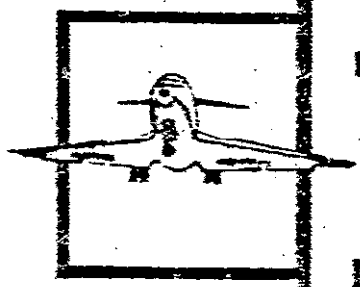

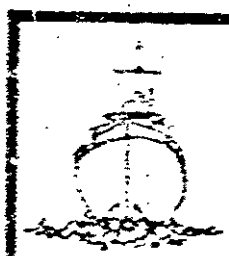

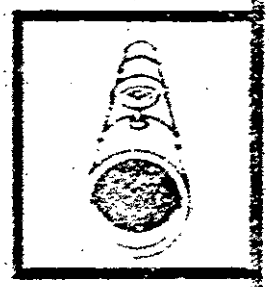

PB85-910409

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY REPORTS

DENVER, COLORADO -- AUGUST 19, 1983

BLOUNTVILLE, TENNESSEE -- JULY 15, 1983

TUCSON, ARIZONA -- FEBRUARY 6, 1983

SIOUX FALLS, SOUTH DAKOTA -- DECEMBER 20, 1983

COCKEYSVILLE, MARYLAND -- APRIL 26, 1984

AKRON, OHIO -- SEPTEMBER 20, 1984

SEATTLE, WASHINGTON -- OCTOBER 18, 1984

MIAMI, FLORIDA -- NOVEMBER 11, 1983

NTSB/AAR-85/01/SUM

UNITED STATES GOVERNMENT

PB85-910409

Aircraft Accident/Incident Summary Reports

{U.S.} National Transportation Safety Board
Washington, DC

30 Sep 85

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15. Supplementary Notes		

16. Abstract This publication is a compilation of the reports of eight seperate aircraft accidents investigated by the National Transportation Safety Board. The accident locations and their dates are as follows: Denver, Colorado, August 19, 1983; Blountville, Tennessee, July 16, 1983; Tucson, Arizona, February 6, 1983; Sioux Falls, South Dakota, December 20, 1983; Cockeysville, Maryland, April 28, 1984; Akron, Ohio, September 30, 1984; Seattle, Washington, October 18, 1984; and Miami, Florida, November 11, 1983. A Brief of Accident containing the probable cause is included for each case.

17. Key Words	18. Distribution Statement
aircraft; pilot; fuel contamination; fuel starvation; fire; air traffic control; flight control; instrument flight rules; communications/navigation equipment; landing gear; hydraulic system; near-midair collision	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	59	

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National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No. 5119	
Aircraft Operator	United Airlines. Flight 310
Aircraft Type and Registration:	Boeing 767, N609UA
Location	Denver. Colorado
Date and Time	August 19. 1983 at 1820 mountain daylight time
Occupants on Board	Crew: 3 passengers: 197
Injuries	Crew: None Passengers: None
Aircraft Damage	None
Other Damage or Injury	None
Type of Occurrence	Loss of Power
Phase of Operation	Normal Descent

The incident occurred during a descent from flight level (FL) 410 to FL 240 in preparation for a landing at the Stapleton International Airport, Denver, near FL 295. When the captain advanced the engine thrust levers from the flight idle position. the left engine surged and exceeded its maximum exhaust gas temperature (EGT) limitation. About 18 seconds later, the right engine surged, and exceeded its EGT limitation. Tha flightcrew shut down both engines in order to prevent damage, declared an emergency, initiated the in-flight engine restart procedures. and successfully restarted the engines near 15,000 feet. Air traffic control had cleared the airspace below the flight and provided the flightcrew with a direct route to the airport during the emergency. The flight subsequently landed at Stapleton without furtner incident. There were no injuries to passengers or crew: as a result of the incident.

Preliminary investigation into the incident indicated that 'the reasons for the malfunction of the Pratt & Whitney JT9D-7R4 engines were probably the result of engine design and maintenance. Although the formation of ice within the engine was also considered a possibility during the early stages of the investigation, further investigation showed that icing would not have caused. the problem based on simulated tests in severe icing conditions.

A few previous malfunctions which resulted in shutdowns of the JT9D-7R4 engines. including shutdowns subsequent to the incident involving United Flight 310, prompted a lengthy investigation by Pratt & Whitney, into the malfunctions condition termed "sub-idle stall." in cooperation with the, National Transportation Safety Board and the Federal Aviation Administration (FAA). and

with aircraft manufacturers and air carriers which use the JT9D-7R4. Several manufacturer service bulletins and an airworthiness directive were issued to operators apprising them of the problem, setting forth interim corrective measures and eliciting specific operational information to assist the investigation. Following extensive tests by Pratt & Whitney from August to November of 1983, it was determined that the sub-idle stall condition occurred because of contaminated fuel nozzles which significantly reduced engine combustor efficiencies. This condition prevented the flightcrew of United Flight 310 from obtaining additional thrust from the engines. Corrective actions taken to prevent recurrence of the problem as a result of the investigation were as follows:

1. Operator bulletins issued to require a higher minimum flight idle engine speed.

2. Technical directives issued requiring an increase in the minimum fuel flow scheduling and retrofit of a new flight idle cam for the fuel control units.

3. Tighter manufacturer limits for rework and overhaul of Hamilton Standard fuel control units to control fuel schedule "shifts."

4. Service bulletin issued to establish a retrofit deadline of December 30, 1983.

5. An in-service fuel nozzle cleaning or replacement program established and wde mandatory by an airworthiness directive.

The attached Brief of Aviation Accident contains the Safety Board's conclusions and findings of probable cause and related factors.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

January 7, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5119 10/19/93 DENVER,CO A/C Reg. No. N609UA Time (Lcl) - 1820 MDT

----Basic Information----
Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC
Name of Carrier -UNITED AIRLINES
Type of Operation -SCHEDULED,DOMESTIC,PASSENGER
Flight Conducted Under -14 CFR 121
Incident Occurred During -DESCENT

Aircraft Damage
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	0	9
Pass	0	0	0	197

Fire
NONE

----Aircraft Information----
Make/Model - BOEING 767
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 302000
No. of Seats - 197
Eng Make/Model - P&W JT9D-7R4
Number Engines - 2
Engine Type - TURBOFAN
Rated Power - 24000 LBS THRUST
ELT Installed/Activated - NO -N/A
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - COMPANY
Method - TELETYPE
Completeness - FULL
Basic Weather - VMC
Wind Dir/Speed- 160/009 KTS
Visibility - 40.0 SM
Lowest Sky/Clouds - 7500 FT SCATTERED
Lowest Ceiling - 25000 FT BROKEN
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light* - DAYLIGHT

Itinerary
Last Departure Point
LOS ANGELES,CA
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - SPECIAL IFR
Type Apch/Lnds - NONE

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - GRASS/TURF
Runway Status - SNOW - CRUSTED

----Personnel Information----
Pilot-In-Command
Age - 55
Certificate(s)/Rating(s)
COMMERCIAL,ATP
ME LAND,SE SEA
Biennial Flight Review
Current - YES
Months Since - UNK/NR
Aircraft Type - UNK/NR
Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)

Total	- UNK/NR	Last 24 Hrs	- UNK/NR
Make/Model	- 359	Last 30 Days	- UNK/NR
Instrument	- UNK/NR	Last 90 Days	- UNK/NR
Multi-Eng	- UNK/NR	Rotorcraft	- UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
THE ACFT WAS DESCENDING FROM FL 410 WITH THE THROTTLES AT IDLE. AS POWER WAS ADDED AT FL 295 THE LEFT ENG SURGED & EXCEEDED MAX EGT. 18 SECS LATER THE RIGHT ENG SURGED & EXCEEDED ITS MAX EGT. THE LEFT & RIGHT ENGS WERE SHUT DOWN AT FL 200 & 177 RESPECTIVELY. THE ENGS WERE SUCCESSFULLY RESTARTED ABOUT FL 150. THE INABILITY OF THE ENGS TO ACCELERATE AFTER THE MANUALLY INDUCED SURGE WAS DUE TO CONTAMINATED FUEL NUZZLES WHICH SIGNIFICANTLY REDUCED COMBUSTION CHAMBER EFFICIENCIES & WHICH RESULTED IN A SUBIDLE STALL.

Brief of Incident (Continued)

File No. - 5119 8/19/83 DENVER,CO A/C Reg. No. N609UA Time (Lcl) - 1820 MDT

Occurrence LOSS OF POWER(TOTAL) - MECH FAILURE/MALFUNCTION
Phase of Operation DESCENT - NORMAL

Finding(s)
1. FUEL SYSTEM,NOZZLE - CONTAMINATION

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 1

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No. 2312

Aircraft Gperator	:	Orion, Inc.
Airolane Type and Registration:		Gulfstream G-159. N68TG
Location	:	Tri-Cities Regional Airport, Blountville, Tennessee
Date and Time	:	July 16, 1583. 2108 eastern daylight time
Persons on Board	:	2
Injuries	:	None
Aircraft Damage	:	Destroyed by Post Crash Fire
Other Damage or Injury	:	None
Type of Occurrence	:	Overrun
Phase of Operation	:	Landing roll

The airplane departed Knoxville, Tennessee, at 2040, operating as TAG 409. The cargo consisted of 4,343 pounds of hazardous material. in two shipments: four millicuries of Yttrium 50 radioactive material, UN2982 H.O.S. Type A, and two packages of 3942 and 3703 curies of Irridium-192 radioactive material, Type B. The Yttrium 90 container conformed to the DOT Spec. 7A requirements. The type B containers were approved by the Department of Energy (DOE). The flightcrew was aware of the nature of the cargo on board. In addition to the cargo, there was 6,000 pounds of fuel aboard. The takeoff gross weipht was 32,411 pounds, and the estimated landing weight was 31,511 pounds.

The surface weather taken at 2045 by the National Weather Service observer was, in part: 25,000 feet scattered; visibility--7 miles; temperature--80°F; dewpoint--64°F; wind 300° at 6 knots; altimeter--30.04 inch Hg. The special observation taken after the accident was essentially the same except that the wind was recorded as 180° at 3 knots. Official sunset was 2048 with a period of twilight to 2128.

The flight, conducted under instrument flight rules (IFR), was uneventful until the airplane arrived in the terminal area and was cleared for the visual approach to runway 4. The weather was VFR. At 2104:17, the airplane was at 5,200 feet (airport elevation 1,500 feet) and the flightcrew reported an indicated airspeed of 250 knots. At 2106:35, the arrival controller told the flight to switch to tower, and asked if the flightcrew "will be able to get down for [runway) four." The pilot responded, "No problem."

At 2106:51, the local controller cleared TAG 409 to land "in the blind," since the flight had not contacted the tower. Conversations between the arrival and local controller followed as they tried to determine if TAG 409 had changed to tower frequency. At 2107:22, TAG 409 transmitted "Tower, TAG 409 on final for four," and the tower controller cleared the flight to land.

At 2107:53, the tower controller said "(Unintelligible) had better get on down." This comment was not transmitted but was recorded on the interohone. At 2108:12, one of the pilots made a series of comments on an open microohone about "getting on the brakes," and then an emergency locator transmitter (ELT) signal was heard.

The airplane ran off the runway, over an embankment, and collided with a chain link fence. The airplane exploded and burned, The flightcrew escaoed with no injuries.

The flightcrew said that the flight was uneventful until the airplane was within 3 miles of the airport; the first officer was flyinq. The captain said that he knew they *were high.* "He (the first officer) misjudged on comina into Tri-Cities Airport. I let him sit there long enough so that he could see what was happening, and then I said at this particular point, 'I will take the aircraft, it's my judgment aad I would rather continue this approach and I'll explain to you on the ground exactly why.'"

The first officer said the visibility was reduced by haze and that he did not descend until he saw the airport. When he did see it "....I got jammed in a little bit tight....By the time I saw the runway, I was. in my opinion, too close for me with 60 hours in the aircraft to try and make an approach to the field. So I said to the captain, 'I'd like to make a 360 to the right' and at that point he said, 'I have the aircraft.'"

The performance study of the flightpath was conducted from the altitudes of 7,700 feet to 2,200 feet mean sea level (about 700 feet above ground level (AGL)). At 2.3 miles from the airport, the airplane made a slight right turn and then a sharp left turn (27.50 angle of bank) and increased the rate of descent to 2,600 feet per minute. The last radar return was 1.45 miles from the runway .threshold, at 700 feet AGL. None *of* the calculateq indicated airspeeds was below 200 knots.

The airplane was configured properly for the landing; and landed on runway 4. The flightcrew believed that the approach speed was V_{ref} plus 5. According to witnesses, the aircraft touched down about 3,500 feet beyond the threshold of the 6,099-foot runway- The required landing distance for the airplane was calculated to have been 2,600 feet. The captain reported that after he got no response from normal braking, he used the emergency brakes. There was evidence of wheel bricking on the runway, beginning about 3,723 feet beyond the runway threshold, which consisted of four distinct black marks--these marks continued beyond the departure end of the runway. An examination of the wheel brakes showed no irregularities. Further. there was evidence of heavy braking as indicated by the imprints of three, pucks on each brake disc and the discoloration of the discs. Consequently, it is apparent that the wheel brake system functioned properly throughout the landing roll.

Further examination disclosed that the parking and emergency brake selector was selected to *the* normal position, and the parking and emergency brake shuttle valves were not in position to port fluid pressure to the

emergency brake pressure side of the valve. Also, the emergency brake "T" handle was not extended. This evidence verifies that the captain did not use the emergency brake for stopping.

The three containers of radioactive material were in a fuel fire for about 45 minutes after the accident. The containers were not damaged and no radioactive material was released.

The National Transportation Safety Board determined that the cause of the accident was the misjudgment of airspeed and distance by the pilot-in-command, and the failure of the pilot-in-command to perform a go-around. Factors relating to the accident were: light condition - dusk; weather condition - hare: airport facilities - visual approach slope indicator not operating; the fence and the dirt bank the airplane struck.

