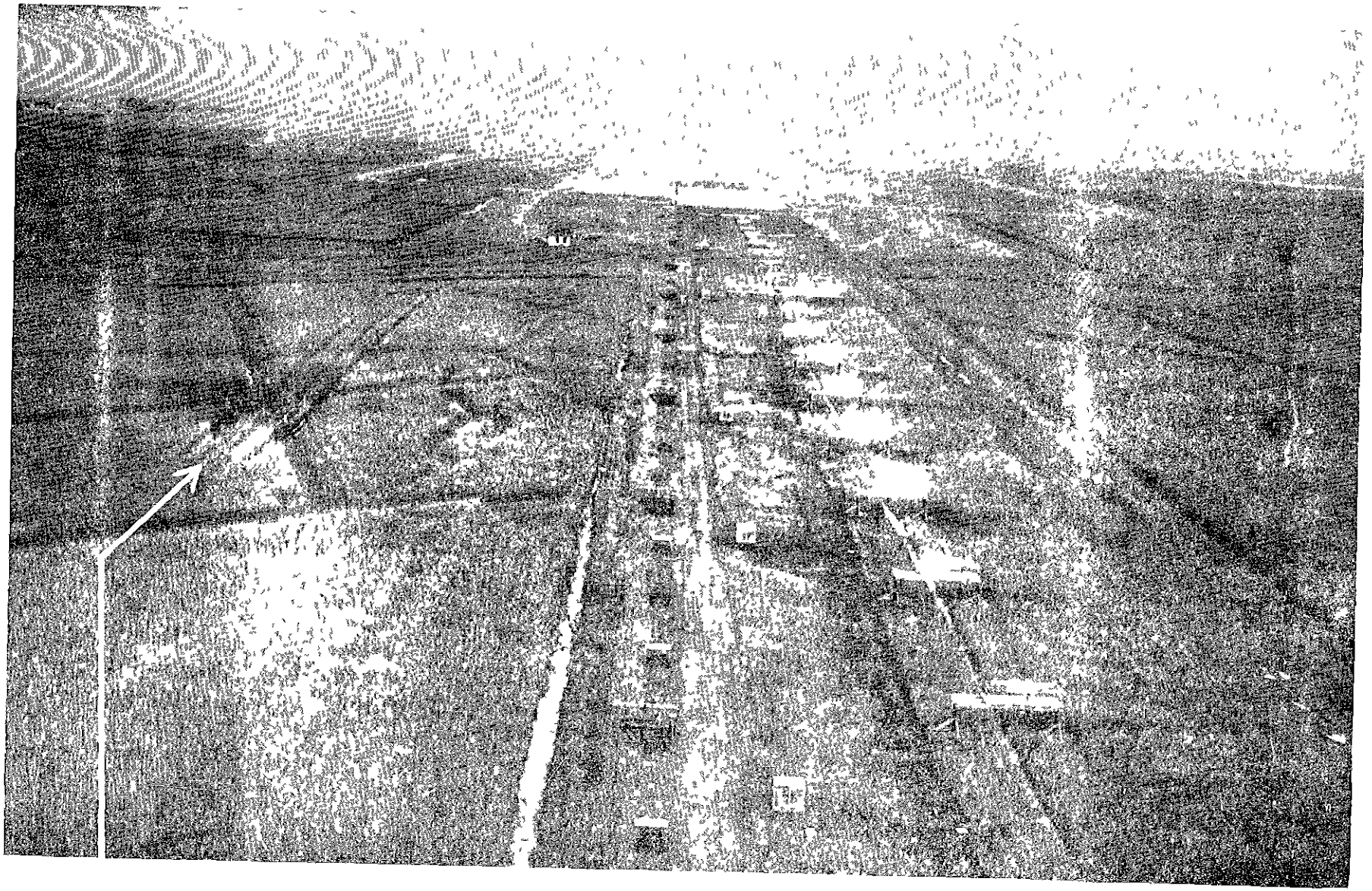
[4] Section 60 12, Civil Air Regulations—Careless or reckless operation Section 61 272, Civil Air Regulations—Letting-down-through procedure Section 61 282, Civil Air Regulations—Restricted-vision landing Section 610(a), Civil Aeronautics Act—"It shall be unlawful * * (1) (2) * (3) (4) For any person to operate as an air carrier without an air carrier operating certificate, or in violation of the terms of any such certificate, and (5) For any person to operate aircraft in air commerce in violation of any other rule, regulation, or certificate of the Authority of this title "

ratings for single and multi-engine aircraft, land and sea He was also the holder of the instrument and flight instructor ratings Mr Webster had logged a total of 2,739 32 hours of flying time, of which 92 26 were in DC-6 equipment and 133 37 hours were instrument flying, as of April 1951 His last physical examination was accomplished on January 4, 1951 The committee recommended that he be returned to flight status, and this was done

Wilson M Biggers, Jr , age 28, was employed by National Airlines, Inc , on July 6, 1949, and was promoted to flight engineer on April 19, 1951 He was also returned to flight status upon recommendation by the committee

Stewardess Evelyn H Morris was employed by National Airlines, Inc , on February 19, 1950

N-90896, a Douglas DC-6, Serial No 43151, was owned and operated by National Airlines, Inc It was manufactured on July 20, 1950, and entered the service of National Airlines, Inc , on July 31, 1950 The aircraft had been flown a total of 2,931 26 hours at the time of the accident and was currently certificated by the CAA An examination of historical and maintenance records of the aircraft disclosed no items of significance to this accident



(III)

WHEEL MARKS IN SWAMP AREA TO LEFT OF CENTER LINE APPROACH LIGHTS.

Landing Accident, NAL DC-6, N-90896, Newark N.J. Airport, 0408 EST 5/21/51