SA-254 File No. I 0015

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted: May 14, 1952 Released: May 16, 1952

NATIONAL AIRLINES, INC., ELIZABETH, NEW JERSEY, FEBRUARY 11, 1952

THE ACCIDENT

At approximately 0020E,[1] February 11, 1952, a Douglas DC-6, N 90891, owned and operated by National Airlines, Inc , as Flight 101, crashed and burned after striking an apartment house within the limits of the City of Elizabeth, New Jersey, shortly after take-off from the Newark Airport, Newark, New Jersey There were 63 persons aboard the aircraft, including one infant and a crew of four Of these, 26 passengers and three members of the crew lost their lives, together with four persons who were occupants of the apartment house into which the aircraft crashed. The other passengers and the stewardess received injuries varying from minor to serious.

HISTORY OF THE FLIGHT

The aircraft involved arrived at New York International Airport,[2] New York, at 2233, February 10, 1952, as Flight 402 from Miami, Florida This flight was routine, with stops at West Palm Beach, Florida, and Washington, D C A turn-around inspection at Idlewild was performed, and 1911 gallons of 100/130 grade fuel added, bringing the total fuel aboard to 2,700 gallons Also, sufficient oil was added to bring the quantity of each tank to 30 gallons. At 2322 the aircraft departed Idlewild on a ferry flight to Newark with a new crew consisting of Captain W. G. Foster, First Officer C E. St. Clair, Flight Engineer I. R. Shea, and Stewardess Nancy J. Taylor The aircraft arrived at Newark Airport at 2335, from which point it was scheduled to depart at 2359 as Flight 101, non-stop to Miami, Florida.

A second inspection was accomplished at Newark and the aircraft was loaded with 2,953 pounds of mail, baggage, air express, air freight, and 59 passengers, including one infant The computed take-off gross weight was 83,437 pounds, or 6,463 pounds less than the allowable gross of 89,900 pounds This weight was so distributed that the center of gravity was within the approved limits. No fuel was added at Newark

The flight was given an instrument clearance from Newark to Miami, with West Palm Beach as alternate. To this clearance was attached the pertinent weather reports which indicated, among other things, that at Newark the ceiling was 20,000 feet, thin overcast, with the entire en route weather generally clear with ceilings of 30,000 feet at Palm Beach and Miami.

At 0013, February 11, Newark Control Tower gave the flight taxi clearance to Runway 24, stating the wind was south, variable at six m p.h., and altimeter 29 92. At approximately 0017 the flight advised the tower that it was ready for takeoff Take-off clearance was issued, and the controller observed the aircraft taxi into take-off position and proceed down the runway in a normal manner, becoming airborne at 0018 after a roll of approximately 3,200 feet.

The climb-out appeared normal until the aircraft passed the vicinity of the Newark Range Station. Here it was observed by Control Tower personnel to lose altitude suddenly and veer slightly to the right. This sudden loss of altitude and the movement to the right are supported by statements of surviving passengers and ground witnesses.

The controller then called the flight and asked if everything was all right, to which he received the following reply, "I lost an engine and am returning to the field." The time was established as 0019 The flight was immediately cleared to land on Runway 6, which clearance was at once amended to land on any runway desired No further radio contacts were made with flight. During the

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

[2] Hereinafter referred to as "Idlewild "

last radio transmission the controller observed the aircraft continue to veer to the right at a low altitude and then disappear from sight

At 0020 tower personnel observed a fire in the vicinity of Elizabeth New Jersey. It was later established that Flight 101 had crashed in Elizabeth near the intersection of Scotland Road and Westminster Avenue.