See the attached accident brief.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

January 7, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident

File No. - 2312 7/15/93 BLOUNTVILLE,TN A/C Reg. No. N68TG Time (Lcl) - 2108 CDT

----Basic Information----
Type Operating Certificate-AIR CARRIER - SUPPLEMENTAL
Name of Carrier -ORION AIR, INC.
Type of Operation -SCHEDULED,DOMESTIC,CARGO
Flight Conducted Under -14 CFR 135
Accident Occurred During -LANDING

Aircraft Damage
DESTROYED
Fire
ON GROUND

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	2	0
Pass	0	0	0	0

----Aircraft Information----
Make/Model - GRUMMAN G-159
Landing Gear - UNK/NR
Max Gross Wt - 36000
No. of Seats - UNK/NR

Eng Make/Model - ROLLS ROYCE R037/529-8E
Number Engines - 2
Engine Type - TURBOPROP
Rated Power - 1910 HP

ELT Installed/Activated - YES/YES
Stall Warning System - YES

----Environment/Operation Information----
Weather Data
Wx Briefing - FSS
Method - IN PERSON
Completeness - FULL
Basic Weather - VMC
Wind Dir/Speed- 180/003 KTS
Visibility - 7.0 SM
Lowest Sky/Clouds - 25000 FT SCATTERED
Lowest Ceiling - NONE
Obstructions to Vision- HAZE
Precipitation - NONE
Condition of Light - DUSK

Itinerary
Last Departure Point
KNOXVILLE,TN
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lnds - VISUAL
STRAIGHT-IN
FULL STOP

Airport Proximity
ON AIRPORT

Airport Data
TRI-CITY
Runway Ident - 04
Runway Lth/Wid - 6599/ 150
Runway Surface - MACADAM
Runway Status - DRY

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
COMMERCIAL,ATP,CFI
SE LAND,ME LAND

Age - 36
Biennial Flight Review
Current - YES
Months Since - 1
Aircraft Type - G-159

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT

Flight Time (Hours)			
Total	4927	Last 24 Hrs	1
Make/Model	427	Last 30 Days	70
Instrument	90	Last 90 Days	164
Multi-Eng	2e27		

Instrument Rating(s) - AIRPLANE

----Narrative----
THE COPLT STATED THAT WHEN HE BEGAN THE APCH TO THE DESTINATION ARPT, THE WEATHER CONDITION WAS HAZY & HE DELAYED HIS DESCENT SLIGHTLY UNTIL HE LOCATED THE ARPT. WHEN HE SAW THE RWY, HE BELIEVED THAT THEY WERE A LITTLE TOO CLOSE, SO HE INDICATED TO THE CAPTAIN THAT HE WOULD LIKE TO MAKE A 360 DEG TURN. AT THAT POINT, THE CAPTAIN ASSUMED CONTROL OF THE ACFT & CONTINUED THE APCH TO RWY 4. ACCORDING TO WITNESSES, THE ACFT TOUCHED DOWNED LONG. ACCORDING TO THE CAPTAIN, HE TRIED SEVERAL APPLICATIONS OF THE NORMAL BRAKING SYS, BUT GOT NO RESPONSE. HE THEN TRIED THE EMERGENCY BRAKES & ASKED THE COPLT TO GET ON THE BRAKES. BUT REPORTED THERE WAS NO BRAKING. SUBSEQUENTLY THE ACFT WENT OFF THE END OF THE RWY, WENT OVER AN EMBANKMENT & HIT A FENCE. IT CAME TO REST ON A 2ND EMBANKMENT WHERE IT EXPLODED & BURNED. TIRE MARKS WITH EVIDENCE OF BRAKING ACTION WERE FOUND STARTING 2377 FT BEYOND THE RWY THRESHOLD. A REQUIRED FIELD LENGTH OF APRX 2600 FT WAS CALCULATED FOR LNDG. NO PREIMPACT PART FAILURE/MALFUNCTION WAS FOUND. VASI LIGHTS WERE INOP.

Brief of Accident (Continued)

File No. - 2312 7/15/03 BLOUNTVILLE,TN A/C Reg. No. N6810 Time (Lcl) - 2100 CDT

Occurrence #1 OVERRUN
Phase of Operation LANDING - ROLL

Finding(s)
1. LIGHT CONDITION - DUSK
2. WEATHER CONDITION - HAZE
3. AIRPORT FACILITIES;VISUAL APCH SLOPE INDICATOR(S) - NOT OPERATING
4. AIRSPEED - MISJUDGED - PILOT IN COMMAND
5. DISTANCE - MISJUDGED - PILOT IN COMMAND
6. GO-AROUND - NOT PERFORMED - PILOT IN COMMAND

Occurrence #2 ON GROUND COLLISION WITH OBJECT
Phase of Operation LANDING - ROLL

Finding(s)
7. OBJECT - FENCE

Occurrence #3 ON GROUND COLLISION WITH TERRAIN
Phase of Operation LANDING - ROLL

Finding(s)
8. TERRAIN CONDITION - DIRT BANK

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 4,5,6

Factor(s) relating to this accident is/are finding(s) 1,2,3,7,8

National Transportation Safety Board
Washington, '94

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No:	
Aircraft Operator:	Mr. Bruce Jerald Wood
Aircraft Type & Registration:	Beech E35 (Bonanza), N4687D
Location:	Tucson, Arizona
Date & Time	February 6, 1983; 1747 Mountain Standard Time
Persons on Board	Pilot
Injuries:	None
Aircraft Damage:	Substantial
Other Damage or Injury:	None
Type of Occurrence:	Vortex turbulence encounter/airframe damage
Phase of Operation:	Approach

At 1500 on February 6, 1983, a Beech E35 (Bonanza), N4687D, departed Guaymas, Mexico, on a visual flight rules (VFR) flight to the Tucson International Airport at Tucson, Arizona. The purpose of the flight was the pilot's personal transportation. During the departure and en route portions of the flight, the aircraft proceeded without incident.

Upon arriving at the Tucson International Airport, the pilot of the Bonanza was cleared to enter the traffic pattern at *4,200 feet mean sea level (m.s.l.) for a landing on runway 29* left. As he continued, he made a modified, straight-in, visual approach to the airport. The approach was from the south with a 45° left turn onto the final approach.

As the Bonanza was approaching, a Boeing 727, PSA Flight 420, was vectored on a heading of 120° onto a left downwind for a visual approach to runway 29 right. As the two aircraft continued on their respective approaches, they flew on generally converging headings.

About 1745, Tucson Approach Control advised the Bonanza pilot that the Boeing 727 was at his 11 o'clock position at 4 miles, and the pilot reported that he had it in sight. At about the same time, the Boeing 727 started a left, base turn to runway 29R. Approach control cautioned the Bonanza pilot about possible wake turbulence and instructed him to change to tower frequency; the Bonanza pilot acknowledged.

At 1745:38, after changing to the tower frequency, the Bonanza pilot was advised that the PSA aircraft was at 12 o'clock and 3 miles, on a base turn to runway 29R. The Bonanza pilot acknowledged and said he had the traffic. The Bonanza pilot again was cautioned about possible wake turbulence and was cleared to land.

At 1747:00, the Bonanza pilot called the tower in an excited voice. He reported that "something blew up here in the r/r and this thing is about to shake apart. I like to come right on in." Later, the pilot reported that at 2 miles east of the airport while on final approach, the aircraft suddenly pitched up and flipped over. After recovering, he was able to continue the approach and land safely.

An examination of the aircraft after it landed revealed that the V-tail was damaged. The leading edge of the right stabilizer was deformed downward about 1 3/4 inches and its lower skin was buckled between the front and rear spars. The front spar of the right elevator (rudd-evator) was twisted. Skin on both rudd-evators was deformed. No preaccident malfunction or failure was evident.

The 1751 surface weather observation at the Tucson International Airport was: 3,500 feet scattered, 9,000 feet scattered, 25,000 feet thin overcast; visibility -- 50 miles; temperature -- 51° F; dewpoint -- 42° F; wind -- 360° at 6 knots; altimeter -- 30.13 inches Hg.

The traffic pattern winds at the time of the accident are not known. However, at the time of the 1605 sounding at Tucson, the winds aloft were:

Altitude (feet above sea level)	Direction (°true)	Speed (knots)
Surface (2,582)	280	8
3,536	290	11
4,429	287	12
5,366	287	15
6,365	289	16
7,365	287	18
8,294	284	19
9,120	280	19
9,917	284	18

The 1605 sounding showed also a strong superadiabatic layer between 2,906 feet and 4,965 feet. The lapse rate in the layer was -3.3° C per 1,000 feet.

According to the Airman's Information Manual (AIM), every airplane generates a wake while in flight and wingtip vortices can persist for a period of time. The strength of the vortex is governed by the weight, speed, and shape of the wing of the generating aircraft. The vortex is strongest when the generating aircraft is heavy, clean, and slow. The strength of the vortex diminishes with time and distance behind the generating aircraft, and atmospheric turbulence hastens the breakup.

Flight tests have shown that vortices from a large aircraft sink at a rate of up to 400 to 500 fact per minute. Generally, the vortices stop sinking (level off) after settling about 300 feet. The AIM recommends that pilots fly at or above the flight path of a large aircraft that in landing on a parallel runway that is closer than 2,500 feet. The parallel runways (29L & 29R) at the Tucson International Airport were about 300 feet apart.

A review of the radio transcript and radar information revealed that the upset the Bonanza bid encountered was in the vicinity of the point its flight path had crossed the flight path of the Boeing 727. When the upset occurred, the Bonanza was following 60 to 65 seconds behind the Boeing, rather than the minimum 2-minute separation interval recommended by the AIM. At that time, the Bonanza's speed was about 160 knots, well above its maneuvering speed of 124 knots.

The exact location of the encounter could not be determined. However, the Bonanza's transponder reply indicated that it had descended to 3,500 feet, about 11 seconds before crossing the flight path of the Boeing. At that point, the Bonanza was about 1,000 feet to the right (southeast) of the Boeing's ground track. When the Boeing had passed that vicinity about 60 seconds earlier, it was in a left turn at 3,900 feet. Interpolation of the 1605 winds aloft shows that the wind at that altitude would have been from 287° to 290° at 11 to 12 knots. If the wind aloft had remained the same, the wake turbulence would have drifted to the east-southeast about 1,000 feet per minute. (See Figure 1 for a depiction of the aircraft flight paths, altitudes, and time intervals.)

The attached Brief of Accident contains the Safety Board's conclusions, findings of probable cause, and related factors.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

January 9, 1985

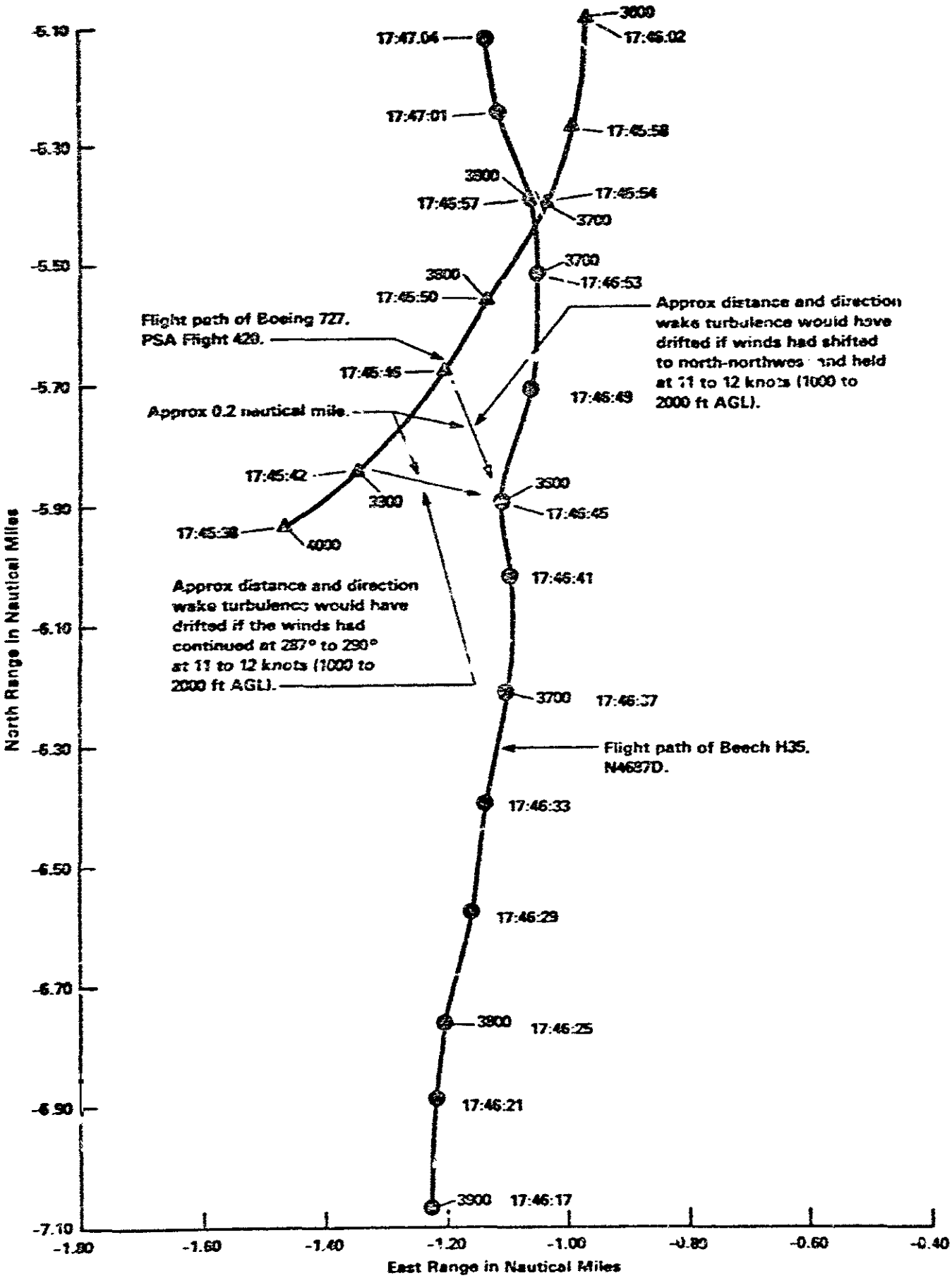
3600
17:47:04
17:46:02
17:47:01
17:45:58
3800
17:45:57
17:45:54
3700
3700
3800
17:46:53
17:45:50
Approx distance and direction wake turbulence would have drifted if winds had shifted to north-northwest and held at 11 to 12 knots (1000 to 2000 ft AGL).
Flight path of Boeing 727, PSA Flight 420.
17:45:45
17:46:49
Approx 0.2 nautical mile.
17:45:42
3300
3500
17:46:45
17:45:38
4000
17:46:41
Approx distance and direction wake turbulence would have drifted if the winds had continued at 287° to 290° at 11 to 12 knots (1000 to 2000 ft AGL).
3700
17:46:37
Flight path of Beech H35, N4687D.
17:46:33
17:46:29
3800
17:46:25
17:46:21
3900
17:46:17
-5.10
-5.30
-5.50
-5.70
-5.90
-6.10
-6.30
-6.50
-6.70
-6.90
-7.10
North Range in Nautical Miles
-1.80
-1.60
-1.40
-1.20
-1.00
-0.80
-0.60
-0.40
East Range in Nautical Miles

FIGURE - 1

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident

File No. - 1928 2/06/83 TUCSON,AZ A/C Reg. No. N4687D Time (Lcl) - 1747 MST

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -PERSONAL
Flight Conducted Under -14 CFR 91
Accident Occurred During -APPROACH

Aircraft Damage: SUBSTANTIAL
Fire: NONE

	Fatal	Serious	Minor	None
Crew	0	0	0	1
Pass	0	0	0	0

----Aircraft Information----
Make/Model - BEECH H35
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 3050
No. of Seats - 4
Eng Make/Model - CONTINENTAL O-470-G
Number Engines - 1
Engine Type - RECIPROCATING-CARBURETOR
Rated Power - 240 HP
ELT Installed/Activated - YES/NO
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - NO RECORD OF BRIEFING
Method - N/A
Completeness - N/A
Basic Weather - VMC
Wind Dir/Speed- 360/006 KTS
Visibility - 50.0 SM
Lowest Sky/Clouds - 3500 FT SCATTERED
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

Itinerary
Last Departure Point
GUAYMAS,MX
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - VFR
Type of Clearance - NONE
Type Arch/Lnds - STRAIGHT-IN
FULL STOP

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
TUCSON INTL.
Runway Ident - 29L
Runway Lth/Wid - 9120/ 75
Runway Surface - ASPHALT
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
PRIVATE
SE LAND
Instrument Rating(s) - NONE

Age - 40
Biennial Flight Review
Current - YES
Months Since - 6
Aircraft Type - H35

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)

Total -	1106	Last 24 Hrs -	6
Make/Model-	1011	Last 30 Days-	UNK/NR
Instrument-	14	Last 90 Days-	187

----Narrative----
DURING ARRIVAL, THE PLT WAS ADVISED OF THE POSITION OF A BOEING 727 THAT WAS LANDING ON RWY 29R & HE REPORTED SEEING THE ACFT. HE ALSO WAS CAUTIONED ABOUT POSSIBLE WAKE TURBULENCE FROM THE BOEING & HE ACKNOWLEDGED. THE PLT REPORTED THAT WHILE HE WAS ON AN APPROACH TO LAND, ABOUT 2 MI FROM THE ARPT, HIS BEECH H35 SUDDENLY PITCHED UP & FLIPPED OVER. HE RECOVERED, WAS ABLE TO CONTINUE THE APPROACH AND LANDED SAFELY. AN EXAM AFTER LANDING REVEALED THAT THE V-TAIL WAS DAMAGED. THE INBOARD LEADING EDGE OF THE RIGHT STABILIZER WAS DEFORMED DOWNWARD ABOUT 1 3/4 INCHES & ITS LOWER SKIN WAS BUCKLED BETWEEN THE FRONT & REAR SPARS. THE FRONT SPAR OF THE RIGHT RUDDERVATOR WAS TWISTED & THERE WAS SKIN DEFORMATION ON BOTH RUDDERVATORS. INVESTIGATION REVEALED THE BEECH HAD CROSSED THE PATH OF THE LARGE ACFT AT APRX THE SAME ALT & ABOUT 60 TO 65 SEC LATER. THE SPEED AT THE TIME OF THE UPSET WAS APRX 160 KTS. THE MANEUVERING SPEED WAS 124 KTS IAS. THE AIM RCMDS 2 MIN SEPN BEHIND A LARGE ACFT WHEN LANDING ON THE SAME RWY OR A PARALLEL RWY WITHIN 2500 FT.

