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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C.

POWERPLANT GROUP CHAIRMAN'S FACTUAL REPORT

by

John G. Young

NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D. C. 20594

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POWERPLANT GROUP CHAIRMAN'S FACTUAL REPORT

DCA-94MA-065

A. ACCIDENT

Location: Charlotte/Douglas International Airport, Charlotte NC
Date: July 2, 1994
Time: 1843 edt
Aircraft: USAir McDonnell Douglas DC9-31, N954VJ

B. POWERPLANT GROUP

Chairman:	John G. Young National Transportation Safety Board Washington, D. C.
Member	Mike Gardner International Association of Machinists Jamestown, NC
Member	Mark A. Rumizen Federal Aviation Administration Engine Certification Office Burlington, MA
Member	Bruce A. Samborski Pratt&Whitney East Hartford, CT
Member	James Ursitti USAir Pittsburgh, PA

Member

Capt. Tom Young
Air Line Pilots Association
Coraopolis, PA

C. SUMMARY

On July 2, 1994, about 1843 eastern daylight time (EDT), a McDonnell Douglas DC9-31, N954VJ, owned by USAir, Inc., and operated as USAIR flight 1016, collided with trees and a private residence while executing the missed-approach procedure for the instrument landing system (ILS) approach to runway 18R at the Charlotte/Douglas International Airport in Charlotte, North Carolina. The captain and one flight attendant received minor injuries; the first officer, two flight attendants and 18 passengers sustained serious injuries; and 37 passengers received fatal injuries. The airplane was destroyed by impact forces and a postaccident fire. Instrument meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed. Flight 1016 was being conducted under 14 Code of Federal Regulations (CFR), Part 121, as a domestic, scheduled passenger service flight from Columbia, South Carolina to Charlotte, North Carolina.

Both engines remained with the aft fuselage. Both inlets had large amounts of branches and foliage packed against the inlet guide vanes. The first stage fan blades of both engines had hard object damage to the tips and leading edges, and both had large amounts of shredded wood and vegetation in the bleed ducts. Borescope examination revealed thirteenth stage compressor blade hard object damage in both engines and wood and foliage debris deposits in both first stage turbines.

D. DETAILS OF THE INVESTIGATION¹

1. Left Engine

The left engine remained attached to the mount structure on the aft fuselage, with the inlet, cowl doors, and thrust reverser assembly in place. The thrust reverser was stowed and latched. The reverser latch had been modified for hydraulic operation in accordance with McDonnell Douglas service bulletin 78-38. The outboard side of the lower cowl door was torn and crushed rearward. The inlet cowl was also crushed and buckled rearward. The inlet area was packed with branches, leaves, and other vegetation. The landing gear door assembly from the left main gear strut was found in the inlet, ahead of the branches and foliage. Dried mud and shredded vegetation were observed in the inlet area, throughout the fan duct, and impinged on the forward edges of struts in the fan duct, as well as the inlet guide vanes and fan blades. Dried

¹ All references to left, right, and clock position are as viewed from aft looking forward.

mud was also found on the forward side of the constant speed drive (CSD) oil cooler, which is mounted in the fan duct.

As viewed from the exhaust side, the 4th stage turbine blades and vanes appeared undamaged. Material that appeared to be metal splatter was observed on the fourth stage turbine blade leading edges. The low pressure rotor could be rotated easily by hand. All the first stage fan blade outboard leading edges and tips were curled and bent opposite the direction of rotation. On several blades the leading edges inboard of the part-span shrouds were broken away and others were bent and curled. The inlet guide vane trailing edges were bent and curled in the direction of rotation. The second stage fan blades also had bent, torn, and curled leading edges.

A borescope examination was accomplished by gaining access through the No.4 combustor igniter port. This permitted observation of the high pressure compressor (HPC) thirteenth stage blades, combustor dome, combustor interior, fuel nozzle, and first stage turbine nozzle guide vanes and blades.

Some thirteenth stage blade trailing edges were dented and had tips curled opposite the direction of rotation. The forward part of the combustor appeared in good condition. Shredded vegetation debris was observed in the fuel nozzle swirl vanes. The interior of the combustor also appeared in good condition. No cracks or burned areas were observed. The first stage turbine nozzle guide vanes and blades were in good condition with no temperature distress or mechanical damage noted. A build-up of burned debris was noted on the blade leading edges and at the root radius on the concave side of the blades.

The compressor bleed air ducts were opened. A large amount of shredded wood and foliage was found in the end caps and accumulated at bends and junctions.

