

73-11

NATIONAL
TRANSPORTATION
SAFETY
BOARD

JUN 20 1973
APR 10 1978



AIRCRAFT ACCIDENT REPORT

TRANS WORLD AIRLINES, INC.

Boeing 707-331C, N788TW

John F. Kennedy International Airport

Jamaica, 'New' York

December 12, 1972



Doc
NTSB
AAR
73/11
c.1

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20591

REPORT NUMBER: NSTB-AAR-73-11

c.1



AIRCRAFT ACCIDENT REPORT

TRANS WORLD AIRLINES, INC.

Boeing 707-331C, N788TW

John F. Kennedy International Airport

Jamaica, New York

December 12, 1972

Adopted: May 2, 1973

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C. 20591

REPORT NUMBER: NTSB-AAR-73-11

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. NTSB-AAR-73-11		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aircraft Accident Report - Trans World Airlines, Inc., Boeing 707-331C, N788TW, John F. Kennedy International Airport, Jamaica, New York December 12, 1972				5. Report Date May 2, 1973	
				6. Performing Organization Code	
7. Author(s)				8. Performing Organization Report No.	
9. Performing Organization Name and Address Bureau of Aviation Safety National Transportation Safety Board Washington, D. C. 20591				10. Work Unit No. 1079	
				11. Contract or Grant No.	
				13. Type of Report and Period Covered Aircraft Accident Report December 12, 1972	
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20591				14. Sponsoring Agency Code	
15. Supplementary Notes					
<p>16. Abstract</p> <p>A Trans World Airlines, Inc., Boeing 707-331C, N788TW, operating as Flight 669, crashed during an ILS approach in IFR conditions to the John F. Kennedy International Airport, Jamaica, New York, at 2256 e.s.t., on December 12, 1972. The three flight crewmembers escaped without injury. There were no passengers. The airplane was destroyed.</p> <p>The flight, operating between Baltimore, Maryland, and Jamaica, New York, had been conducting an autocoupled landing approach under Category II procedures. During the visual transition segment, the aircraft continued below the glide slope until it struck approach light bars that were mounted on a wooden pier in the threshold area. The aircraft crashed onto the runway and slid approximately 2,600 feet.</p> <p>The National Transportation Safety Board determines that the probable cause of this accident was that the captain did not maintain a safe descent path by visual external reference during an instrument landing system approach.</p>					
17. Key Words Aircraft Accident, ILS Precision Approach, Decision [eight, Night, Vertical Guidance, External Reference, Crew Procedures.				18. Distribution Statement Released to public; distribution unlimited.	
19. Security Classification (of this report) UNCLASSIFIED		20. Security Classification (of this page) UNCLASSIFIED		21. No. of Pages 12	22. Price

.
n
n
e
9, hal
ng

TABLE OF CONTENTS

	Page _____
Synopsis	1
Investigation	2
Analysis	5
Probable Cause	7
Appendix A - Crew Information	9
Appendix B - Aircraft Information	11

S P E C I A L N O T I C E

This report contains the essential items of information relevant to the probable cause and safety message to be derived from this accident/incident. However, for those having a need for more detailed information, the original factual report of the accident/incident is on file in the Washington office of the National Transportation Safety Board. Upon request, the report will be reproduced commercially at an average cost of 15¢ per page for printed matter and 85¢ per page for photographs, plus postage. (Minimum charge is \$2.00.)

Copies of material ordered will be mailed from the Washington, D. C. business firm which holds the current contract for commercial reproduction of the Board's public files. Billing is sent direct to the requester by that firm and includes a \$2.00 user service charge by the Safety Board for special service. This charge is in addition to the cost of reproduction. No payments should be made to the National Transportation Safety Board.

Requests for reproduction should be forwarded to the:

National Transportation Safety Board
Administrative Operations Division
Accident Inquiries & Records Section
Washington, D. C. 20591

A

7
A
J
J
S

c
r

c
a
t

W
t

E

c

I
t

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20591
AIRCRAFT ACCIDENT REPORT

Adopted: May 2, 1973

TRANS WORLD AIRLINES, INC.
BOEING 707-331C, N788TW
JOHN F. KENNEDY INTERNATIONAL AIRPORT
JAMAICA, NEW YORK
DECEMBER 12, 1972

SYNOPSIS

On December 12, 1972, Trans World Airlines, Inc., Flight 669, a Boeing 707-331C, N788TW, was a scheduled cargo flight from Friendship International Airport, Baltimore, Maryland, to John F. Kennedy International Airport, Jamaica, New York. At 2256 eastern standard time, the aircraft crashed at John F. Kennedy International Airport while executing an instrument landing system approach to Runway 4R.