Brief of Accident (Continued)

File No. - 1928 2/06/83 TUCSON,AZ A/C Reg. No. N4687D Time (Lcl) - 1747 MST

Occurrence #1 VORTEX TURBULENCE ENCOUNTERED
Phase of Operation APPROACH

Finding(s):
1. TRAFFIC ADVISORY - ISSUED - ATC PSNL(LCL/GND/CLNC)
2. SAFETY ADVISORY - ISSUED - ATC PSNL(LCL/GND/CLNC)
3. PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND
4. PLANNED APPROACH - IMPROPER - PILOT IN COMMAND

Occurrence #2 AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation APPROACH

Finding(s):
5. DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED -
6. STABILIZER - OVERLOAD
7. FLIGHT CONTROL,RUDDERVATOR - OVERLOAD

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 3,4

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

Aircraft Operator:	Ozark Airlines, Flight **650**
Airplane Type an2 Regist-ation:	McDonnell Douglas DC-9-31, N994Z
Location	Sioux Falls Regional Airport, **Sioux** Falls, **South** Dakota
Date and Tine	December 20, 1983, 1317 central standerd time
Persons on Eoard	Crew-5, Passenqers-81
Injuries	Crew-2 minor, Passengers-None
Aircraft Damage	Substantial
Other Damage or Injury	Snow sweeper destroyed, operator fatal
Type of Occurrence	Collision with vehicle
Phase of Operation	Landing

The Ozark flight 650 departed **Sioux** City, Iowa, on an instrument flight rules (IFR) flight plan at 1253 and climbed *to* its assigned altitude of 11,000 feet. The crew tuned-in and listened to the Sioux Falls Automatic Terminal Information System (ATIS) broadcast shortly after takeoff. The flight was handed *off* from Sioux City approach contra? to Sioux Falls approach control at 1306. **The** approach controller **issued** descent instructions to 3,400 feet and vectors for intercepting the runway 3 ILS approach course. Flight 650 was cleared for the approach at 1311. At 1313, the approach controller directed that the crew contact Sioux Falls tower. The controller stated that at that time he observed Flight 650's radar return to be **4** miles from the Runway 03 outer marker which **is** 5.7 nile5 from the threshold of Runway 03. The captain acknowledged the instruction but did not contact the tower. When the airplane was **on** final approach, about 2.5 miles from the runway, the local controller initiated a call to **Ozark** 650, to which the captain responded. **The** controller then cleared the flight to land and qave the current runway visual range (RVR) as 3,500 feet. He aid not advise the flight of the snow removal operation in progress on Runway 03.

The crew stated that they first saw the ground and the approach lights at about 200 feet above the ground, and then saw the runway. Because **the** ATIS repsrted blowing snow, the crew expected to see, and were not surorised to ***see,*** snow blowinq acros the runway about 2,000 feet beyond the threshold. They saw also that an **area** of pavement **over** 75 **feet.** wide along the runway centerline was clear of **snow.** The crew stated that no information was transmitted to them either **by** ATIS, approach control, or local control concerning snow removal operations.

The airplane made a smooth touchdown about 1,000 feet from the threshold. The spoilers deployed and the copilot, who was flying, was just beginning to apply reverse thrust when the airplane entered a cloud of snow. At that time, the right wing struck a large snowsweeping vehicle which was traveling in the same direction to the right of the runway centerline. The crew stated that at no time did they see a vehicle or a rotating beacon, and they thought the snow cloud was the reported blowing snow.

The right wing was separated from the airplane by the impact, and a large flash fire erupted from the fuel cloud escaping from the separated wing. The airplane slewed to the right and continued along the runway in the landing direction. It went off the runway on the left side and and came to rest 4,125 feet from the approach end of Runway 03. The collision occurred about 2,200 feet from the approach end of the runway.

The passengers evacuated the airplane using the escape slides at the two forward exits. There were no injuries to the passengers and the three flightcrew members. The two flight attendants were treated for minor injuries. The snowsweeper operator was killed.

Witnesses driving on the parallel taxiway saw a large fireball which rapidly died out and also a fire on the fuselage of the airplane which extinguished as it traveled down the runway. There was no fire when the airplane came to rest. The broom sweeper's wreckage remained on the runway burning, and the fire was extinguished by firefighters.

During winter months at many airports in the north, runways. taxiways, and the air carrier ramp areas of the airport necessarily are cleared of snow while they are being used by landing, taxiing, and parking aircraft. All vehicles operating on, or adjacent to, usable runways or taxiways are required to be equipped with two-way radios and must be in contact with the tower or be escorted by a vehicle with a two-way radio in contact with the tower. All communications between such vehicles and the tower are on the ground control frequency of 121.9.

At the time of the accident, runway sweeping was necessary and was in progress. The sweeper was a commercial Snowblast Vehicle with a gross weight in excess of 34,000 pounds, and was equipped with a two-way radio, standard vehicular lights, and an SAE standard 10-inch, 360° amber rotating beacon on top of the cab roof. Witnesses stated that they had observed the beacon operating when the sweeper was on the runway. The sweeper began work on Runway 03 about 1230 and made 4 to 6 swaths the full length of Runway 03 during the operation. Because of air traffic, the control tower had directed the sweeper to leave the runway three times. The last time the sweeper operator was in contact with the tower was at 1309:40, and no further communications were had between the sweeper operator and the control tower. It took the sweeper 5 to 7 minutes to traverse the length of the runway. At the time of the accident, the sweeper was traveling northeast on Runway 03 about 1,500 feet from the approach end on the east side of the centerline. There were two runway exits in the vicinity of the accident; one service road located about 1,000 feet sway, and one taxiway at about 2,305 feet from the Runway 03 threshold.

On the day of the accident, the air traffic controller reported for his normally scheduled shift at 0303. At the tire of the accident, he was assigned to the combined positions of clearance delivery/ground control/local control, (GC/LC), having assumed these duties at 1303 and he had been on duty for 5 hours, 16 minutes. Two hours 53 minutes were logged on operating positions within the facility (AR = 1+28, CG/LC = 1+25). Before reporting for his assigned shift, he had been off duty for 16 continuous hours.

The GC/LC controller stated that upon assuming the CG/LC operating positions, he received a normal position briefing from the controller he was relieving and was advised that there was an aircraft on the runway 3 ILS final approach and Sweeper 7 (the involved sweeper) was on the runway. He stated that operations were normal and Sweeper 7 was being directed on and off the runway between arriving and departing traffic. He stated that the runway lights were on their highest setting ('step 5) at the time of the accident.. He stated that he received a verbal hand off of Ozark 650 from the approach controller when the flight was about 10 miles southwest of the airport and that the flight did not report on the tower frequency. He then asked the approach controller to "hit OZ650 again" and that he then initiated a call to the flight on tower frequency and that the flight responded to his call. He then cleared the flight to land and issued the RVR. He stated that he could not recall whether Ozark 650 had its landing lights on or not.

The transcript of tower communications shows that neither the approach controller nor the local controller advised Ozark 650 of snow removal operatfons. Also the local Controller did not communicate with Sweeper 7 after he took the hand off of Ozark 650. The transcript showed that in the 12 minutes preceeding the accident, the controller had six communications with Sweeper 7, involving position reports by the sweeper operator, clearance to cross on intersecting runway, and clearance off the runway for a landing airplane, then back on the runway. The last communication between the controller and Sweeper 7 occurred about 6 minutes before the accident.

Investigators questioned the CG/LC controller as to when he last recalled seeing Sweeper 7. He stated that he knew that it had crossed Runway 33 southwest bound toward the approach end of Runway 03 and that he had lost sight of him at that time. When the CG/LC controller was questioned as to where Sweeper 7 was when he issued the landing clearance to Ozark 650, he stated he did not know where it was.

Two other similar incidents have been investigated by the Safety Board. On December 19, 1933, a Japan Air Lines Boeing 747 cargo flight was cleared by the local controller to land on Runway 06 right, at the Anchorage, Alaska, International Airport. At that time the runway visual range in the touchdown zone was 1000 feet in fog. Two minutes later the ground controller cleared an Airport Authority pickup truck to drive eastbound on Runway 06 right to make a Tapley run to check the braking action of the runway surface. The ground controller stated that he requested clearance from the local controller to allow the pickup on the runway. He was not aware that the 747 had been cleared to land. The local controller was busy with other communications and was not sure if he acknowledged the request from ground control. however, the ground controller believed the local controller said "okay."

The crew of the Japan Air Lines B-747 stated they did not see the vehicle prior to the collision, which occurred about 2000 feet beyond the runway threshold while the airplane's main gear was on the ground but before the nose had been lowered from the landing attitude. The vehicle's lights and rotating beacon were on at the time. The crew observed a dull flash and felt a jolt under the airplane at which time the antiskid inoperative warning light illuminated, followed shortly thereafter by an indication of number 1 hydraulic system inoperative. Although the entire wheel truck assembly was separated from the left body gear, the captain was able to slow the airplane and turn off the runway. There was no major damage to the airplane. The pickup truck was destroyed and the driver received serious injuries.

On March 8, 1384, at the Greater Cincinnati Airport, a Piedmont Airlines being 737 was forced to make a go-around after touchdown on Runway 36 in a-der to avoid seven snow removal vehicles operating on the runway. When the Piedmont flight was approximately 15 miles from the airport and under the control of Cincinniti Approach Control, the local controiler had given the ground controller approval to clear the snow removal vehicles onto Runway 36. The snow plows were proceeding northbound on the runway in a "V" formation and were accompanied by an automobile which maintained communication with the ground controller.

The airplane contacted the tower when at the outer marker and was cleared to land by the local controller. There was no coordination or canversation between the local controller and ground controller concerning the vehicles on the runway when the landing clearance was issued.

The weather was reported as: ceiling 300 feet obscured, runway visual range 1200 feet in snow and blowing snow. As the airplane touched down on the runway. the captain saw a rotating amber beacon on one of the vehicles and initiated a go-around immediately. The airplane lifted off and passed over the vehicles with an estimated clearance of 10 feet. It landed safely at the airport following the occurrence.

The National Transportation Safety Board determines that the probable cause of these accidents were Inadequate Control Tower Service by Air Traffic Control Personnel Factors relating to these accidents were weather conditions; snow, obscuration, low ceiling; and vehicles on the runway. Refer to the attached Briefs of Aviation Accidents.

As a result of these investigations, the Safety Board issued the following recommendations to the Federal Aviation Administration:

> Develop a mechanical/aural/visual (or combination thereof) alert device and require its use by local and ground controllers to coordinate their activities when a vehicle has been cleared to operate on the active duty runway for an extended period such as in snow removal operations. (Class II, Priority Action) (A-85-15)
>
> Periodically emphasize in the training of air traffic control personnel providing airport advisory services the proper application of runway usage procedures stressing positive cocrdination between control positions. (Class II, Priority Action) (A-85-16)
>
> Periodically emphasize in the training of air traffic controller personnel the requirements contained in the Air Traffic Control Handbook 7310.651). March 1984 for restricting vehicle and aircraft operations in the ILS critical areas when the ILS is being used for approach/landing guidance and the reported ceiling, visibility or runway visual range are below the specified levels. (Class II, Priority Action) (A-85-17)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
vice Chairmen

/s/ G.H. PATRICK BURSLEY
Member

February 1, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident

File No. - 3315 12/20/83 SIOUX FALLS,SD A/C Reg. No. N994Z Time (Lcl) - 1317 CST

----Basic Information----
Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC
Name of Carrier -OZARK AIR LINES, INC
Type of Operation -SCHEDULED,DOMESTIC,PAX/CARGO
Flight Conducted Under -14 CFR 121
Accident Occurred During -LANDING

Aircraft Damage
SUBSTANTIAL
Fire
ON GROUND

Injuries	Fatal	Serious	Minor	None
Crew	0	0	0	5
Pass	0	0	2	79
Other	1	0	0	0

----Aircraft Information----
Make/Model - DOUGLAS DC-9-31
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - UNK/NR
No. of Seats - 110

Eng Make/Model - P & W JT8D-7
Number Engines - 2
Engine Type - TURBOFAN
Rated Power - UNK/NR

ELT Installed/Activated - NO -N/A
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - COMPANY
Method - TELETYPE
Completeness - UNK/NR
Basic Weather - IMC
Wind Dir/Speed- 070/009 KTS
Lowest Sky/Clouds - UNK/NR
Lowest Ceiling - 1000 FT OBSCURED
Obstructions to Vision- BLOWING SNOW
Precipitation - SNOW
Condition of Light* - DAYLIGHT

Itinerary
Last Departure Point
SIOUX CITY,IA
Destination
SAME AS ACC/INC

Type of Flight Plan - IFR
Type of Clearance - IFR
Type Apch/Lnds - ILS-COMPLETE
FULL STOP

Airport Proximity
ON AIRPORT

Airport Data
JOE FOSS FIELD
Runway Ident - 03
Runway Surface - CONCRETE
Runway Status - SNOW - DRY

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
ATP
SE LAND,ME LAND

Age - 38
Biennial Flight Review
Current - YES
Months Since - 5
Aircraft Type - DC-9-30

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)

Total	25217	Last 24 Hrs	UNK/NR
Make/Model	9776	Last 30 Days	UNK/NR
Instrument	UNK/NR	Last 90 Days	UNK/NR
Multi-Eng	UNK/NR	Rotorcraft	UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
DURING LANDING THE CREW ACQUIRED VISUAL REFERENCE WITH THE GROUND & APCH LIGHTS ABOUT 200 FT AGL, FOLLOWED BY VISUAL SIGHTING OF THE RWY. SINCE THE ATIS REPORTED BLOWING SNOW, THE CREW EXPECTED TO SEE, & WAS NOT SURPRISED TO SEE, SNOW BLOWING ACROSS THE RWY ABOUT 2,000 FT BEYOND THE THRESHOLD. AT ABOUT 2,200 FT DOWN THE RWY THE ACFT ENTERED A CLOUD OF SNOW, & THE RIGHT WING STRUCK A LARGE SNOW SWEEPING VEHICLE WHICH WAS TRAVELING IN THE SAME DIRECTION & TO THE RIGHT OF THE RWY CENTERLINE. THE ACFT'S RIGHT WING SEPARATED & IT SWERVED OFF THE RWY. NEITHER THE APPROACH CONTROLLER NOR THE LOCAL CONTROLLER ADVISED THE FLT OF SNOW REMOVAL OPERATIONS, NOR DID THE LOCAL CONTROLLER COMMUNICATE WITH THE SWEEPER AFTER HE TOOK THE HAND-OFF OF THE FLT FROM APPROACH CONTROL. HE ALSO STATED HE DID NOT KNOW WHERE THE SWEEPER WAS WHEN HE CLEARED THE FLT TO LAND.