2. Right Engine

The right engine remained with the aft fuselage section of the airplane. It was lying on the ground on its right side next to the fuselage and with the inlet cowl against a wall of the house. The forward mount assembly remained intact and attached to the engine. However, the forward part of the pylon structure was fractured and separated from the fuselage. The rear mount assembly and cone bolt remained intact and attached to the pylon structure. The bolt that attaches the mount to the engine flanges was fractured and the flanges were bent.

The inlet cowl was crushed and buckled rearward against the fan case on the right side from 12 o'clock through 3 o'clock to 6 o'clock. The inboard side of the lower cowl door was torn and dented, with the oil service access door missing. The thrust reverser was fully deployed. The manually-operated latch, located at the 6 o'clock position, was in the unlatched position. This latch was not modified for hydraulic operation. The upper bucket operating arms were bent. When the engine was lifted by crane during removal from the accident site, the thrust reverser buckets

moved toward the stow position and remained only slightly open.

The inlet area was packed with leaves and fragments of branches up to 2 inches in diameter. Some were trapped between the inlet guide vanes and the first stage fan blades. The fan inlet guide vanes, stage 1 and 2 fan blades, fan duct, and leading edges of struts exposed in the fan duct were coated with dried mud. The CSD oil cooler, mounted in the fan duct, was packed with mud.

The first stage fan blades had severe leading and trailing edge damage, with nicks, tears, and pieces broken out. Several had tips broken off. The inlet guide vane leading and trailing edges were bent and torn in the direction of rotor rotation. The second stage blades were similarly damaged, with nicked, torn, and broken leading edges. Several blades were bent opposite the direction of rotation. The second stage guide vanes had similar leading and trailing edge damage. The fourth stage turbine blades and vanes were viewed from the exhaust side. They appeared in good condition, with no mechanical damage or heat distress apparent. The low pressure rotor could not be rotated.

A borescope examination was accomplished by gaining access through the No. 7 combustor igniter port. This permitted observation of the HPC thirteenth stage blades and vanes, combustor dome, fuel nozzle, combustor, and first stage turbine nozzle guide vanes and blades.

The combustor external surface was in good condition, as was the fuel nozzle. A piece of wood chip was stuck in the fuel nozzle swirl vanes. The twelfth stage stator vane trailing edges were nicked and dented. The thirteenth stage blade leading edges were dented and deeply nicked. The interior of the combustor appeared in good condition. No cracks or burning were evident. The first stage turbine nozzle guide vanes had debris deposited in the inboard platform radius on the concave side of the vane. There was a build-up of debris on the first stage blade leading edges. The compressor bleed air ducts were opened. A large amount of shredded wood and foliage was found in the end caps and accumulated at bends and junctions.

The fan discharge outer case was fractured circumferentially on the right side from about the 2 o'clock position to about the 5 o'clock position. Several fan exit guide vanes just forward of this fracture were displaced circumferentially clockwise, in the direction of rotor rotation.

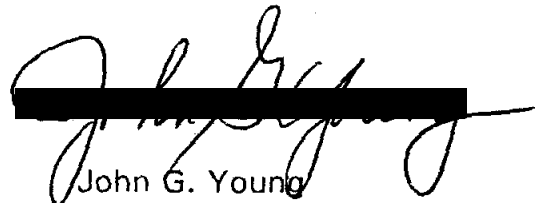
The accessory gearbox remained intact and undamaged with all the accessories in place. The forward end of the oil tank was dented. The power lever and fuel shut off levers on the fuel control were intact with the Teleflex cable ends attached. The Teleflex assemblies had separated in the pylon. The thrust reverser feedback cable and quadrant were intact. The crossover shaft and levers on the right (outboard) side were also intact. The thrust reverser latch operating cable was attached to the cross shaft lever, which appeared to be bent. There was mud and vegetation packed in the area around the lever.

On the lower right side of the fixed cowl, at about the 7 o'clock position, just forward of the aft edge, was a smooth dent overlaid with an area of axial scratches. When the reverser was in the stowed position, the scratches aligned with a bent and scraped area on the lower reverser forward lip. Immediately behind this deformation were scratches which aligned with those on the fixed cowl.

3. Engine Data

The engines were Pratt & Whitney Model JT8D-7.

<u>Position</u>	1	2
<u>Serial No.</u>	657031	657670
<u>Total Time</u>	61338hrs	52818hrs
<u>Total Cycles</u>	70157	60678
<u>Date Installed</u>	1-31-94	7-3-92
<u>Time Since Installation</u>	965:50hrs	4217:23hrs
<u>Cycles Since Installation</u>	996	4349


 John G. Young
 Sr. Aerospace Engineer