After the descent from cruising altitude, using the autopilot approach coupler, the aircraft was established on the instrument landing system. When nearing Decision Height, the aircraft continued below the glide slope until it struck approach light bars which were mounted on a wooden pier just short of the runway threshold area. The aircraft crashed onto the runway and slid approximately 2,600 feet. It came to rest on sandy ground about 500 feet to the right of the runway edge on a heading reversed to its initial direction.

The official weather observation that was made at John F. Kennedy International Airport at 2251 eastern standard time was, in part: Ceiling indefinite 200 feet, sky obscured, visibility 1/2-mile, light drizzle, fog, wind 040° 5 knots, and runway visual range for Runway 4R 4,500 feet variable to more than 6,000 feet.

The aircraft received substantial damage. The main landing gear and all of the engines separated along the deceleration path. There was no fire. The three flight crewmembers were the only persons aboard the aircraft, and none was injured.

The National Transportation Safety Board determines that the probable cause of this accident was that the captain did not maintain a safe descent path by visual external reference during an instrument landing system approach.

INVESTIGATION

Flight 669 departed from Friendship International Airport at 2225 1/ and operated routinely until the time of the accident. Weather observations at J. F. Kennedy International Airport showed a decrease in the ceiling and visibility during the previous hour, and the runway visual range for Runway 4R was variable. The captain decided to make a Category II Instrument Landing System (ILS) approach to Runway 4R, using the autopilot, approach coupler, and autothrust systems.

A Category II approach to Runway 4R authorizes a descent to a Decision Height 2/ of 162 feet. Runway 4R is 8,400 feet in length and is equipped with a 3,000-foot Standard "A" high-intensity approach light system. Approximately 2,500 feet of the light system is built on wooden piers that extend over the water. High-intensity runway lights, centerline lights and touchdown zone lights are installed on this runway. The Category II touchdown point is 1,015 feet from the threshold.

The carrier's domestic operations specifications state that the following conditions must exist in order to continue a Category II instrument approach below 300 feet:

1. No failure flags showing on Category II components.
2. No excessive roughness or crosstracking away from centerline.
3. Localizer needle within or touching the bull's eye.
4. Stable attitude with an airspeed within plus or minus 5 knots of programmed indicated airspeed.
5. Glide slope needle within one dot of deflection.

As outlined in the company flight handbook, all cockpit crewmembers shall assist the captain in monitoring and cross-checking flight instruments and position indicators. The captain shall be informed promptly of any

1/ All times used herein are eastern standard, based on the 24-hour clock unless otherwise noted.

2/ Decision Height (DH) is the height specified in mean sea level above the highest runway elevation in the touchdown zone at which a missed approach shall be initiated if visual reference has not been established.

obs
spe
asso
com
det
with
alt:
20 :
bar
the

aft
eng
tha
to
mon

the
fin,
Whe
cap
spe
add
fla
tha
cap
alt
war
app

des
cal
sta
mai
arc
alt
sec
The
far

observed malfunctions or irregularities. Attention shall be focused specifically on altimeter accuracy and setting and on failure warnings associated with flight instruments. The procedure permits the pilot-in-command to use either the barometric altimeter or radio altimeter to determine DH, if authorized on the airport approach chart. In accordance with procedures, the pilots of Flight 669 correctly set the barometric altimeter bugs (visual alerting indicator devices) at 182 feet, which was 20 feet higher than the value published on the approach chart for the barometric DH. The radio altimeter bugs were set on 162 feet, which was the DH value shown on the approach chart.

During the descent from cruising altitude the autopilot was used, and, after the interception of the localizer course, the autothrust function was engaged when the autothrust slow-fast indicator centered. The speed, at that time, was V_{ref} plus 20 knots. ^{3/} Both flight director systems appeared to have been operating normally and—the captain told the first officer to monitor the approach maneuvers on his own flight director.

As the glide slope needle neared the nose of the airplane symbol on the captain's flightpath indicator, the landing gear was lowered. The final checklist was completed and the landing flaps were extended to 40°. When the indicated airspeed neared the V_{ref} setting plus 5 knots, the captain commented that he was uncomfortable at that low an approach airspeed, and he manually advanced the thrust levers to maintain several additional knots. Upon interception of the glide slope centerline, the flaps were extended to 50°, and the first officer checked to ascertain that the glide slope capture annunciator was on. At the outer marker, the captain noted that the aircraft altitude coincided with the approach chart altitude of 846 feet m.s.l. The first officer reported that no instrument warning flags were in view, and he also noted that all flightpath indicators appeared normal.