Brief of Accident (Continued)

File No. - 3315 12/20/83 SIOUX FALLS,SD A/C Reg. No. N994Z Time (Lcl) - 1317 CST

Occurrence ON GROUND COLLISION WITH OBJECT
Phase of Operation LANDING - ROLL

Finding(s)
1. WEATHER CONDITION - SNOW
2. WEATHER CONDITION - OBSCURATION
3. CONTROL TOWER SERVICE - INADEQUATE - ATC PSNL(LCL/GND/CLNC)
4. OBJECT - VEHICLE

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 3

Factor(s) relating to this accident is/are finding(s) 1,2,4

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident/Incident

File No. - 6000 12/19/83 ANCHORAGE,AK A/C Reg. No. J8151 Time (Lcl) - 0905 AST

----Basic Information----

Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC
Name of Carrier -JAPAN AIRLINES
Type of Operation -SCHEDULED,INTL,CARGO
Flight Conducted Under -14 CFR 121
Acc/Inc Occurred During -LANDING

Aircraft Damage
SUBSTANTIAL
Fire
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	0	3
Pass	0	0	0	0
Other	0	1	0	0

----Aircraft Information----

Make/Model - BOEING 747-200F
Landing Gear - UNK/NR
Max Gross Wt - 820000
No. of Seats - UNK/NR

Eng Make/Model - P & W JT9D-70
Number Engines - 4
Engine Type - TURBOFAN
Rated Power - 53000 LBS THRUST

ELT Installed/Activated - YES/NO
Stall Warning System - YES

----Environment/Operations Information----

Weather Data
Briefing - COMPANY
Method - IN PERSON
Completeness - UNK/NR
Basic Weather - INC
Wind Dir/Speed- CALM
Visibility - .125 SM
Lowest Sky/Clouds - 100 FT
Lowest Ceiling - 100 FT OBSCURED
Obstructions to Vision- FOG
Precipitation - NONE
Condition of Light - NIGHT(DARK)

Itinerary
Last Departure Point
TOKYO, JAPAN
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lnds - ILS-COMPLETE

Airport Proximity
ON AIRPORT

Airport Data
ANCHORAGE INTL
Runway Ident - 06R
Runway Lth/Wid - 10897/ 150
Runway Surface - MACADAM
Runway Status - DRY

----Personnel Information----

Pilot-In-Command
Certificate(s)/Rating(s)
ATP
ME LAND

Age - 52
Biennial Flight Review
Current - YES
Months Since - 1
Aircraft Type - B-747

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)

Total	17000	Last 24 Hrs	7
Make/Model	3300	Last 30 Days	UNK/NR
Instrument	UNK/NR	Last 90 Days	UNK/NR
Multi-Eng	UNK/NR	Rotorcraft	UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----

AT 2359 THE LOCAL CONTROLLER CLEARED THE FLT TO LAND ON RWY 6R. AT 0001 THE GROUND CONTROLLER CLEARED A STATE-OPERATED PICK-UP TRUCK ONTO RWY 6R FOR A TAPLEY RUN. THE GROUND CONTROLLER STATED THAT HE REQUESTED CLEARANCE FROM THE LOCAL CONTROLLER TO ALLOW THE TRUCK ON THE RWY. HE WAS NOT AWARE THAT THE B-747 HAD BEEN CLEARED TO LAND. THE LOCAL CONTROLLER WAS BUSY WITH OTHER COMMUNICATIONS & WAS NOT SURE IF HE ACKNOWLEDGED THE REQUEST FROM GROUND CONTROL; HOWEVER, THE GROUND CONTROLLER BELIEVED THE LOCAL CONTROLLER SAID "OKAY." THE ACFT STRUCK THE TRUCK ABOUT 2,000 FT BEYOND THE APPROACH END OF THE RWY WHILE THE ACFT'S MAIN LANDING GEAR WAS ON THE GROUND BUT THE NOSE HAD NOT YET BEEN LOWERED FROM THE LANDING ATTITUDE. THE FLT CREW STATED THAT THEY DID NOT SEE THE TRUCK PRIOR TO THE COLLISION. AT 0013 THE RWY VISUAL RANGE(RVR) WAS 600 FT VARIABLE 000 FT.

Brief of Accident/Incident (Continued)

File No. - 6000 12/19/83 ANCHORAGE,AK A/C Reg. No. JB151 Time (Lcl) - 0005 ADT

Occurrence IN FLIGHT COLLISION WITH OBJECT
Phase of Operation LANDING - FLARE/TOUCHDOWN

Finding(s)
1. LIGHT CONDITION - DARK NIGHT
2. WEATHER CONDITION - LOW CEILING
3. WEATHER CONDITION - FOG
4. WEATHER CONDITION - OBSCURATION
5. CONTROL TOWER SERVICE - INADEQUATE - ATC PSNL(LCL/GND/CLNC)
6. OBJECT - VEHICLE

---Probable Cause---

The National Transportation Safety Board determines that the Probable Cause(s) of this Accident/Incident is/are finding(s) 5

Factor(s) relating to this incident is/are finding(s) 1,2,3,4,6.

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5031 3/08/84 ERLANGER,KY A/C Reg. No. N794N Time (Lcl) - 0742 EST

----Basic Information----
Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC
Name of Carrier -PIEDMONT AVIATION
Type of Operation -SCHEDULED,DOMESTIC,PAX/CARGO
Flight Conducted Under -14 CFR 121
Incident Occurred During -LANDING

Aircraft Damage
NONE
Fire
NONE

Injuries	Fatal	Serious	Minor	None
Crew	0	0	0	5
Pass	0	0	0	17
Other	0	0	0	0

----Aircraft Information----
Make/Model - BOEING 737-200
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 90000
No. of Seats - 112
Eng Make/Model - P & W JT8-15
Number Engines - 2
Engine Type - TURBOJET
Rated Power - 15500 LBS THRUST
ELT Installed/Act - YES/NO
Stall Warning Sys - YES

----Environment/Operations Information----
Weather Data
No Briefing - FSS
Method - TELEPHONE
Completeness - FULL
Basic Weather - IMC
Wind Dir/Speed- 100/010 KTS
Visibility - 300 SM
Lowest Sky/Clouds - 300 FT
Lowest Ceiling - 300 FT OBSCURED
Obstructions to Vision- BLOWI G SNOW
Precipitation - SNOW
Condition of Light - DAYLIGHT

Itinerary
Last Departure Point
LOUISVILLE,KY
Destination
SAME AS ACC/INC

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lndg - ILS-COMPLETE

Airport Proximity
ON AIRPORT

Airport Data
GREATER CINCINNATI INTL
Runway Ident - 36
Runway Lth/Wid - 9500/ 150
Runway Surface - CONCRETE
Runway Status - SNOW - WET

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
COMMERCIAL,ATP,FLT ENG
SE LAND,ME LAND

Age - 38
Biennial Flight Review
Current - YES
Months Since - 4
Aircraft Type - B-737

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT

Flight Time (Hours)

Total	- UNK/NR	Last 24 Hrs	- UNK/NR
Make/Model	- 2400	Last 30 Days	- UNK/NR
Instrument	- UNK/NR	Last 90 Days	- UNK/NR
Multi-Eng	- UNK/NR	Rotorcraft	- UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
WHILE THE ACFT WAS ABOUT 15 MI SW OF THE ARPT BEING VECTORED FOR A RWY 36 CAT II APPROACH, THE LOCAL CONTROLLER GAVE THE GROUND CONTROLLER PERMISSION TO CLEAR SNOW REMOVAL EQUIPMENT TO PROCEED NORTH ON RWY 36 & TO EXIT RWY 36 AT THE INTERSECTION OF RWY 27L. THE ACFT REPORTED AT THE OUTER MARKER & WAS CLEARED TO LAND. THERE WAS NO CONVERSATION BETWEEN THE CONTROLLERS AS TO THE STATUS OF THE SNOW REMOVAL EQUIPMENT. JUST AFTER TOUCHDOWN THE CAPTAIN OBSERVED THE AMBER ROTATING BEACON OF ONE OF THE VEHICLES ABOUT 1,000 FT AHEAD. THE CAPTAIN MADE AN IMMEDIATE GO-AROUND & THE ACFT MISSED THE 8 VEHICLES BY AN ESTIMATED 10 FT. THE RWY VISUAL RANGE (RVR) WAS REPORTED AS 3,000 FT.

Brief of Incident (Continued)

File No. - 5031 3/08/84 ERLANGER,KY A/C Reg. No. N794M Time (Lcl) - 0742 EST

Occurrence MISCELLANEOUS/OTHER
Phase of Operation LANDING

Finding(s)
1. WEATHER CONDITION - LOW CEILING
2. WEATHER CONDITION - SNOW
3. WEATHER CONDITION - OBSCURATION
4. CONTROL TOWER SERVICE - INADEQUATE - ATC PSNL(LCL/GND/CLNC)
5. OBJECT - VEHICLE
6. ABORTED LANDING - PERFORMED - PILOT IN COMMAND
7. GO-AROUND - INITIATED - PILOT IN COMMAND

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 4

Factor(s) relating to this incident is/are finding(s) 1,2,3,5

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No.	*928*
Aircraft Operator:	G. *6* J. Leasing Company
Aircraft Type & Registration:	Machen Superstar I (Piper PA-60-601P)
Location:	Cockeysville, Maryland
Date 6 fire:	April 28, *1984; 1507* Eastern Standard Time
Persons on Board:	2 -- Pilot-1; Passenger-1
Injuries:	Fatal - 2
Aircraft Damage:	Destroyed
Other Damage or Injury	None
Type of Occurrence:	Loss of Power/Loss of Control
Phase of Operation:	Climb *to* crofse

On April 28, 1984, N6079R, a Piper Aerostar, serial number 61P-0735-8063359, was scheduled for a pleasure flight from Lancaster, Pennsylvania, to Gainesville, Florida, on an instrument flight rule (IFR) flight plan, with a final cruising altitude of FL 180.

On the morning of the accident, the pilot of N6079R traveled from Baltimore, Maryland, to Lancaster, Pennsylvania, to pick up the airplane that had been upgraded with a Machen, Inc., 656 Superstar Conversion. At that time, he received a 30-minute dual familiarization flight and a short review of the performance charts and flight manual supplement associated with the conversion. The fuel tanks were topped off after the familiarization flight.

About 1125, the pilot of N6079R received a partial weather briefing from Washington Flight Service Station (FSS). At 1422, he called the Harrisburg Flight Service Station, obtained an abbreviated briefing from Lancaster to Gainesville, and filed a flight plan. Official weather reports and forecasts the day of the accident showed no significant weather along the route of flight, and there were no SIGMETs or AIRMETs pertinent to the area of the accident. Ceilings were between 4,000 and 5,000 feet with layers to above 20,000 feet; visibility beneath was unrestricted.

A witness at the Lancaster Airport described the pilot as nervous and said his "hands were shaking." Also, the instructor who had given him the familiarization ride testified that the pilot said he felt uncomfortable and nervous. However, a close friend with whom the pilot had talked by telephone just before

takeoff did not detect nervousness in his vofce. The instructor: saw the aircraft takeoff and obcerved nothing unusual.

Following its takeoff at 1448, Lancaster Tover released N6079R io Harrisburg Approach Control *at 1450;* tbe flight was subsequently handed off to the New York Air Route Traffic Control Center (ARTCC) and then *to* the Washington ARTCC. Each Center communicated with the flight. and the pilot acknowledged and responded to instructloas after each transmission. At 1457:42, Washington Center cleared the flight to "maintain One eight zero.' Several other routine instructions were given to and acknowledged by the pilot of N6079R. At 1503:25, N6079R transmitted, "Aerostar *six* oh seven nine Romeo Leaving seventeen for eighteen." The next transmission froa the flight was a Mayday call at 1505:26, which was acknowledged by Washington Center at 1505:34. N6079R responded at 1505:38, "OK, Mayday, lost engines, lost engines, droppiag fast." *This was* the *last* transrission from N6079R. Radar contact was lost less than 2 minutes later. The aircraft crashed shortly thereafrer in a grassy field adjacent to a road in Cockeysville. Maryland. The airplane was demolished and the two occupants were killed. There was no fire, and there were no injuries to persons on the groucd.

h readout of the recorded radar dars from the Baltimore Approach Control facility revealed that N6079R descended froa 16,900 feet *to* 2,300 feet In about *90* seconds, an average descent rate of *more* than 9,700 feet per minute.

Witnesses saw the aircraft after ft descended through the overcast when it was estimated o be bctveen 3.000 to 1,500 feet above ground level (AGL). Weather at the site vas partly cloudy. According to several witnesses, one a current pilot. there was a discernible pitchup, described by one witness as abrupt, the wings were "bankfag" ok "shifting" from left to right continuously, the plane rolled to an fnverted position and then entered a nosedown attitude. The flaps aod gear were up. Several witnesses saw something fall from the airplane before *it* hit the ground.

The Piper Aerostar was purchased in January 1984. and, io February 1984 at the request of the pilot, had been modified by the addition of an auxiliary fuel tank. The pilot had flown the plane to Florida and back three or four times after the fuel tank installation.

N6079R vas upgraded most recently vith a Machen, Inc., 656 Superstar Cooversion. which included the installation of two turbocharger-equipped engines, vith full feathering propellers. *The* conversion was made by a firm certified by the Federal Aviation Administration (FAA) for repair and maintenance on Piper Aerostar airplanes. Work or? N6079R was completed and checked out by an airframe and powerplants (A&P) nechanic. and was test flown

the day before the accident. The instructor/test pilot noticed no unusual characteristics vith regard to cooling, engine stability vis-a-vis rate of fuel flow, manifold pressure, or high oil temperatures. He stated chat during the familiarization flight with the pilot on the day of the accident the fuel tank selectors were in the on position, that fuel in all tanks would be used with the selectors in that position, and that there vas no reason for them to have been changed. The pilot's attention was directed to the expanded Hachen Superstar portion of the flight manual. especially the power-to-fuel ratio settings, and during the flight, emphasis was directed to engine gages, the new digital fuel flov system. and pover settings.