INVESTIGATION

Investigation disclosed that the aircraft had first made light contact with the top of a tree located on the west side of Salem Avenue, immediately followed by heavy impact of the right wing with the roof of an apartment building. This impact was of sufficient force to shear the right wing just outboard of No 4 engine nacelle, the wing falling into the apartment house courtyard. It was in this building, badly damaged by subsequent fire, that four occupants lost their lives. The aircraft continued forward along an approximate heading of 280°, striking other obstructions and disintegrating along a path that terminated at Westminster Avenue.[3]

To expedite the investigation and to assure the most thorough examination possible of the aircraft and its components, working groups were formed—Witness, Operations, Structures, Electrical and Electronics and Power Plants and Propellers—composed of appropriate representatives of the industry, CAA, and the State of New Jersey. CAA investigator was in charge of each group

The Witness group interviewed more than 80 persons and obtained written statements from 40 who were able to supply pertinent information. All surviving passengers, whose physical condition permitted, were interviewed and where possible, either submitted written statements or testified at the public hearing. To summarize the information gathered from these surviving passengers, it appears evident that shortly after takeoff the aircraft made a sudden drop and veered to the right.

Associated with the sudden drop and change of aircraft heading was an unusual engine noise variously described as 'wail," "whine," "roar," "propellers going into reverse," "grinding sound or shrill noise," and "noise like an explosion." Reaction of other passengers described the aircraft as 'shuddering," "vibrating," and "shimmying from side to side " Two passengers, sitting on the right side of the aircraft, both stated that shortly after takeoff they noticed that the outboard propeller on the right side came to a stop One of these passengers, on her first flight was concerned to the extent that she called this fact to the attention of her husband sitting beside her. His reactions, however, are not known since due to the seriousness of his injuries he recalls no details of the flight

The Operations group confined its efforts to the investigation of items concerning refueling, dispatching, take-off weight, load distribution, crew history and crew training, weather, radio contacts flight documents, and such other documents and manuals as are required to be aboard the aircraft. No irregularities which in any way would affect the operation of the aircraft were found The aircraft was properly certificated and dispatched, and nothing was found to indicate that it was not in an airworthy condition upon departure from Newark.

The crew was also properly certificated, and previous to boarding the aircraft at Idlewild for the ferry flight to Newark had had a rest period of 17 hours and 10 minutes

Study of the crew history revealed that Captain Foster had been employed by National Airlines as captain since November 4, 1942, and had accumulated a total time as pilot of 11,901 hours, of which 1,059 hours were in DC-6 equipment. His last six-month instrument flight check was accomplished on January 3, 1952, with a grade of average. The instrument check preceding this one was accomplished on DC-6 equipment June 8, 1951, with a final grade of average. On June 9, 1951, Captain Foster successfully completed an instrument check on DC-4 equipment with a grade of average. He had also accomplished three line checks since December 1950, in which he received passing grades.

First Officer Carney E St. Clair had been employed by National Airlines since December 1, 1950. He had received average or above average in all his work and had been recommended as captain material. His total flight time was 3,804 hours, with 941 hours in DC-6 equipment

Flight Engineer Shea was orginally employed by National Airlines as a mechanic in

[3] See attached Appendix A

February 1948, transferring to the Operations Department on December 3, 1951, as Flight Engineer His total flight time was 139 hours, all of which was on DC-6 equipment

The task of the Structures group was to locate, identify, and make a detailed examination of all portions of the airframe structure, and make a record of the position and setting of all instruments, controls, and movable mechanisms associated with the operation of the aircraft This was accomplished, to the extent necessary, before any of the wreckage was moved A distribution chart was made showing the location of all major portions of the wreckage, and numerous photographs were taken, not only as a permanent record but to be used in the future study and evaluation of the material

Following preliminary examination of the wreckage at the scene and completion of the distribution chart, the wreckage was removed to a place where the material could be stored under cover and a detailed examination of the various components was made A comprehensive study of the airframe structure and associated systems revealed no evidence of structural failure, malfunctioning, or fire prior to the initial impact with the apartment building. All damage to the aircraft structure and the various components was the result of impact and subsequent fire A list of readings of items on the cockpit control pedestal and instrument panels is attached [4] As a result of the complete disintegration of the forward portions of the fuselage, these readings and positions may or may not be indicative of the readings and positions prior to impact

The Electrical and Electronics group found no evidence of incorrect installation or improper maintenance of equipment, nor was there any indication of internal fire. Mechanical damage and fire was observed in parts of certain cables and equipment, but all such damage appeared to have come from external sources, such as might result from impact and subsequent fires.