The cockpit voice recorder (CVR) tape revealed that as the aircraft descended farther, the captain called out "500 feet" and the first officer called out "speed 130, sink 600." (During a later interview, the captain stated that he recalled an airspeed at 134 knots and that he planned to maintain a minimum speed of 130 knots, as that was the missed approach go-around speed.) Also, at this point, the warning tone signal of the radio altimeter was heard. This 800-cycle tone is programmed to sound for 2 seconds when the altimeter antenna descends to 500 feet absolute altitude. The radio altimeter emits a rising steady tone when the aircraft descends farther to an altitude 50 feet above the manually set bug. The tone

^{3/} The reference speed, V_{ref} is 1.3 times the computed stall speeds and is also used as the target speed on the final approach. On this flight, the speed was determined to have been 128 knots.

terminates abruptly at the selected DH. Additionally, the No. 2 radio altimeter automatically controls radio signal sensitivity to the approach coupler on ILS approaches. This desensitization begins at approximately 1,000 feet absolute altitude.

Shortly after the aircraft reached 500 feet, the first officer stated that he saw the glow of approach lights through the clouds. At 2254 hours, 13.2 seconds after the 2-second tone of the radio altimeter, the CVR tape recorded a distinct click, and the engine noise level decreased. When an additional 14.8 seconds had elapsed, the first officer called the approach lights in view; 1.4 seconds later, the captain called the aircraft altitude as 100 feet above the DH.

The first officer warned, 3.6 seconds later, that the aircraft was low; 0.8 seconds later, the DH alerting tone was heard. The first officer called, "Runway lights," before the DH tone ceased; 3.5 seconds later, he called, "Runway in sight." The engine noises increased, 1.5 seconds later; and 3.3 seconds thereafter, the copilot called out, "You're too low, man! too low! too low." The engine noises were heard to decrease again, and 1 second later the crash occurred. The elapsed time was 55.2 seconds from the 500-foot radio altimeter tone to the initial impact, and 32 seconds elapsed from the time that a distinct click and sounds of decreasing engine thrust were recorded by the cockpit area microphone.

Before reaching the DH, the flight engineer also saw the approach lights through the fog. At the time the runway lights were reported in view, the flight engineer noted that the aircraft was aligned with the runway.

The captain recalled glancing up and seeing the centerline of the approach lights, including "the far ends of the 1,000-foot light bar." ^{4/} He looked at the radio and barometric altimeters and saw that the aircraft was approaching the DH. The airspeed was Vref plus 3 knots as the copilot called the runway was in sight. The captain stated that he believed that the aircraft was in a position to effect a normal landing when he heard the aircraft strike the wooden pier of the approach lighting system.

The first officer said that when he saw the runway, he could see approximately two high-intensity runway lights on either side of the runway. About this time, he heard what he thought was the sound of the auto-pilot disconnecting, but he did not look inside the cockpit. By then, the white runway lights on either side of the runway were clearly visible for

^{4/} This light bar is perpendicular to the line of approach lights and designed to provide roll guidance to the pilot. It is located 1,000 feet from the threshold and is approximately 300 feet in length.

quite some distance, and he recalled that the aircraft was on a normal approach path for a landing. The first officer then noted that the rate of descent seemed to increase rapidly, and he stated that when he saw "a flattening of the scene with the aircraft descending rapidly toward the red approach lights," 5/ he shouted a warning.

The first officer recalled that when he shouted the warning, the captain applied thrust and rotated the aircraft. Seconds later, the aircraft struck the wooden pier and momentarily became airborne again. The captain attempted to land normally on the runway; however, after the aircraft touched down, it started to skid toward the right side of the runway. The captain attempted to correct the right drift with the application of differential thrust, but without success. Approximately 1,800 feet from the threshold, the aircraft left the right side of the runway and skidded across the sandy ground for 800 feet, where it made a relatively fast pivot to the right and came to rest 180° from the initial heading and approximately 500 feet from the edge of the runway. Both starboard engines had separated from the pylon mountings as the aircraft started the pivoting turn and both portside engines were torn from their mountings during the turn. No fire ensued.

ANALYSIS

The upper air weather observation disclosed that absolutely unstable air existed in a shallow layer just above the surface and that stable air existed at other levels below 5,000 feet m.s.l. Wind directions and velocities aloft were not observed during this observation. However, a flight plot for Flight 669 was constructed from data contained in the Flight Data Recorder and from the New York Center ARTS III (Automated Radar Terminal System) computer readout. This plot revealed that an effective tailwind component of approximately 42 knots existed at the 1,500-foot level on the localizer course for Runway 4R. The winds lessened gradually with decreasing altitude, and at approximately 500 feet, the wind velocity was light. The surface wind was reported as 040" at 5 knots.

The wind conditions were well within the capabilities of the automatic approach coupler and the autopilot. A wind change of this magnitude would not have presented any approach difficulties. It is noteworthy that several minutes prior to the accident, two large turbine-powered airplanes, a Douglas E-10 and a Boeing 707, had completed autocoupled landing approaches.