The National Transportation Safety Board's examination of the wreckage and engines and propellers indicated that neither engine was developing power at impact. Both propellers were attached to their respective hubs and all blades were in the feathered position. Oil was present in both propeller governing units. The engines were free of preimpact deficiencies whlch would have affected normal engine operation. The electric fuel boost puap switches vere found in the off position and the fuel mixtures on rich. Yhen the boost puaps are off during climb above 10,000 feer, insufficient positive fuel head pressure to the engine driven high pressure fuel pumps results in puop cavitation and fuel starvation The first indication of potential starvation would have been noticeable on the fuel pressure gage, located in the lover right instrument panel. The normal operating procedures Listed in the FAA Approved Airplane flight Manual require the electric fuel boost pumps to be on during climb above 10,000 feet; the takeoff checklist on the left sun visor of the airplane also included this statement. Flight tests conducted by Hachen verified that the engines will quit at altitude if the leveloff is initiated by first reducing propeller rpm. The engines cannot be restarted if the mixture is rich.

The fuselage vas demolished, and the lover forward area and belly area vefe crushed upward and accordioned aft. The empennage was separated from the fuselage. The right vfng was broken into three major sections: an inboard section out to about wing station (WS) 140 with retracted flap attached, an outboard wing panel from US 140 to 195, and the wing extension assembly with the wingtip attached. At US 195, the wing extension assembly was separated from the outboard wing panel along the chordwise row of rivet attachment points to the upper and lower surfaces of the wing skin. On the outboard end of the wing panel at WS 195, attachment clips were installed on the wing rib. but there vere no rivet holes within these clips to provide for attachment to the intercostals of the wing extension assembly. The aft intercostal of the wing extension assembly did not contain rivet holes to provide for the attachment of the clips on the right ving panel. The forward intercostal contained three drilled holes, but there was no evidence that rivets had

ever been installed, The aileron inboard end vas partially attached at the inboard hinge; the remainder of the right aileron vas separated from the vfng and was found in two pieces about 1/2 nil- froa the accident site, One of the pieces coataincd a posi:ive beod which aligned with a positive bend and fracture in the right wing. The left wing was also broken into *three* aain pieces. *an* inboard section *out* to WS 135 with retracted flap attached, an outboard panel from WS 135 to WS 195, and the wing extension assembly. The attachment clips for the vfng exreasion assembly were pulled from the ving rib and were still attached *to* the intercostals on the wing extension assembly. The left aileron vas separated from the wing at the hfnge points.

All fractures observed during the examination of the wreckage were typical of overload failures. The alignment of the positive bend in the right aileron with the positive beod in the right vfng *is evidence* that the two bear together prior to separatfon of the aileron. Although the attachment rivets between the right ving extensfon assembly and the intercostals were missing, and the abseace of the rivets would compromise the structural integrity of the wing assembly, the evidence indicates that this *omission was not a factor in* this accident.

The pilct was certificated as a private pilot. airplane single engine land, on Yay 5, 1968. A auitiengine rating was issued in March 1975 and an instrumeat rating in Hay 1970 after initial disapproval and *flight retesting* each *time,* and a single engine sea rating was issued in July 1975. In June 1983, the pilot reported *a* total of 2,500 flight hours on his application for a third class medical certificate. However, ro assessment can be made of flight time reported ok iaacruaeat and multiengine experience since complete records do not exist, and the absence of entries in his logbook precludes an evaluation of training received. FAA had no recorded vfolatfons agafast the pilot. but he had been involved in a ground loop accident in 1968, and in 1971 he suffered injuries in *a* helicopter accident vhile receiving dual instruction.

The airplane had been flown 105 hours since its purchase in January 1984. Although there vere nc Aerostar entries in the pilot's flight log, he had received 60.5 hours dual instruction by the sellers of the Aerostar since purchase, including the 30-minute familiarization flight on April 28 following the Superstar conversion. In addition, ue bad received 2 hours of Aerostar flight transition Instruction at the Fiper Training Center in Vero Beach, Florida, fn March 1984, following *2* dags of ground transition school. However, the Piper flight Instructor did not issue a transition certificate, but recommended further multiengine practice with an instructor. In 8 report on his assessment *of* rbe pilot's perforcance. the instructor listed deficiencies, such as the pilot's inabiiity to remember procedures, lack of understanding of the procedures, poor

performance of flight maneuvers, and slow reaction time.

The pilot held a third class medical certificate with a corrective lens limitation, issued on June *24,* 1983. Eis doctor had seen him for a brief visit a week before the accident and said he believed the pilot was physically and mentally sound. A toxitology test following the accident was negative for drugs and alcohol.

In summary, the investigation of this accident revealed that the loss of both engines resulted from fuel starvation because the electric fuel boost pumps most probably were uot on during the climb above 10,000 feet. It is not likely the pilot turned them off during the climb. but rather that he never turned them on initially as required by tne flight manual and checklist. Although he was certified for multiengine instrument flight, his demonstrated proffciency 1 month before the Hachen conversion *was* not adequate to earn him a transition certificate. There is sufficient evidence to suggest that the pilot vas nervous and uncomfortable about flying to Florida. Self-induced psychological stress over his minimal experience in the newly converted, high performance airplane may have contributed to or been responsible for his unease, Once dual engine failure occurred, the demanding situation exceeded the pilot's capabilities and caused hin to lose control of the airplane, In addition, part of the descent voutd have been in instrument conditions, and spatial disorientation could hate contributed to his inabilfty to maintain control. Given the pilot's recorded lack of proficiency in the Aerostar, he probably was not capable, in a stressful situation, t6 perform the steps *in* the emergency checklists for "Engine Failure During Flight" and "Restarting Feathered Engine" which contained up to 28 steps. Given the rapid descent rate disclosed by the radar data, any abrupt control input or attitude change could result in positive G forces exceeding the airplane's limitations.

The National Transportation Safety Board issued the following recommendation to the FAA as a result of this investigation:

> Issue an Airworthiness Directive *to* require a one-time inspection (and repair if necessary) of Models PA-60-6018. -601P, and -602P Piper Aerostar airplanes to determine whether the intercostals of the wing extension assemblies are properly attached with rivets to the wing rib structure at wing station 195. (Class II, Priority Action) (A-85-31)

The attached Brief of Accident contains the Safety Board's conclusions, findings of probable cause, and related factors.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

May 2, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident

File No. - 928 4/28/84 COCKEYSVILLE,MD A/C Reg. No. N6079R Time (Lcl) - 1507 EST

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -PERSONAL
Flight Conducted Under -14 CFR 91
Accident Occurred During -DESCENT

Aircraft Damage
DESTROYED
Fire
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	1	0	0	0
Pass	1	0	0	0

----Aircraft Information----
Make/Model - MACHEN SUPERSTAR I PA-60-601P
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 6000
No. of Seats - 6
Eng Make/Model - LYCOMING IO-540-S1A5HM
Number Engines - 2
Engine Type - RECIP-FUEL INJECTED
Rated Power - 325 HP
ELT Installed/Activated - YES/NO
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - FSS
Method - TELEPHONE
Completeness - FULL
Basic Weather - VMC
Wind Dir/Speed- CALM
Visibility - 20.0 SM
Lowest Sky/Clouds - 4200 FT
Lowest Ceiling - 4200 FT OVERCAST
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

Itinerary
Last Departure Point
LANCASTER,PA
Destination
GAINESVILLE,FL

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lnds - NONE

Airport Proximity
OFF AIRPORT/STRIP.

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - N/A
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
PRIVATE
SE LAND,ME LAND,SE SEA
Instrument Rating(s) - AIRPLANE

Age - 58
Biennial Flight Review
Current - UNK/NR
Months Since - UNK/NR
Aircraft Type - UNK/NR

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)			
Total	2500	Last 24 Hrs	UNK/NR
Make/Model	105	Last 30 Days	UNK/NR
Instrument	UNK/NR	Last 90 Days	UNK/NR
Multi-Eng	UNK/NR	Rotorcraft	UNK/NR

----Narrative----
ON THE DAY OF DEPARTURE THE PLT HAD RECEIVED A 30 MIN FAMILIARIZATION FLT UPON COMPLETION OF THE SUPERSTAR CONVERSION. EMPHASIS WAS DIRECTED TO ENG GAGES, FUEL FLOW & COUNTER, & POWER SETTINGS. THE FLT WAS FLOWN AT 5,500 FT. THE PLT THEN OBTAINED A WX BRIEFING & FILED A FLT PLAN. ABOUT 15 MIN AFTER DEPARTURE, WHILE CLIMBING THRU FL 170, THE PLT RADIOED THAT HE HAD LOST BOTH ENGS. THE ACFT WAS SUBSEQUENTLY OBSERVED DESCENDING UNCONTROLLED OUT OF THE OVERCAST. AT ABOUT 1,000 FT AGL THE RIGHT AILERON SEPARATED. THE FUEL BOOST PUMPS WERE FOUND IN THE "OFF" POSITION. THE AFM STATES THAT THE BOOST PUMPS SHOULD BE ON DURING CLIMB ABOVE 10,000 FT. THE PLT HAD BEEN ENROLLED IN AN AEROSTAR TRANSITION SCHOOL THE PREVIOUS MONTH DURING WHICH A 2-HR COMBINED DEMONSTRATION/FLT EVALUATION FLT WAS CONDUCTED. THE INSTRUCTOR PLT RECOMMENDED FURTHER MULTI-ENG TRAINING.

Brief of Accident (Continued)

File No. - 928 4/28/84 COCKEYSVILLE,MD A/C Reg. No. N6079R Time (Lcl) - 1507 EST

Occurrence #1 LOSS OF POWER(TOTAL) - NON-MECHANICAL
Phase of Operation CLIMB - TO CRUISE

Finding(s)
1. FLIGHT MANUALS - NOT FOLLOWED - PILOT IN COMMAND
2. FLUID,FUEL - STARVATION
3. FUEL BOOST PUMP SELECTOR POSITION - IMPROPER - PILOT IN COMMAND
4. IMPROPER USE OF PROCEDURE,LACK OF TOTAL EXPERIENCE IN TYPE OF AIRCRAFT - PILOT IN COHMAND

Occurrence #2 LOSS OF CONTROL - IN FLIGHT
Phase of Operation CLIMB - TO CRUISE

Finding(s)
5. AIRCRAFT PERFORMANCE,TWO OR MORE ENGINES - INOPERATIVE
6. AIRCRAFT HANDLING - UNCONTROLLED - PILOT IN COMMAND
7. IMPROPER USE OF EQUIPMENT/AIRCRAFT,SPATIAL DISORIENTATION - PILOT IN COMMAND
8. IMPROPER USE OF EQUIPMENT/AIRCRAFT,INADEQUATE RECURRENT TRAINING - PILOT IN COMMAND

Occurrence #3 AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation DESCENT - UNCONTROLLED

Finding(s)
9. FLIGHT CONTROL,AILERON - OVERLOAD
10. DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND
11. FLIGHT CONTROL,AILERON - SEPARATION

Occurrence #4 IN FLIGHT COLLISION WITH TERRAIN
Phase of Operation DESCENT - UNCONTROLLED

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 1,2,3,6,7,9,10

Factor(s) relating to this accident is/are finding(s) 4,5,8

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No.	:	*5059*
Aircraft Operator	:	1. U.S. Air Force. 89th Military Airlift Wing 2. Mr. John R. Kowalczyk
Airplane Type and Registration:		1. Boeing VC-137-BN 58-6971 2. Cessna 3105 N3057L
Location	:	hkron, Ohio
Date and Tine	:	September 30, 1984, 1758 Eastern Daylight Time
Persons on Board -- Injuries	:	1. Crew 17 Passengers 28 - No Injuries 2. Crew 2 - No Injuries
Aircraft Damage	:	1. None 2. None
Other Damage or Injury	:	1. None 2. None
Type of Occurrence	:	Air Traffic Coatrol System Operational Error
Phase of Operation	:	1. Climb - TO Cruise 2. Cruise - Normal

On September 30, 1984, at about 1758 1/, Air Force 2, 2/ a Boeing VC-137B (civilian B-707-153) operated by the 89th Military Airlift Wing. and N3057L, a Cessna 310, passed within less than the prescribed air traffic control (ATC) separation due to an ATC system operational error 3/. The incident occurred near Akron, Ohio.

The Cessna vas operating on an instrument flight rules (IFR) clearance on a flight from Green Bay, Wisconsin, to Annapolis, Maryland. The flight was operating at an assigned altitude of 13,000 feet and vas under the control of the Federal Aviation Administration's (FAA) Cleveland. Ohio, Air Route Traffic Control Center (ARTCC).

Air Force 2 had departed the Cleveland Hopkins Airport on an IFR clearance to Andrews Air Force base, Maryland. After departure from Cleveland. Air Force 2 vas assigned an altitude of 8,000 feet by the Cleveland departure controller, and control of the flight was transferred to the Cleveland ARTCC. On initial contact With the Cleveland ARTCC controller, (R 44) Air Force 2 was cleared to clinb to flight level 230 (FL 230). 4/

Both airplanes were identified and vere being observed on radar to be proceeding southeastbound with Air Force 2 behind but overtaking N3057L. Air Force 2 was about IS miles behind the Cessna when the Cleveland ARTCC controller instructed the flight to climb and maintain FL 230. At the time the climb instruction was issued. recorded radar data indicated that Air Force 2 was maintaining an indicated airspeed (IAS) of about 250 'mots and a rate of climb of about 1,500 feet per minute. As the flight passed through 10,000 feet 5/, the aircraft commander increased the flight's airspeed to about 320 knots IAS and then increased the rate of climb to about 3,300 feet per minute.

1/ All times shown herein are Eastern daylight time and are based on the 24-hour clock.

2/ Identification vhen transporting the Vice President of the United States.

3/ An error which results in less than the applicable separation minima between two or no-e aircraft, or between an aircraft ard terrain or obstacles and obstructions prescribed by FAA Handbook 7110.65 and supplemental instructions,

4/ A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet. For example, flight level 230 representa a barometric altimeter indication of 23,000 feet.

5/ 14 CFR Part 91.70 require.: that, "Unless otherwise authorized by the Administrator, no person may operate an aircraft below 10,000 feet MSL at an indicated airspeed of more than 250 knots (288 m.p.h.)."

As Air Force 2 continued its climb, the Cleveland ARTCC's computer conflict alert function 6/ activated as to both airplanes, alerting the controller to a prospective incursion on the prescribed separation. The controller, acting upon this infsnnation, instructed Air Force 2 to maintain 12,000 feet. Air Force 2 acknowledged the change in altitude assignment and stated to the controller that the flight was passing 12,200 feet in its climb when the instruction vas issued and that the flight would descend to 12,000 feet

Recorded radar data from the Cleveland ARTCC indicated that Air Force 2 reached an altitude of 13,000 feet before arresting its clinb and descending to 12.000 feet. Additionally, the data indicated that a minimum slant range distance of 0.25 nautical mile existed between the airplanes at 1759:49. At this time, Air Force 2 vas 600 feet below N3057L descending and passing off the Cessna's right. The minimum prescribed ATC separation is 1,003 feet vertical or 5 miles lateral clearance between the two airplanes.

The flightcrews of both airplanes stated that, at the tine of the occurrence, instrument meteorological conditions (IMC) existed and that they did not see each other. Additionally, the pilot of the Cessna stated that he vas not aware of the occurrence until contacted by Safety Board investigators.

The Cleveland ARTCC controiler, who was responsible for the separation of the airplanes, was a full performance level controiler vith 25 years experience. He was properly certificated for his position and was medically qualified. During an interview conducted after the incident the controller stared. "I should have turned him rather than climbed him." The controller had been assigned to his operating position about 10 minutes before the operational error took place. He stated Chat his workload was light to moderate at the tiae.