Although all parts of the electrical system and wiring could not be examined because of impact or fire damage resulting from the crash, examination of those parts recovered or otherwise available with the wreckage for examination revealed no faults which would lead to a suspicion of faulty equipment, faulty installation, or improper maintenance The four propeller feathering switches were found in the "open" position, normal for de-energized position. All ignition switches were found to be on "both" position, and no electrical leakage of their circuits was detected.

The Power Plant group was divided into two sections, one to cover the mechanical aspects of the engines and accessories, and the other the propellers and governors. The positions of the power plants and propellers, as they finally came to rest at the scene of the crash, were photographed and plotted on the wreckage distribution chart Examination at the scene revealed that all three blades of the propeller on No. 3 engine were broken off, as was one blade each from propellers on engines Nos. 1, 2, and 4. The broken portions of all blades were recovered with the exception of the outer portion of No. 1 blade from No 3 propeller However, a large piece of molten metal subsequently found in the burned apartment building, when analyzed, was found to be of propeller material and was undoubtedly the remaining portion of the missing blade Before being removed from the scene, the domes of the propellers were removed and the low pitch stop positions noted and photographed.

The engines and propellers were then taken to a more appropriate location for a detailed inspection and examination of parts, and for such further technical studies as the examination of the material indicated

Damage to the engines as a result of impact and subsequent fire was comparatively light. There was no evidence found to indicate structural failure or malfunction of engines Nos. 1 and 2 prior to impact. The pitch setting of the propeller blades of these two engines, as well as the general pattern of bending and leading edge damage, indicated considerable power was being developed at the moment of impact Engines Nos. 3 and 4 were completely disassembled with particular attention directed to any evidence that might indicate structural failure, malfunction, or overspeed. The ignition harnesses had suffered impact damage to such an extent that they could not be functionally tested. Neither was it possible to recover the complete fuel system. However, no evidence was found to indicate

[4] See Appendix B

structural failure or malfunctioning prior to impact, either by visual observations or by functional tests where such tests were possible.

During the examination of No. 3 engine particular attention was directed toward possible evidence of this engine having been subjected to overspeed While no evidence of overspeed was found, such lack of evidence is not conclusive proof that an overspeed did not occur since the presence of such evidence depends upon the duration and extent of overspeed and the amount of power being developed at the time. Sufficient evidence, however, was found to indicate conclusively that No 3 engine and propeller were rotating in their normal direction and No. 4 engine was stopped at the time of impact.

As a result of the preliminary examination of the propellers at the scene and a later detailed technical study and evaluation following disassembly, propellers on engines Nos. 1 and 2 were found in the 46° to 53° positive pitch range, the propeller on engine No 3 was in full reverse pitch, and the propeller on engine No. 4 was fully feathered.

A careful examination of the records associated with the propeller reversing system on aircraft N 90891 revealed that on January 29 and again on February 3, 1952, the red flag indicating the propellers could be reversed came up and stayed up after takeoff This flag should have dropped back out of sight when the wheels left the ground. In both instances the difficulty was corrected by replacing the micro-switches located on the nose wheel and right main landing gear.

On January 24, 1952, during a maintenance run-up check, it was found that propeller No. 160993, installed on No. 4 engine, aircraft N 90891, would go in reverse pitch when being taken out of the feathered position. The propeller was removed and taken to the propeller overhaul shop where it was found that possible moisture between the slip ring and contact plate was causing the trouble. The slip ring assembly was replaced. This corrected the difficulty and on January 31, 1952, the propeller was reinstalled in aircraft N 90891 on No. 3 engine, in which position it was at the time of the accident.