A review of the air carrier's flight handbook and policy manual disclosed that the instrument approach procedures in effect at that time were adequate. The flightcrew was adequately trained and qualified to make a Category II

5/ In this installation, the aviation red wing bar lights were located 110 feet from the runway threshold.

instrument approach, and they followed procedures properly up to that point where the aircraft departed from the required glide slope.

An examination was conducted of the electronic and air data equipment involved in the approach navigation procedures, and, although some units were found to be outside of the air carrier's shop tolerances, these discrepancies could be attributed to impact damage incurred during the crash. None of these conditions would have affected the navigation of the flight to the extent that they would have caused a descent below programmed glide slope altitudes.

After the accident, an airborne check of the instrument landing facilities was conducted, and, although the approach lighting components had been put out of service by the crash, the localizer and glide slope portion of the system were found to be within certification standards.

Examination of the flightpath data showed that the aircraft's apparent rate of descent increased to 1,140 feet per minute shortly after the first officer saw the glow of the approach lights and the CVR tape recorded a distinct click, similar to an autopilot disconnect, and the engine noise level decreased. Since no discrepancies were found with the instrument landing system and since all other conditions were within the capabilities of the aircraft and the autopilot functions, the Board concludes that the autopilot, and thus the glide slope function of the approach coupler, was disconnected prior to the time the aircraft reached decision height. Weather conditions, as officially reported near the time of the accident and as observed by the flightcrew during the approach phase, were such that visual transition to the approach lights and runway lights could have been made at approximately 300 feet m. s. l. The Board further concludes that after the autopilot was disconnected, additional reference to the electronic glide slope displays in the cockpit was insufficient to assess the aircraft's descent path, and the pilot-in-command did not realize that the flightpath trajectory had changed. Likewise, the copilot did not recognize the descent path change until he saw a "flattening of the scene." At that time, the position of the aircraft was too low, and the time segment too short, to effect recovery before the aircraft struck the wooden pier.

The captain of Flight 669 was in the approach transition area only for sufficient time for him to assess the aircraft's position but not long enough to assess the rate of flightpath change. The Safety Board concludes that if the autopilot had not been disengaged until the minimum authorized altitude, or if the nonflying crewmembers had continued to monitor the flight instruments, the aircraft would have reached the runway safely.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of this accident was that the captain did not maintain a safe descent path by visual external reference during an instrument landing system approach.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

May 2, 1973

at
ipment
units
e
the
of
w
nents
lope
ds.
pparent
e first
ed a
noise
ment
ili-
es
ch
cision
f the
e, were
s could
con-
nce to
essess
ze that
ot
scene."
e
e wooden

nly for
ong
oncludes
horized
the
ly.

APPENDIX A

CREW INFORMATION

Captain John J. Clancy, aged 49, held Airline Transport Pilot Certificate No. 356687 and was type rated in the E-707. At the time of the accident, he had accumulated a total of 19,938 hours, of which 8,400 hours were in the B-707 aircraft. He held an FAA first-class medical certificate dated August 19, 1972, with limitations, "Holder shall wear corrective glasses for near and distant vision while exercising privileges of his airman's certificate." His last proficiency check was accomplished in a satisfactory manner on July 17, 1972. This check included recurrency qualifications for Category II operations as pilot-in-command. Company records reflect that Captain Clancy was familiar with the particular approach involved.

First Officer Robert W. Jones, aged 33, held Airline Transport Pilot Certificate No. 1712705 and was typed rated in the B-707 aircraft. At the time of the accident, he had accumulated a total of 4,777 hours, of which 2,971 hours were in the B-707 aircraft. He held an FAA first-class medical certificate issued on October 2, 1972, with no limitations. His last proficiency check was accomplished in a satisfactory manner on October 19, 1972.

Second Officer Fred P. McIntyre, aged 37, held Flight Engineer Certificate No. 1819118 with a rating for turbine aircraft. He held an FAA first-class medical certificate issued on March 24, 1972, with no limitations.

APPENDIX B

AIRCRAFT INFORMATION

Boeing Model 707-331C, N788TW, serial No. 18713, was owned by Trans World Airlines, Inc., Kansas City, Missouri. The aircraft was accepted on June 12, 1964, and on the accident date the total aircraft time was 29,715 hours. The last major inspection was completed on November 5, 1972, and the last periodic service check was accomplished on December 12, 1972.

The aircraft was powered by four Pratt & Whitney JT3D-3B turbine engines. The No. 1 engine, serial No. P644548BAB, had a total time of 24,752 hours; the No. 2 engine, serial No. P668248BAB, had a total time of 13,331 hours; the No. 3 engine serial No. P643690BAB, had a total time of 30,185 hours, and the No. 4 engine, serial No. P645323BAB, had a total time of 21,030 hours.

The aircraft and engines had been maintained in accordance with the Federal Aviation Regulations.