The Safety Board's investigation determined that the operatioral error occurred because of the unsatisfactory performance of the individual air traffic controller. The controller failed to assure that the prescribed minimum ATC separation would be maintained between Air Force 2 and the Cessna when their flightpaths crossed. The controller used poor judgment and poor control technique when he cleared Air Force 2 to clinb through the altitude being maintained by the Cessna. Two other control techniques — vertical or lateral separation -- were available, either of which would have assured the prescribed separation between the airplanes. First, the controller could have cleared Air Force 2 to maintain 12,000 feet until well past the Cessna and then issued the clearance to climb to FL 230; or the controller could have issued a turn to Air Force 2. and when the minimum lateral separation was attained, instructed the crew to climb to FL 230.

6/ An aural and/or visual alert to controllers that an actual or potential aircraft separation hazard exists. The alert is generated by preset separation parameters within the ATC computer. Sot all alerts indicate an actual compromise of separation; some alerts indicate that prescribed separation will be compromised if corrective action is not taken.

The Safety Board's investigation concluded that the Air Traffic Control System otherwise operated satisfactorily. The radio communications, radar, computer hardware and software were operating as designed and did not contribute to the operational error. In fact, the conflict alert function warned the controller of the potential conflict between the two airplanes.

The attached Briefs of Aviation Incidents contain the Safety Board's finding(s) and determination of probable cause(s) and factor(s) relating to this incident.

As a result of this investigation, the Safety Board issued the following safety recommendation to the Department of Defense:

> Equip all current and newly acquired fixed-wing and rotary-wing aircraft operated by the military departments, which are used primarily to transport passengers, with state-of-the-art cockpit voice recorders and digital flight data recorders that record sufficient parameters for effective accident investigation, and place these recorders in the aircraft for maximum survival potential. (A-84-134)

In its response letter, dated February 4, 1985, the Department of Defense agreed with the intent of this safety recommendation. The Secretary of Defense has directed that all airplanes used by the 89th Military Airlift Wing be retrofitted with more capable recorders.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

May 8, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5059 | 9/30/84 | AKRON,OH | A/C Reg. No. 86971 | Time (Lcl) - 1750 EDT

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -MILITARY/AF
Flight Conducted Under -14 CFR 91
Incident Occurred During -CLIMB

Aircraft Damage
NONE
Fire
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	0	17
Pass	0	0	0	28
Other	0	0	0	2

----Aircraft Information----
Make/Model - BOEING VC-137B-BN
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 259000
No. of Seats - UNK/NR
Eng Make/Model - P & W TF-3
Number Engines - 4
Engine Type - TURBOFAN
Rated Power - UNK/NR
ELT Installed/Activated - UNK/NR
Stall Warning System - YES

----Environment/Operational Information----
Weather Data
Wx Briefing - UNK/NR
Method - UNK/NR
Completeness - UNK/NR
Basic Weather - IMC
Wind Dir/Speed- UNK/NR
Visibility - UNK/NR
Lowest Scat/Clouds - UNK/NR
Lowest Ceiling - 3000 FT OVERCAST
Obstructions to Vision- FOG
Precipitation - RAIN
Condition of Light - DUSK

Itinerary
Last Departure Point
CLEVELAND,OH
Destination
CAMP SPRINGS,MD

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Ends - NONE

Airport Proximity
OFF AIRPORT/BIRIP

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - N/A
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
MILITARY
SE LAND;ME LAND
Instrument Rating(s) - AIRPLANE

Age - 35
Biennial Flight Review
Current - UNK/NR
Months Since - UNK/NR
Aircraft Type - UNK/NR

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT
Flight Time (Hours)

Total - 4592		Last 24 Hrs - UNK/NR	
Make/Model- UNK/NR		Last 30 Days- UNK/NR	
Instrument- UNK/NR		Last 90 Days- UNK/NR	
Multi-Eng - UNK/NR		Rotorcraft - UNK/NR	

----Narrative----
A BOEING VC-137B-BN, USAF 858-4971, OPERATING AS AIR FORCE 2 (AF-2), DEPARTED CLEVELAND, OH, AT ABOUT 1745 EDT ON AN IFR CLEARANCE. AFTER DEPARTING CLEVELAND, AF-2 WAS ASSIGNED AN ALT OF 8000 FT MSL BY CLEVELAND DEPARTURE CONTROL & WAS TRANSFERED TO CLEVELAND ARTCC. ON INITIAL CONTACT WITH CLEVELAND ARTCC, AF-2 WAS CLEARED TO CLIMB TO FLT LEVEL 230. A CESSNA 310J, N3057L, WAS CRUISING IN THE SAME VICINITY ON AN IFR CLEARANCE AT 13,000 FT & WAS ALSO UNDER CONTROL OF CLEVELAND ARTCC. AS AF-2 WAS CLIMBING THRU 12,200, ARTCC'S ATC COMPUTER CONFLICT ALERT FUNCTION WAS ACTIVATED FOR BOTH ACFT, ALERTING THE CONTROLLER OF A PENDING LOSS OF REQUIRED SEPARATION. THE CONTROLLER INSTRUCTED AF-2 TO MAINTAIN 12,000 FT. AF-2 ACKNOWLEDGED. HOWEVER, AF-2 REACHED APRX 13,000 FT BEFORE STARTING DESCENT & BEGN CONTD DECREASING. RADAR DATA SHOWED A MIN SLANT RANGE DIST OF 1/4 MI WITH 600 FT VERT SEPN. THIS CONSTITUTED AN ATC OPERATIONAL ERROR INVOLVING LESS THAN STANDARD SEPN. THE ACFT WERE IN IMC & NONE OF THE FLTS SAW THE CONFLICTING TRAFFIC

Brief of Incident (Continued)

File No. - 5059 9/30/84 AKRON,OH A/C Reg. No. 8697J Time (Lcl) - 1750 EDT

Occurrence MISCELLANEOUS/OTHER
Phase of Operation CLIMB - TO CRUISE

Finding(s)
1. IFR SEPARATION STANDARDS - NOT MAINTAINED - ATC PERSONNEL(ARTCC)

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 1

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5059 9/30/84 AKRON,OH A/C Reg. No. N3057L Time (Lcl) - 1758 EDT

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -PERSONAL
Flight Conducted Under -14 CFR 91
Incident Occurred During -CRUISE

Aircraft Damage
NONE
Fire
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	0	2
Pass	0	0	0	0
Other	0	0	0	45

----Aircraft Information----
Make/Model - CESSNA 310J
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 5100
No. of Seats - 6
Eng Make/Model - CONTINENTAL IO-470-U
Number Engines - 2
Engine Type - RECIP-FUEL INJECTED
Rated Power - 260 HP
ELT Installed/Activated - UNK/NR
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - FSS
Method - IN PERSON
Completeness - FULL
Basic Weather - IMC
Wind Dir/Speed- UNK/NR
Visibility - UNK/NR
Lowest Sky/Clouds - UNK/NR
Lowest Ceiling - 3000 FT OVERCAST
Obstructions to Vision- FOG
Precipitation - RAIN
Condition of Light - DUSK

Itinerary
Last Departure Point
GREEN BAY,WI
Destination
ANNAPOLIS,MD

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lndg - NONE

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - N/A
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
COMMERCIAL
SE LAND,ME LAND

Age - 54
Biennial Flight Review
Current - YES
Months Since - 13
Aircraft Type - C-310

Medical Certificate - VALID MEDICAL-WAIVER/LIMIT
Flight Time (Hours)
Total - 3002
Make/Model- UNK/NR
Instrument- UNK/NR
Multi-Eng - UNK/NR
Last 24 Hrs - UNK/NR
Last 30 Days- UNK/NR
Last 90 Days- UNK/NR
Rotorcraft - UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
A BOEING VC-137B-BN, USAF #58-6971, OPERATING AS AIR FORCE 2 (AF-2), DEPARTED CLEVELAND, OH, AT ABOUT 1745 EDT ON AN IFR CLEARANCE. AFTER DEPARTING CLEVELAND, AF-2 WAS ASSIGNED AN ALT OF 8000 FT MSL BY CLEVELAND DEPARTURE CONTROL & WAS TRANSFERED TO CLEVELAND ARTCC. ON INITIAL CONTACT WITH CLEVELAND ARTCC, AF-2 WAS CLEARED TO CLIMB TO FLT LEVEL 230. A CESSNA 310J, N3057L, WAS CRUISING IN THE SAME VICINITY ON AN IFR CLEARANCE AT 13,000 FT & WAS ALSO UNDER CONTROL OF CLEVELAND ARTCC. AS AF-2 WAS CLIMBING THRU 12,200 ARTCC'S ATC COMPUTER CONFLICT ALERT FUNCTION WAS ACTIVATED FOR BOTH ACFT, ALERTING THE CONTROLLER OF A PENDING LOSS OF REQUIRED SEPARATION. THE CONTROLLER INSTRUCTED AF-2 TO MAINTAIN 12,000 FT. AF-2 ACKNOWLEDGED, HOWEVER, AF-2 REACHED APRX 13,000 FT BEFORE STARTING DESCENT & SLOW CONTD DECREASING. RDAR DATA SHOWED A MIN SLANT RANGE DIST OF 1/4 MI WITH400 FT VRT SEPN. THIS CONSTITUTED AN ATC OPERATIONAL ERROR INVOLVING LESS THAN STANDARD SEPN. THE ACFT WERE IN IMC & NONE OF THE PLTS SAW THE CONFLICTING TRAFFIC

Brief of Incident (Continued)

File No. - 5059 9/30/84 AKRON,OH A/C Reg. No. N3057L Time (Lcl) - 1758 EDT

Occurrence MISCELLANEOUS/OTHER
Phase of Operation CRUISE - NORMAL

Finding(s)
1. IFR SEPARATION STANDARDS - NOT MAINTAINED - ATC PERSONNEL(ARTCC)

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 1

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No.	:	5058
Aircraft Operator	:	1. U.S. Air Force, 89th Military Airlift Wing 2. Mr. Bruce E. Collins
Airplane Type and Registration:		1. Boeing VC-137-BN 58-6970 2. Mooney M20C N6507U
Location	:	Seattle, Washington
Date and Time	:	October 18, 1984, 1445 Pacific Daylight Time
Persons on Board - Injuries	:	1. Crew 16 Passengers 33 - No Injuries 2. Crew 1 - No Injuries
Aircraft Damage	:	1. None 2. None
Other Damage or Injury	:	1. None 2. None
Type of Occurrence	:	Near Midair Collision
Phase of Operation	:	1. Approach - Between Initial and Final Approach Fixes 2. Cruise

On October 18, 1984, about 1445:27, 1/ the flightcrew of Air Force 2, 2/ a Boeing VC-137B (civilian B-707-153) operated by the 89th Military Airlift Wing, reported to the Boeing Field Airport Traffic Control Tower (ATCT) local controller that the flight had to take evasive action to avoid another aircraft. The near midair collision 3/ was reported by the aircraft commander (AC) who was occupying the right cockpit seat, regarded to be the copilot's seat. The assigned copilot was seated in the left seat and was flying the aircraft on an instrument approach to runway 31L at Seattle Boeing Field Airport. Shortly after the incident, the AC stated that the traffic was a Mooney airplane (low wing, single engine).

At the time of the incident, Air Force 2 was operating on an instrument flight rules (IFR) clearance and was inbound for a landing at Boeing Field. The flight had contacted the Seattle Terminal Radar Approach Control (TRACON) east arrival controller at 1436:35, and requested a touchdown time of 1447. Air Force 2 was vectored by the east arrival controller for the localizer backcourse approach to runway 31L.

Weather at the time was described by the flightcrew of Air Force 2 as good with the sky clear and reported visibility at 15 miles.

At 1441:40, the east arrival controller instructed Air Force 2 to descend to 3,000 feet and to proceed inbound on the final approach course. At 1442:34, the flight was cleared for the approach and instructed to cross the LACRE Intersection at or above 2,600 feet and to contact Boeing Tower on 120.6 MHz upon arrival at the LACRE Intersection. LACRE Intersection is 7.5 miles (distance measurement equipment) from the airport. The flight acknowledged the clearance. At 1442:49, the east arrival controller advised Air Force 2 of traffic at its 10 o'clock position, 2 miles distant. The flight acknowledged the traffic advisory, but advised the controller that it was not in sight. At 1443:11, the east arrival controller issued a second traffic advisory to Air Force 2 regarding traffic at its 11-o'clock position, 1 1/2 miles distant and on a northbound heading. Air Force 2 acknowledged the traffic advisory but again advised that it did not have the traffic in sight.

At 1443:29, Air Force 2 advised the east arrival controller that the flight was changing to the Boeing Tower frequency. At 1444:15, the east arrival handoff controller called the Boeing ATCT flight data controller and advised that Air Force 2 would be contacting them and that the flight did not have the traffic in sight that was off to its left. At 1444:45, Air Force 2 reported on the Boeing Tower frequency and advised that the flight had to take evasive action to avoid traffic.

1/ All times shown herein are Pacific daylight time and are based on the 24-hour clock.

2/ Identification when transporting the Vice President of the United States.

3/ An instance when a report is received by ATC personnel from an aircrew member that a collision hazard existed between two or more aircraft.

The aircraft commander, in arviewed by a Safety Board investigator after the incident, stated that the weather was good and that the flightcrew had been advised of the traffic. The AC, seated in the right seat, first observed thr traffic out of the airplane cockpit's left-side window. The airplane appeared to be level with his aircraft and on a collision course. Ee estimated ita distance from his aircraft to be 1,000 *to* 1,500 feet when first sighted. The AC assumed control of the aircraft from the left-seat pilot, retarded the power, and pushed the nose of the airplane over (down) slightly. The traffic passed directly over the midsection of Air Force 2 about 100 to 200 feet above the airplane. The traffic did not appear to have taken evasive action.

During an interview conducted on October 19, *1984.* the Seattle TRACON's east arrival controller stated that he first saw the traffic about SO miles south/southeast of the Seattle-Tacoma International Airport (SEA) and continued to monitor its progress. When it became apparent that the target could possibly be traffic for Air Force 2, he issued traffic advisories. The controller instructed Air Force 2 to contact Boeing Field Tower at the LACRE Intersection, and after his second traffic advisory when the flight was Et LACRE, Air Force 2 advised him that the flight was changing radio frequencies. He replied, "Air Force 2, *good* day." He instructed the east arrival handoff controller to advise Boeing Tower that the flight was on a 7 1/2-mile final to runway 31 and that it did not have the traffic in sight.

The SEA has a terminal control area (TCA). The TCA was structured by the FAA with SEA *as* the primary airport. Boeing Field Airport, located about *5* miles norrh of SEA, is outside the boundary aad under the altitude floor of the TCA as is the Boeing Field runway 31i localizer backcourse approach course. Boeing Field Airport is used extensively by general aviation. Additionally, the airport serves the Boeing Airplane Companies as a departure and arrival point for flight testing of their commercial and military airplanes.

The pilot of the small slngle-engine airplane, N6507U, vas interviewed by Safety Board investigators on November 28, *1964.* He stated that he was not aware of the incident until FAA Flight Standards personnel contacted him about 2 veeks after the occurrence. The pilot stated that about 3 to *4* weeks before the Incident, his airplane was vandalized aad the antenna for the No. 2 radio was stolen, rendering the No. *2* radio inoperative. The pilot steted that the No. 1 radio was not functioning properiy either and that he had not completed maintenance on the system because he normally used the No. 2 radio for communications. On the day of the incident, the pilot was conducting a business trip from Spanaway, Washington, airport, located south of Tacoma, Washington, near McChord Air Force Base, to Arlington, Washington. Be departed Spanavay about 1425. Because of the airplane's radio problems, the pilot did not file a flight plan and he was not able (nor was he required) to contact ATC for traffic advisories or to obtain an ATC clearance to fly through the TCA.