Investigation disclosed no evidence that fire existed prior to impact which is substantiated by statements of surviving passengers

ANALYSIS

No discussion seems necessary with regard to the aircraft structure, the control surfaces and their related system, since no evidence was found to indicate failure or malfunctioning of these items prior to impact.

Power plants in No. 1 and No. 2 positions were undoubtedly functioning in a normal manner and developing substantial power at the time of the accident No. 4 engine was stopped prior to impact with its propeller in the fully feathered position, which indicates that this condition had been accomplished through action by the flight crew. A complete tear down revealed nothing to indicate that this engine and propeller were not operable at the time their use was discontinued A complete tear down of No. 3 engine revealed not only that it was operating at impact but disclosed no evidence whatever to indicate that it was not capable of continued operation.

This analysis will be concerned primarily with the propeller (No 160993) installed on No. 3 engine inasmuch as there is conflicting testimony concerning its probable pitch position prior to and at initial impact with the roof of the apartment building.

Testimony of persons aboard the aircraft who survived the crash, as well as that of persons on the ground who observed the flight following takeoff, has been carefully analyzed. This testimony in general describes circumstances which would be expected to accompany a sudden reversal of a propeller under power in flight. These circumstances include a sudden increase in noise level, which was of short duration, accompanied almost simultaneously by abrupt settling and veering to the right of the aircraft There was no testimony to indicate that any malfunctioning was either heard or felt prior to the loud noise and abrupt maneuver which preceded the accident. This tends to eliminate any action on the part of the crew in the course of trouble-shooting which may have initiated a propeller reversal. Further, the reported abruptness and extent of the

maneuver indicates that the crew was not anticipating any difficulty at that moment

The circumstances described would be expected in the event of a reversal of one propeller with the engine producing substantial power (It should be recalled that No 3 propeller was found at the full reverse—minus 18°—position when the dome was removed at the scene) If the crew did not immediately recognize that a propeller had reversed in flight, attention might well have been directed to the outboard engine which in the event of loss of power would produce a more severe yaw than would an inboard engine. It is reasonable to assume that the comparatively violent maneuver, which occurred at low altitude and low air speed, created an emergency with such attendant urgency in the cockpit that the crew did not have sufficient time to make a correct analysis of the difficulty Under these conditions the feathering of No. 4 propeller appears to have been a logical action. The feathering of this propeller with No. 3 propeller operating in reverse pitch at appreciable power would adversely affect performance resulting in a high rate of descent However, had the aircraft been equipped with reverse pitch indicating lights in the cockpit, the malfunctioning propeller could have been readily identified and the No. 4 propeller undoubtedly would not have been feathered

A lengthy study has been made of the physical condition of No. 3 propeller. There are a great many parts with significant indications, and it is not believed that a firm conclusion with regard to the position of the propeller can be arrived at on the basis of any one condition

It is considered pertinent that the prominent impact damage to the blade shim plates, blade gears, and rotating cam gear occurred while the propeller was in the reverse pitch position. A faint mark corresponding to plus 29° (low pitch) on the reverse signal ring and one shim plate is of no particular significance. Similar indications have been observed on shim plates and reverse signal rings removed from propellers in the course of routine overhaul Furthermore, the reverse signal ring is of a thinner section than the shim plate with which it is in intimate contact circumferentially It would not be possible to mark the reverse signal ring by impact loads without also marking the thicker shim plate at its adjacent location, and no such marks were found. The marks which were observed at the corresponding 29° location are due to the fact that this is the one fixed position at which the propeller operates during ground run-up, start of takeoff, and reduced throttle in flight, and is also the position at which the propeller rests when not in operation

All evidence on No. 2 and No. 3 blades indicated that they were in reverse pitch when they contacted the roof of the apartment building. Both of these blades were twisted by loads tending to turn the blades in the reverse pitch direction. Evidence consists of rearward bends, failure in tension on camber side, camber side of both blades being discolored by roofing material, and pieces being broken from the trailing edge of No 3 blade by loads imposed on the camber side. Of particular significance is the fact that the dowels and screws which retain the blade gear to the blade were sheared on all three blades by loads tending to turn the blades toward reverse pitch direction.