The pilot stated that, during the previous 3 years, he had averaged about 200 hours per year, operating in or out of the Seattle area. The pilot stated that on all previous flights, either into or out of the Seattle area, he always had contacted ATC for either traffic advisories or a TCA clearance. However, on the day of the incident, because he was unable to communicate vith ATC, he planned his flight so as to proceed east of the Seattle TCA. He believed that, at the time of the incident, he must have Seen preoccupied vith attempts to get his No. 1 radio working and had his head down in the cockpit. The pilot verified that his airplane, a Mooney M-20C, was not equipped with an altitude eccoding transponder.

Baaed on the Mooney pilot's reported cruisicg altitude of 2,500 feet mean sea level. recorded radar data obtained frw the Seattle TRACON indicated that a minimum slan: range distance of slightly less than 1/10th of a mile existed between the airplanes at 1445:07. Air Force 2 was on a heading of 303° and 8650713 was on a heading of 346°.

The pilot recalled that he did observe a "heavy" airplane off his port (left) ving at a distance of 1 to 2 miles. The "heavy" appeared to be inbound to Boeing Field at or beiov his cruising altitude of 2,500 feet. He did not observe any traffic come close to him at any time. The Safety Board believes that the heavy airplane observed by the Mooney pilot in fact was Air Force 2 and that the observation was made after the near midair collision had occurred.

The Safety Board's investigation determined chat the incident occurred in a see-and-avoid airspace environment which contained a mixture of controlled IFR traffic and uncontrolled VFR traffic. The uncontrolled VFR traffic was detected by the air traffic controller, and the flightcrev of the IFR traffic (Air Force 2) was advised of the traffic's relative position on two occasions. The near midair collision occurred because the flightcrew of Air Force 2 did not sight the VFR traffic in a timely manner and take appropriate action to avoid the other airplane. Moreover, when the VFR traffic was not observed after two ATC advisories, the flightcrew of Ais Force 2 could have (but did not) requested a vector (heading) to avcid the traffic. When rhe flightcrew of Air Force 2 finally obtained visual contact vith the traffic, an evasive maneuver was necessary to preclude an inflight collision between the airplanes.

Finally, the investigation determined that the pilot of N6507U used poor judgment in initiating a flight in close proximity to the Seattle TCA with both radios inoperative. This precluded the pilot from being in contact with ATC for traffic advisories or to obtain a clearance to fly through the Seattle TCA.

The Safety Board's investigation determined that the ATC system operated satisfactorily. The radio communications, radar, and computer functioned as designed and did not contribute to the near midair collision. The traffic advisories issued by the Seattle TRACON controller were proper and were in accordance with current FAA procedures.

The attached Briefs of Aviation Incidents contain the Safety Board's finding(s) and determination of probable cause(s) and factor(s) relating to the incident.

As a result of this investigation, the Safety Board issued the following safety recommendation to the Department of Defense:

> Equip all current and newly acquired fixed-wing and rotary-wing aircraft operated by the military departoents, which are used primarily to transport passengers, with state-of-the-art cockpit voice recorders and digital flight data recorders that record eufficient parameters for effective accident investigation, and place these recorders in the aircraft for maximum survival potential. (A-84-134)

In its response letter, dated February 4, 1985, the Department of Defense agreed uith the intent of the safety recommendation. The Secretary of Defense has directed that all airplanes used by the 89th Military Airlift Wing be retrofftted with more capable recorders.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATKICK BURSLEY
Member

May 8, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5058 10/18/84 SEATTLE,WA A/C Reg. No. 86970 Time (Lcl) - 1445 PDT

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -MILITARY/AF
Flight Conducted Under -14 CFR 91
Incident Occurred During -APPROACH

Aircraft Damage
NONE
Fire
NONE

	Injuries			
	Fatal	Serious	Minor	None
Crew	0	0	0	16
Pass	0	0	0	33
Other	0	0	0	1

----Aircraft Information----
Make/Model - BOEING VC-137B-BN
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 258000
No. of Seats - UNK/NR
Eng Make/Model - P&W TF-33
Number Engines - 4
Engine Type - TURBOFAN
Rated Power - UNK/NR
ELT Installed/Activated - UNK/NR
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - MILITARY
Method - UNK/NR
Completeness - FULL
Basic Weather - VMC
Wind Dir/Speed- 060/003 KTS
Visibility - 15.0 SM
Lowest Sky/Clouds - CLEAR
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light* - DAYLIGHT

Itinerary
Last Departure Point
SPOKANE,WA
Destination
SEATTLE,WA

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lnds - ILS-BACKCOURSE

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
BOEING FIELD
Runway Ident - 31L
Runway Lth/Wid - 10000/ 200
Runway Surface - ASPHALT
Runway Status - DRY

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
MILITARY
SE LAND,ME LAND
Instrument Rating(s) - AIRPLANE

Age - 33
Biennial Flight Review
Current - UNK/NR
Months Since - UNK/NR
Aircraft Type - UNK/NR

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT
Flight Time (Hours)
Total - 4602
Make/Model- UNK/NR
Instrument- UNK/NR
Multi-Eng - UNK/NR
Last 24 Hrs - UNK/NR
Last 30 Days- UNK/NR
Last 90 Days- UNK/NR
Rotorcraft - UNK/NR

----Narrative----
DURING ARRIVAL, A BOEING VC-137B-BN, USAF #58-6970, OPERATING AS AIR FORCE 2 (AF-2), WAS CLEARED FOR A LOCALIZER BACK-COURSE APCH. AT 1442:49, TRACON ADVISED AF-2 OF TRAFFIC AT ITS 10 O'CLOCK POSITION AT 2 MI, ALT UNKN. AT 1443:11, TRACON ADVISED AF-2 THE TRAFFIC HAD MOVED TO ITS 11 O-CLOCK POSITION AT 1-1/2 MI. AF-2 ACKNOWLEDGED BOTH TRANSMISSIONS. AT 1443.29, AF-2 ADVISED THAT THE FLT WAS CHANGING ITS FREQ TO BOEING TOWER. SHORTLY THEREAFTER, THE ACFT CMDR OF AF-2, SEATED IN THE RIGHT, SAW THE TRAFFIC, A MOONEY M20C, N6507U, ON A COLLISION COURSE. HE TOOK CONTROL & INITIATED EVASIVE ACTION. THE PLT OF N6507U WAS CRUISING AT 3,500 FT OUTSIDE THE SEATTLE TCA & DID NOT SEE AF-2, WHICH HAD CONVERGED FROM HIS RIGHT REAR AREA. THE MOONEY'S #1 RADIO WAS INOP & ITS #2 RADIO ANTENNA HAD BEEN VANDALIZED; THUS THE PLT WAS NOT IN RADIO CONTACT WITH ATC. THE LAST DIGIT/WHEEL ON HIS TRANSPONDER WAS STUCK ON '5' & CODE 1205 WAS BEING TRANSMITTED. THE TRANSPONDER HAD NO MODE 'C' ALT REPORTING CAPABILITY. ALL OF THE BACKCOURSE APCH WAS OUTSIDE THE TCA.

Brief of Incident (Continued)

File No. - 5058 10/18/84 SEATTLE,WA A/C Reg. No. 86970 Time (Lcl) - 1445 PDT

Occurrence NEAR COLLISION BETWEEN AIRCRAFT
Phase of Operation APPROACH - IAF TO FAF/OUTER MARKER (IFR)

Finding(s)
1. COMMUNICATIONS - NOT POSSIBLE - PILOT OF OTHER AIRCRAFT
2. TRAFFIC ADVISORY - ISSUED - ATC PERSONNEL(DEP/APCH)
3. VISUAL LOOKOUT - INADEQUATE - COPILOT
4. VISUAL LOOKOUT - DELAYED - PILOT IN COMMAND
5. REMEDIAL ACTION - PERFORMED - PILOT IN COMMAND

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 3,4

Factor(s) relating to this incident is/are finding(s) 1

National Transportation Safety Board
Washington, D.C. 20594

Brief of Incident

File No. - 5058 10/18/84 SEATTLE,WA A/C Reg. No. N6507U Time (Lcl) - 1445 PDT

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -PERSONAL
Flight Conducted Under -14 CFR 91
Incident Occurred During -CRUISE

Aircraft Damage
NONE
Fire
NONE

Injuries	Fatal	Serious	Minor	None
Crew	0	0	0	1
Pass	0	0	0	0
Other	0	0	0	49

----Aircraft Information----
Make/Model - MOONEY M20C
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 2575
No. of Seats - 4
Eng Make/Model - LYCOMING O-360
Number Engines - 1
Engine Type - RECIPROCATING-CARBURETOR
Rated Power - 180 HP
ELT Installed/Activated - UNK/NR
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - NO RECORD OF BRIEFING
Method - N/A
Completeness - N/A
Basic Weather - VMC
Wind Dir/Speed- 060/003 KTS
Visibility - 15.0 SM
Lowest Sky/Clouds - CLEAR
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

Itinerary
Last departure Point
SEANAWAY,WA
Destination
ARLINGTON,WA

ATC/Airspace
Type of Flight Plan - NONE
Type of Clearance - NONE
Type Apch/Lnds - NONE

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - N/A
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
PRIVATE
SE LAND

Age - 54
Biennial Flight Review
Current - UNK/NR
Months Since - UNK/NR
Aircraft Type - UNK/NR

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT
Flight Time (Hours)
Total - 1800
Make/Model- UNK/NR
Instrument- UNK/NR
Multi-Eng - UNK/NR
Last 24 Hrs - UNK/NR
Last 30 Days- UNK/NR
Last 90 Days- UNK/NR
Rotorcraft - UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
DURING ARRIVAL, A BOEING VC-137B-BN, USAF #58-6970, OPERATING AS AIR FORCE 2 (AF-2), WAS CLEARED FOR A LOCALIZER BACK-COURSE APCH. AT 1442:49, TRACON ADVISED AF-2 OF TRAFFIC AT ITS 10 O'CLOCK POSITION AT 2 MI, ALT UNKN. AT 1443:11, TRACON ADVISED AF-2 THE TRAFFIC HAD MOVED TO ITS 11 O-CLOCK POSITION AT 1-1/2 MI. AF-2 ACKNOWLEDGED BOTH TRANSMISSIONS. AT 1443:29, AF-2 ADVISED THAT THE FLT WAS CHANGING ITS FREQ TO BOEING TOWER. SHORTLY THEREAFTER, THE ACFT CMDR OF AF-2, SEATED IN THE RIGHT, SAW THE TRAFFIC, A MOONEY M20C, N6507U, ON A COLLISION COURSE. HE TOOK CONTROL & INITIATED EVASIVE ACTION. THE PLT OF N6507U WAS CRUISING AT 2,500 FT OUTSIDE THE SEATTLE TCA & DID NOT SEE AF-2, WHICH HAD CONVERGED FROM HIS RIGHT REAR AREA. THE MOONEY'S #1 RADIO WAS INOP & ITS #2 RADIO ANTENNA HAD BEEN VANDALIZED, THUS THE PLT WAS NOT IN RADIO CONTACT WITH ATC. THE LAST DIGIT/WHEEL ON HIS TRANSPONDER WAS STUCK ON "5" & CODE 1205 WAS BEING TRANSMITTED. THE TRANSPONDER HAD NO MODE 'C' ALT REPORTING CAPABILITY. ALL OF THE BACKCOURSE APCH WAS OUTSIDE THE TCA.

Brief of Incident (Continued)

File No. - 5058 10/18/84 SEATTLE,WA A/C Reg. No. N6507U Time (Lcl) - 1445 PDT

Occurrence NEAR COLLISION BETWEEN AIRCRAFT
Phase of Operation CRUISE

Finding(s)
1. COMM/NAV EQUIPMENT,TRANSMITTER - INOPERATIVE
2. COMM/NAV EQUIPMENT,RECEIVER - INOPERATIVE
3. COMMUNICATIONS - NOT POSSIBLE - PILOT IN COMMAND
4. VISUAL LOOKOUT - DELAYED - PILOT OF OTHER AIRCRAFT
5. REMEDIAL ACTION - PERFORMED - PILOT OF OTHER AIRCRAFT

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident is/are finding(s) 4

Factor(s) relating to this incident is/are finding(s) 1,2,3.

National Transportation Safety Board
Washington, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT SUMMARY

File No.	:	3323
Aircraft Operator	:	Eastern Air Lines, Inc.
Airplane Type and Registration	:	Boeing 727-225A, N812EA
Location	:	Miami International Airport, Miami, Florida
Date and Time	:	November 11, 1983, 2100 eastern standard time
Persons on Board	:	Crew - 7, Passengers - 152
Injuries	:	Crew - None, Passengers - 1
Aircraft Damage	:	Substantial
Other Damage or Injury	:	None
Type of Occurrence	:	Emergency landing
Phase of Operation	:	Landing flare/touchdown

On November 11, 1983, at 1926, e.s.t, Eastern Air Lines (Eastern) flight 836, N812EA, a B-727-225A, with 152 passengers and 7 crewmembers aboard, took off from Miami International Airport, Miami, Florida. The flightcrew stated that the climbout was normal until the flight reached approximately 10,900 feet. At that point a loud bang was heard, followed by illumination of the red DOORS and red RIGHT GEAR warning lights above the landing gear lever. In accordance with prescribed procedures, the first officer moved the landing gear lever from the OFF to the UP position. Following the first officer's actions, the second officer reported loss of fluid and pressure in the A and B hydraulic systems. The primary flight controls reverted to manual operation, and the climb was terminated.

The flightcrew advised Miami Center of the loss of both hydraulic systems and requested permission to maintain 11,000 feet while trying to determine the cause of the malfunction. The pilot of flight 836 advised that he would dump more than 19,000 pounds of fuel while trouble-shooting the hydraulic system and completing all applicable abnormal checklists. The flightcrew could not determine the right main landing gear (RMLG) position by viewing it through the visual inspection hole located in the main cabin floor. Flight 836 then requested radar vectors to the Miami International Airport for a fly-by. Miami Center coordinated with Miami Approach Control and Miami Tower, and the aircraft made the fly-by on runway 27 right; while in a clean configuration. The flight controller at Miami International Airport flight control tower, an Eastern mechanic at the ramp tower, and Eastern personnel positioned near the approach end of runway 27 right observed that the left main landing gear (LMLG) and the nose landing gear (NLG) were inside their wheel wells and that their respective gear doors were closed. The RMLG door was in what appeared to be the unpressurized open position, but the RMLG was not extended.

Upon completing the fly-by, night 836 was cleared to climb to 3,000 feet on a heading of 090°. Once more the flightcrew reviewed all pertinent abnormal checklists and manual reversion flight limitations, after which the captain elected to attempt to lower all landing gear by using the emergency manual extension procedure. The second officer read the pertinent instructions placarded near each landing gear manual crank socket, inserted the crank in the LMLG manual extension socket, and cranked it down; the cockpit LMLG down-and-locked green light illuminated. The second officer then inserted the crank in the RMLG socket and repeated the procedure. The crank rotated without restrictions, but when the procedure was completed, the cockpit RMLG down-and-locked green light did not illuminate; instead, the gear unsafe red warning light remained illuminated. The procedure was repeated for the NLG, and when completed the NLG down-and-locked cockpit green light became illuminated. The captain retarded one of the throttles and the landing gear unsafe warning horn was heard, indicating that one or more landing gear were not down and locked.