No. 1 blade was broken approximately 11 inches from the butt end from a load applied on the face side adjacent to the leading edge. A piece of this blade about 15 inches long was found inside the apartment building in a partially burned condition Unfortunately, the outer portion of this blade as such was not recovered, thus preventing a complete study of all factors

The direction of break of this blade does not conform to the direction of break of the other two blades. In fact, it suggests a loading which might result from the blade's striking an obstruction while rotating in the positive low pitch position Consequently, much study has been devoted to the various possibilities.

The direction of shear of the blade gear dowels and screws is the same as on the other two blades, of which all indications point to their being in reverse pitch at the time of impact with the roof of the building

Shearing of the blade gear dowels and screws resulted in the blade's being free to turn about its longitudinal axis Aerodynamic loads on the blade would tend to turn it away from full reverse toward the positive low pitch position. Score marks on the butt face of the blade indicate that it did turn in the barrel arm subsequent to shearing

of the dowels and screws, resulting in the direction of fracture of the blade being of no particular significance in relation to its position at initial impact.

For the propeller blades to be at plus 29° at the initial impact of No. 1 blade and the following two blades to be at minus 18° at the time of their respective initial impacts, the propeller blades would have to change pitch 47° during one-third propeller revolution. At 2600 engine RPM, this would have to occur in .017 seconds, necessitating a pitch change rate of 2780°/sec, and would require oil to be displaced from the dome at the rate of approximately 692 gal/min. Although no substantiating data are available, it is not believed likely that pitch change rates of such a magnitude could be attained. The normal maximum rate of pitch change is about 30°/sec.

In arriving at the sequence of failure, it appears logical that the dowels and screws sheared first, followed by breakage of the blade. Had the blade broken first, it is doubtful if the short portion that remained could be subjected to forces great enough to rotate the propeller to reverse pitch and shear the dowels and screws. Consequently, the only plausible sequence of events is that the dowels and screws sheared first, leaving the blade free to rotate in the barrel arm, and such rotation did occur.

The wedge insert was found to be broken with evidence that the breakup occurred at some time prior to the accident. This particular wedge insert, however, had been installed at the time the slip ring assembly was replaced following the propeller reversal difficulty on maintenance run-up, January 24, 1952. A flat spot was found in the surface of the low pitch stop wedge in the area normally contacted by the low pitch stops. The possibility that high impact loads were transmitted to the low pitch stops, thus causing the flat spot, has been considered. This did not happen. The contour of the low pitch stops is such that they would not make a flat indentation on the wedge. Furthermore, there are score marks on the surface of the flat spot that correspond with score marks all around the periphery of the wedge. This indicates that there was operation of the propeller subsequent to formation of the flat spot. It is considered likely that unequal loading on the wedge when it was in position for one low pitch stop lever to contact the flat spot resulted in the breaking and displacing of the wedge insert.

Detailed study was given the deep indentations on the piston sleeve and the lip of metal formed over the chamfered surface at the three points where contact with the low pitch stop levers is made. This study was made to determine, if possible, whether this deformation was the result of one impact force of high magnitude or of several of lesser magnitude.

The curvature of the flow lines of the metal in the bulbous shaped lip indicates a progressive forming and bending of the metal over and under. Also of particular significance are the three layers of copper imbedded in the metal forming the lip which undoubtedly came from the copper coated end of the piston sleeve. This indicates conclusively that its formation was the result of a number of smaller impact forces rather than of one impact force of major magnitude.

Tests conducted independently of the Board have been reported which indicated that indentations such as were found on the piston sleeve would have to have been the result of crash impact loads, had they resulted from one blow. There is no known manner in which a loading of such magnitude could be generated in flight. However, since the evidence indicates definitely that the indentations on the piston sleeve were progressively formed, this possibility is discarded.

The fact that evidence indicates that the propeller inadvertently reversed in flight raises the question as to what caused this reversal. Due to impact damage and fire, the propeller control system in its entirety could not be examined. There are certain facts, however, which can be considered

Although the system was carefully designed with safeguards to prevent inadvertent reversal, such an occurrence is not impossible. The governor solenoid valve circuit, which extends from the cockpit to the governor on the nose of the engine and which was not isolated from other circuits, will cause reversal of the propeller if it should become energized. Should this occur, due to some fault in the electrical system, resulting in unwanted voltage to the governor solenoid valve circuit, reversal of the propeller would result without any action on the part of the crew and as long as the circuit

remained energized, the propeller could not be taken out of the reverse pitch position.

On February 14, 1952, the Administrator of Civil Aeronautics sent to all CAA regional offices the following telegram

" . to preclude possibility of inadvertent propeller reversal of Hamilton Standard propellers on Douglas DC-6, DC-6A and DC-6B aircraft the wiring from the engine firewall to the governor solenoid valve is to be isolated from all other circuits to prevent inadvertent application of electric power to solenoid circuit This is to be accomplished preferably by removing wire from any bundles in which it may run and placing it in separate isolated conduit Isolation of this portion of circuit to be accomplished as soon as possible but not later than midnight February 18. Portion of circuit behind firewall and throughout remainder of aircraft to be inspected immediately. Inspection to include check of all terminal points to assure no hazard of contact with loose wires nearby and check of all points where chaffing or other damage may occur which could permit energized wires to contact solenoid circuit wire or terminals. Further instructions re isolation of portion of circuit behind firewall will be transmitted as soon as available We do not recommend deactivation of reversing propellers on any aircraft while above program being accomplished."

National Airlines on February 13 began a program of rendering the propeller reversing feature inactive on all their DC-6 equipment. This was completed on February 15. A reactivation program in compliance with the terms of the above telegram was started on February 15, and completed February 18. However, on March 12, National Airlines began a program for the permanent deactivation of the propeller reversing feature on all their DC-6 equipment This program was completed on March 20, 1952, and is currently in effect

FINDINGS

On the basis of all available evidence the Board finds that

1. The carrier, the aircraft, and the crew were properly certificated
2 The flight was properly dispatched
3. The weather was satisfactory for VFR operations and had no bearing on this accident.
4. Mechanical difficulty developed during climb shortly after takeoff from Runway 24.
5. No 3 propeller reversed in flight, and No. 4 propeller was feathered.
6. Under these conditions the aircraft did not maintain altitude and settled rapidly.
7 There was no fire prior to impact with the apartment building.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the reversal in flight of No. 3 propeller with relatively high power and the subsequent feathering of No. 4 propeller resulting in a descent at an altitude too low to effect recovery

BY THE CIVIL AERONAUTICS BOARD

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

Josh Lee, Member, did not participate in the adoption of this report.

Supplemental Data

INVESTIGATION AND HEARING

The Civil Aeronautics Board was notified promptly after the accident by CAA Communications. An investigation was begun immediately 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 Elizabeth, New Jersey, March 12, 13 and 14, 1952.

AIR CARRIER

National Airlines, Inc., is a Florida corporation with general offices in Miami, Florida, and operates as an air carrier under currently effective certificates of public convenience and necessity issued by the Civil Aeronautics Board, and an air carrier operating certificate issued by the Civil Aeronautics Administration These certificates authorize the company to transport by air, persons, property, and mail over various routes within the continental limits of the United States and Havana, Cuba, including the route from New York International Airport, New York, New York, through Newark, New Jersey, to Miami, Florida.