After reviewing once more all the abnormal procedures and manual reversion checklists and limitations, the captain requested a second fly-by at Miami International Airport. The flight controllers, after coordinating with the Eastern mechanic at the ramp tower and other Eastern mechanics positioned near runway 27 right, cleared and vectored the flight for a low approach to runway 27 right and to circle to land on runway 9 right. During the second fly-by it was observed that the LMLG and NLG were extended, both the LMLG and RMLG doors were open, and the RHLG was inside the wheel well. Miami Tower relayed this information to the flightcrew.

After completing the second fly-by, the flight proceeded to an area northwest of Hiami International Airport where the crew once more reviewed the abnormal procedures, executed a few negative "G" load maneuvers, and prepared for a manual reversion approach with the right main landing gear stuck inside the wheel well and the other two landing gear in the down end locked position. Flight 836 requested a Wing on runway 9 right in order to have the grass area south of the runway on the aircraft's right side. The flight controller cleared the flight, and the aircraft was landed on the runway. As the aircraft slowed down during the ground roll, the right wing dropped and contacted the ground. The aircraft veered about 45° to the right, the LMLG collapsed and separated, the NLG separated, and the aircraft skidded to a stop 2,500 feet from the departure end of the runway and about 100 feet south of the runway's primary surface.

Immediately after the aircraft came to a stop, fire and rescue personnel and equipment positioned near the crash site started to spray foam on the aircraft end to assist with the emergency evacuation, which was begun within 10 seconds after the aircraft stopped. The captain, the jumpseat rider, the first officer, end the second officer exited the aircraft via the right-side cockpit window, and proceeded to the right-forward slide, where they assisted in the passenger evacuation. All 152 passengers were evacuated through the slides, located at the main cabin forward ieft and right and rear left and right entrance doors. The overwing exits were not opened or used during the evacuation. The evacuation was well coordinated and carried out expeditiously. One passenger's injury was classified "serious" but this was due to a lengthy hospital confinement for a cardiac condition. The aircraft was substantially damaged; there was no fire.

It was determined that the loud bang heard by the flightcrew in the right main gear wheel well was an explosive blowout of the right main landing gear No. 3 tire while retracted in its wheel well. The Safety Board's investigation determined that the explosion caused structural damage which resulted in the loss of hydraulic systems A and B and precluded emergency manual extension of the right main lending gear. Examination

of the No. 3 tire indicated that it failed due to massive ply separations around its crown. The origin of the ply separations was located along the chafer strip/toe bead area. The extensive damage in this area was from two sources--abrasion and excessive heat. Damage from either source would have allowed high-pressure nitrogen (approximately 175 psig) to enter the ply system under dynamic conditions, causing ply separation.

Similar ply separations were found in three other tires in Eastern's inventory at or near the toe bead showing that the routine holography inspection of only the crown portion of newly retreaded tires is inadequate to detect ply separations at the toe bead and along the sidewall. The Thompson Aircraft Tire Corporation (TATCO) and Eastern implemented a complete bead-to-bead holography inspection of its B-727 fleet starting on January 6, 1984. The results of the program through March 31, 1984, showed a substantial increase in tires rejected for heat-related defects over the same period in 1983.

The most likely source of the excessive heat that damaged the tires was the brakes. It was determined that new B.F. Goodrich (BFG) brake lining cups were installed by Eastern on its B-727 fleet around June 1983. BFG issued Service Bulletin No. 418 on July 25, 1983, followed by an FAA Notice N8320.288 on September 23, 1983, which stated, in part, that these linings caused accelerated brake rotor wear which could result in their becoming worn below minimum thickness. Wear-down of rotors beyond minimum thickness causes progressively higher brake temperatures for the same energy dissipation. As brake temperatures gradually rise above normal limits, tire bead seat areas gradually deteriorate. The deterioration becomes progressively worse with repeated exposures to higher-than-normal temperatures.

The hydraulic lines for the A and B hydraulic systems running through the right wheel well were severely damaged in several locations by the explosion of the No. 3 tire. Hydraulic fluid and pressure in the B system was lost when the line between the main brake accumulator and the brake pressure switch was severed. Since this portion of the B system is pressurized continuously at 3,000 psig, the flightcrew could have done nothing to prevent the loss of B system pressure through this line. Moreover, since there is a balance line between the B system and A system reservoirs, about half of the volume in the A system reservoir was lost through the B system leak. This left about 2.5 gallons of fluid remaining in the A system reservoir.

The A system lost its remaining fluid through the line which pressurizes the main landing gear lock actuator and the wheel retraction brake. This line is part of the main landing gear retraction system. When the cockpit gear handle is in the OFF position, hydraulic pressure is released from all landing gear hydraulic lines and actuators and the line is pressurized only when the cockpit gear handle is in the UP position. The first officer's action of placing the gear handle in the UP position caused all landing gear retraction lines, including the line which was severed, to receive A system pressure. This circumstance resulted in the further loss of fluid and complete loss of pressure in the A system.

The first officer's action of placing the gear handle in the UP position and leaving it there was in accordance with the B-727 Operations Manual which states:

> If landing gear door light illuminates during climb, cruise, or descent, position landing gear lever UP and observe gear door warning light extinguishes. Leave landing gear lever in UP position. If gear door warning light does not extinguish, observe landing gear operating speed limit. Expect performance penalties.

This accident and five previous tire blowout incidents 1/ show clearly that no significant loss of airplane stability or controllability occurs when landing gear doors are blown open or severed from the airplane, although there is a loss in performance due to an increase in drag. However, in this and the five other cases, all hydraulic lines in the wheel wells were damaged substantially. In this and one of the other cases, both A and B hydraulic systems were lost. The A system was lost when the flightcrews followed the Aircraft Operations Manual and put the gear handle in the UP position.

Examination of the hydraulic, electrical, and control system components in the right wheel well of the accident airplane showed extensive damage which resulted from the exploding tire. As discussed above, hydraulic lines for both the A and B systems were bent, deformed, and severed. Some Wing gear hydraulic valves were broken from their attachments. Electrical wires, bundles, clamps, and connectors were damaged. One wire was severed. Aileron control cables for the manual reversion system were damaged and a cable guide was broken. A system components in the wheel well were unprotected from the damaging effects of an exploding tire.

The Safety Boards investigation concluded that the No. 3 right main landing gear tire which had been damaged previously, possibly during repair operations, exploded in the wheel well after it had been further weakened by heat transfer from the wheel brake system. The explosive force resulted in the disruption of hydraulic system lines and eventual depletion of hydraulic fluid and a total hydraulic system pressure loss.

As a result of this investigation, the Safety Board recommended that the Federal Aviation Administration:

> Require operators of B-727 airplanes to establish a training program for flightcrews addressing recognition, assessment, options, and procedures to be followed in the event a tire has exploded in a wheel well. The training program should be based, in part, on the discussion in the letter transmitting this recommendation. (Class II, Priority Action) (A-85-81)
>
> Issue an Air Carrier Operations Bulletin, or require additional information in the Aircraft Operations Manual, Abnormal Procedures/Expanded Checklist section and Hydraulic-Alternate Operations section, to provide information and instructions to be followed by a flightcrew after a tire has exploded in a wheel well. The information and instructions should be based, in part, on the discussion in the letter transmitting this recommendation. (Class II, Priority Action) (A-85-82)
>
> Review with the Thompson Aircraft Tire Corporation and Eastern Air Lines the provisions of Advisory Circular No. 145-4, "Inspection, Retread, Repair, and Alterations of Aircraft Tires," emphasizing that tire bead seat areas should not be sanded (Section 8a. "Tire Repairs for Tires Operated Above 120 MPH") and that final inspections of retreaded tires should rigorously follow the guidelines of Section 10. "Nonrepairable Aircraft Tires." (Class II, Priority Action) (A-85-83)

1/ October 13, 1970, Western Airlines, B-727-200, 82801W; August 8, 1973, Braniff Airlines, B-727-100C, N1728T; May 25, 1974, United Air Lines, B-727-100C, N7415U; November 13, 1976, American Airlines, B-727-100, N1991; and December 22, 1980, Delta Airlines, B-727-200, N535DA.

Issue an advisory circular describing the damage to tires that can result from elevated brake temperatures. Emphasize the importance of visually inspecting bead seat areas prior to mounting and the need to perform bead-to-bead holograms for heat damage whenever exposure to higher-than-normal brake temperatures is suspected, including occurrences where there has been faster-than-normal rotor rear. Emphasize the need to replace tires suspected of having been subjected to heat damage and brake linings suspected of causing faster-than-normal rotor wear or higher-thawnormal brake temperatures for any reason as soon as possible to minimize heat damage to tires. (Class II, Priority Action) (A-85-84)

Request the B.F. Goodrich Company to amend Service Bulletin No. 418, "Landing Gear, AU 727 Models, Main Landing Gear Brakes - inspection for Excessive Rotor Wear." dated July 25, 1983, to provide adequate warning that tire damage also is possible from the continue use of the "new" brake lining cups and to require the removal of all "new" brake lining cups on a priority basis. (Class II, Priority Action) (A-85-85)

In cooperation with the Boeing Commercial Airplane Company, determine the feasibility of shielding the A and B hydraulic system lines, electrical wiring, and control system cables located in the wheel wells of B-727 airplanes, and of modifying the wheel well lighting systems to make them less vulnerable to damage in the event of a tire explosion within the wheel well (Class II, Priority Action) (A-85-86)

The attached Brief of Accident contains the Safety Board's findings, conclusions, and probable cause.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ G.H. PATRICK BURSLEY
Member

September 5, 1985

National Transportation Safety Board
Washington, D.C. 20594

Brief of Accident

File No. - 3323 11/11/83 MIAMI,FL A/C Reg. No. N812EA Time (Lcl) - 2100 EST

----Basic Information----
Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC
Name of Carrier -EASTERN AIRLINES
Type of Operation -SCHEDULED,DOMESTIC,PAX/CARGO
Flight Conducted Under -14 CFR 121
Accident Occurred During -LANDING

Aircraft Damage
SUBSTANTIAL
Fire
NONE

Injuries	Fatal	Serious	Minor	None
Crew	0	0	0	7
Pass	0	1	0	151

----Aircraft Information----
Make/Model - BOEING 727-225A
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 183000
No. of Seats - 157

Eng Make/Model - P & W JT8D-15
Number Engines - 2
Engine Type - TURBOFAN
Rated Power - 15500 LBS THRUST

ELT Installed/Activated - NO N/A
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - COMPANY
Method - TELEPHONE
Completeness - WEATHER NOT PERTINENT
Basic Weather - VMC
Wind Dir/Speed- 320/003 KTS
Visibility - 7.0 SM
Lowest Sky/Clouds - CLEAR
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - NIGHT(BRIGHT)

Itinerary
Last Departure Point
SAME AS ACC/INC
Destination
DENVER,CO

ATC/Airspace
Type of Flight Plan - IFR
Type of Clearance - IFR
Type Arch/Lndg - ILS-COMPLETE
STRAIGHT-IN

Airport Proximity
ON AIRPORT

Airport Data
MIAMI INTL
Runway Ident - 09R
Runway LGth/Wid - 13002/ 150
Runway Surface - ASPHALT
Runway Status - DRY

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
ATP
SE LAND,ME LAND

Age - 49
Biennial Flight Review
Current - YES
Months Since - 3
Aircraft Type - B727

Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT

Flight Time (Hours)

Total	9011	Last 24 Hrs	UNK/NR
Make/Model	6954	Last 30 Days	UNK/NR
Instrument	UNK/NR	Last 90 Days	191
Multi-Eng	UNK/NR	Rotorcraft	UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
AFTER DEPARTING MIAMI & CLIMBING THROUGH 10,900 FT THE #3 RIGHT MAIN LANDING GEAR TIRE EXPLODED CAUSING MASSIVE DAMAGE TO SYSTEMS A & B HYDRAULIC LINES WHICH RESULTED IN A LOSS OF A & B HYDRAULIC SYSTEMS. THE ACFT RETURNED TO MIAMI & THE CREW WAS UNABLE TO EXTEND THE RIGHT MAIN LANDING GEAR USING EMERGENCY MANUAL EXTENSION PROCEDURES. AFTER LANDING WITH THE RIGHT MAIN GEAR RETRACTED, THE LEFT MAIN & NOSE GEAR COLLAPSED & SEPARATED. MASSIVE PLY SEPARATIONS WERE FOUND IN THE #3 TIRE STARTING AT THE TOE BEAD, DOWN THE SIDEWALL & EXTENDING CIRCUMFERENTIALLY AROUND THE CROWN OF THE TIRE AT THE 10TH TO 13TH PLY LAYERS. INSP OF THE SITE WHERE THE SEPARATION MET THE BEAD BUNDLES REVEALED A LOCATION WHERE THE BEAD SEAT HAD BEEN SANDED & SMOOTHED. THE ABRASION HAD REMOVED THE OUTER CHAFER STRIP, SEVERAL COVER PLIES, & HAD EXPOSED THE PLIES COVERING THE TOE BEAD. THE BEAD SEAT, AS WELL AS THE CORDS WRAPPED AROUND THE TOE BEAD, HAD ALSO BEEN SUBJECTED TO EXCESSIVE HEAT FOR AN EXTENDED PERIOD OF TIME CAUSING SEVERE DETERIORATION OF THE BEAD SEAT AREA.

File No. - 3323 11/11/83 MIAMI,FL A/C Reg. No. N812EA Time (Lcl) - 2100 EST

Occurrence #1 AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation CLIMB - TO CRUISE

Finding(s)
1. LANDING GEAR,TIRE - PREVIOUS DAMAGE
2. MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PSNL
3. LANDING GEAR,TIRE - OVERTEMPERATURE
4. LANDING GEAR,TIRE - EXPLODED
5. HYDRAULIC SYSTEM,LINE - FAILURE,PARTIAL
6. FLUID,HYDRAULIC - EXHAUSTION
7. HYDRAULIC SYSTEM - DISABLED
8. EMERGENCY PROCEDURE - POOR -

Occurrence #2 FORCED LANDING
Phase of Operation LANDING - FLARE/TOUCHDOWN

Occurrence #3 OTHER GEAR COLLAPSED
Phase of Operation LANDING - FLARE/TOUCHDOWN

Finding(s)
9. HYDRAULIC SYSTEM - NO PRESSURE
10. DOOR,LANDING GEAR - MOVEMENT RESTRICTED
11. GEAR EXTENSION - NOT POSSIBLE -
12. LANDING GEAR,MAIN GEAR - OVERLOAD
13. LANDING GEAR,NOSE GEAR - OVERLOAD

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident is/are finding(s) 1,2,3,4,7,8,9,10

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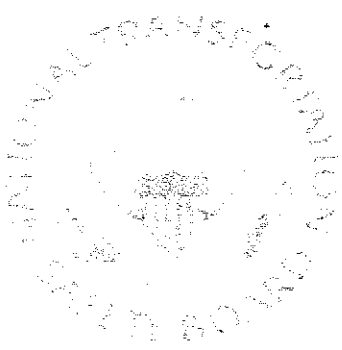
PB89-917410



NATIONAL
TRANSPORTATION
SAFETY
BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT/INCIDENT
SUMMARY REPORTS