FLIGHT PERSONNEL

Captain Foster, age 46, held a currently effective airman certificate with an airline transport rating He had accumulated a total of 11,901 hours, of which 1,059 hours were on DC-6 type equipment. His last CAA medical examination was December 12, 1951, and his last instrument check was January 3, 1952. First Officer St. Clair, age 34, also held a currently effective airman certificate with commercial and instrument ratings. He had accumulated 3,804 flying hours, of which 941 were on DC-6 type equipment. His last CAA medical examination was May 17, 1951.

THE AIRCRAFT

N 90891 was a currently certificated Douglas DC-6 aircraft. It was equipped with four Pratt and Whitney Model B-2800-CA-15 engines and Hamilton Standard Hydromatic Model 6851A-0 propellers. The following list shows the position in which each was installed and the time since overhaul

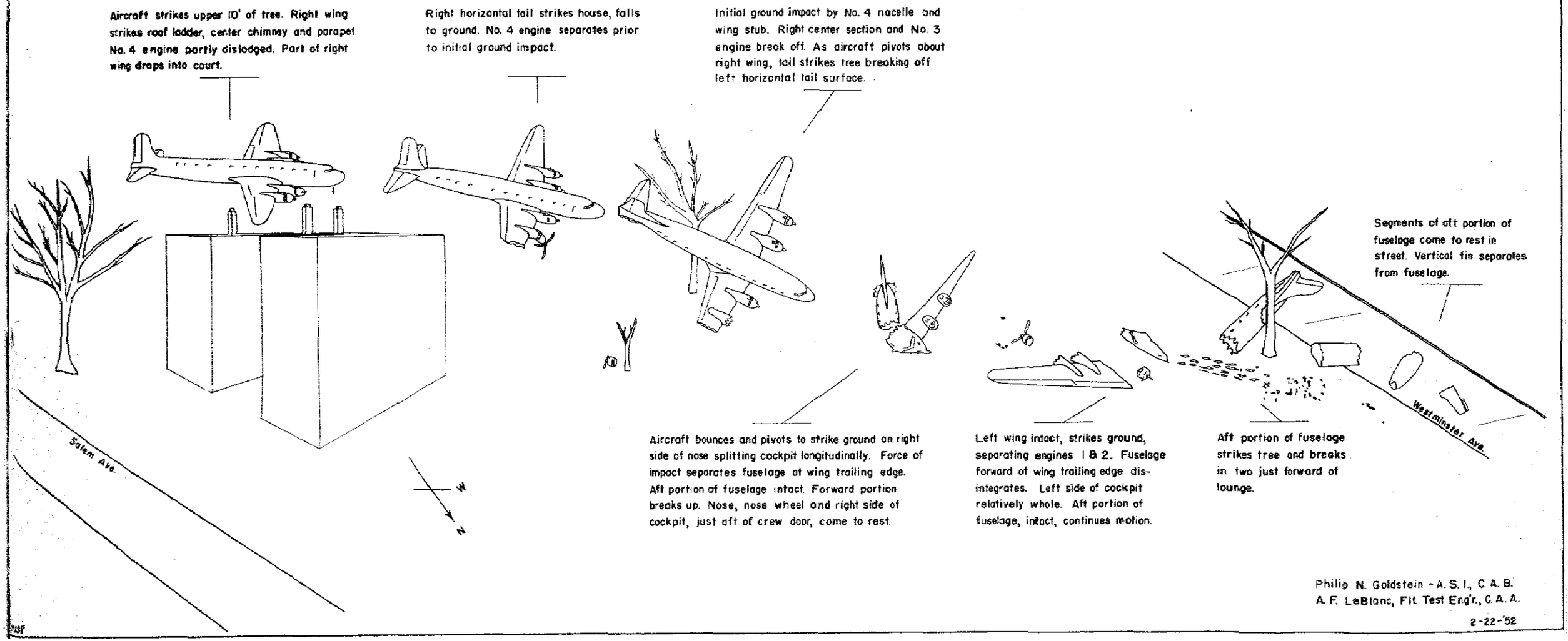
Engines

Position	*Serial No.*	*Time since overhaul*
#1	30337	214 45
#2	30338	1098 19
#3	27431	1045 08
#4	28259	1213 47

Propellers

Position	*Serial No.*	*Time since overhaul*
#1	160938	923 37
#2	160144	800 37
#3	160993	1123 46
#4	165985	209 29

AIRCRAFT ACCIDENT - NATIONAL AIRLINES' DC-6
N90891 AT ELIZABETH, N. J., FEB. 11, 1952
ANALYSIS OF PROGRESSIVE DISINTEGRATION OF AIRCRAFT



Philip N. Goldstein - A. S. I., C. A. B.
A. F. LeBlanc, Flt. Test Eng'r., C. A. A.

2-22-'52

AIRCRAFT ACCIDENT—NATIONAL AIRLINES' DC-6
N 90891 at Elizabeth, N. J., February 11, 1952

PEDESTAL CONTROLS

1. Elevator trim tab indicators—left 4° nose up, right 4° nose down
2 Throttle lock—off
3 Throttle #1, 1/3 open, #2 closed, #3 open, #4, 1/3 open
4 Manual Reverse Stop in safe position—up
5 Propeller Selector—High RPM
6 Main Fuel Tank Selector—ON
7 Cross Feed—1, 2, 3, & 4—ON
8. Rudder Trim Indicator—15° Left
9 Aileron Trim Indicator—7° Left wing down
10. Mixture #1 & 2 Idle Cutoff
11 Carburetor Air—Cold
12 Landing Gear Handle—Down Position
13 Hydraulic Selector—OFF
14 Flap control—UP
15. Instrument Panel

Left Pilot's Flight Panel
1 Altimeter—2740' Barometer Setting 29 83".
2 Artifical Horizon Glass shattered—spilled
3 Air Speed—123 mph
4 ADF Indicator, double needle 350°, single 154°
5 ILS Indicator—needles centered—both flaps showing
6 Clock—still running correct time
7 Flux Gate Compass—340°
8 Bank & Turn—needle centered—ball to right
9 Suction Gauge—0

Left Center Instrument Panel
1 BMEP Gauges #1—84, #2—0, #3—120
2 Manifold Pressure Gauges #1—30", #2, 3, & 4, needles missing
3 Fuel Flow Indicator #1 & #2—0
4 Tachometers #1, 2, 3, & 4—0
5 Supercharger Oil Pressure Gauge, L—0, R—190
6 Head Temperature Gauge, #1, 2, 3 & 4—0
7 Flap Indicator—up.

Fire Warning Selectors Left to Right
#1—Horizontal—in
#2—Vertical—in
#3—Vertical—in.
#4—Missing
#5—Horizontal—in
#6—Missing.
#7—Pulled out, Rod bent
#8—Missing.
#9—Missing

Inverter Switch Box—Left side cockpit
Both switches—emergency position

Left Overhead Electrical Panel
1. Cockpit Heater—off
2 Windshield Heater—off
3 Wing Heater CO_2 Selector, Right bank position
4 Cabin Heat Bypass Switch—on

Center Panel over Windshield
1 Magneto switches #1, 2, 3, & 4 on Both
2 Feathering switches #1 & 2—Normal.
#3 & 4—Crushed & burned
IN position

Left Panel (over Windshield)
1 Left Wing Heater Switch—off
2 All other switches on this panel were found to be—ON

Right Panel above Windshield
1 Ampmeters #1—25, #2—0, #3—0, #4—40
2 Voltmeter 2 volts

Separate Panel with Supercharger Switches
1 #1 & #3 switches destroyed, #2 low blower

Separate Panel—Cowl Flap Switches
#1—6°, #2—0°, #3—4°, #4—3°.

Fuel Quantity Gauges found detached from panel
#1—2,100 lbs
#2—1,300 lbs

Cabin Pressure Change Gauges
Set for 400' down
Set for 600' down

Air Brake Selector Handle safetied in normal position

Hydraulic Pressure Gauges
#1—0"
#2—400"