



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 28, 1991

In reply refer to: A-91-1 and A-91-2

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On October 18, 1989, a McDonnell Douglas DC-9-31, N922RW, operated by Northwest Airlines as flight 109, departed the end of the runway at Monte Vista, Colorado, during an emergency landing at night following the loss of all generators. The airplane sustained minor damage, and the captain sustained minor injuries. The first officer, 3 flight attendants, and 99 passengers were uninjured. The airplane was operating as a scheduled passenger flight under 14 CFR part 121.

Investigation revealed that the crew became aware of a problem when they noted the illumination of the number two generator constant speed drive (CSD) low oil pressure warning light during cruise at flight level 350. Instead of disconnecting the number two generator CSD from the right engine, the crew mistakenly disconnected the number one generator CSD from the left engine. The number two generator CSD subsequently failed. Since the CSD drives cannot be reconnected in flight, all electrical power from these two generators was lost.

On two occasions, the crew attempted to windmill start the auxiliary power unit (APU) to obtain electrical power. However, both attempts were unsuccessful, and the only source of electrical power that remained was the airplane's battery.

The airplane was flown to the Monte Vista Airport for an emergency landing. This airport has a single paved runway 6,000 feet long and 60 feet wide. Twelve miles to the east is the Alamosa Airport, which has one paved runway 8,499 feet long and 100 feet wide. Both airports have runway edge lights that are pilot-activated by radio. The crew was advised of the presence and location of both airports by air traffic control. The crew stated that they did not see the Alamosa Airport and made their airport selection based on seeing a rotating beacon.

The airplane's flap position indicator and stall warning system are powered by the airplane's generators, and are inoperative after a loss of generators. The crew elected to land with no flaps because of the absence of a flap position indication even though normal flap operation was possible.

The resulting landing airspeed at Monte Vista was therefore higher than the appropriate airspeed with flaps extended.

The crew also elected to extend the landing gear by emergency means because of the absence of a landing gear position indication although normal gear operation was possible. The landing gear position indicator is powered by the airplane's generators but cannot be operated solely by the battery. When the landing gear is lowered by emergency means, the gear doors remain open. As a result, the gear doors were damaged during landing.

According to McDonnell Douglas, the flap and landing gear position indication systems of the DC-9 airplane could be redesigned to operate by battery power without a substantial decrease of battery life.

The crew's unsuccessful attempts to windmill start the APU were made at an altitude outside the APU's start envelope and were aborted because of hot starts. The manufacturer of the APU, Garrett Airesearch, and McDonnell Douglas had developed an APU start envelope chart that contained airspeed and pressure altitude limitations under which a crew could expect a successful windmill start. According to the Garrett and McDonnell Douglas charts contained in both the APU GTCP85-98D specification and the DC-9 flight manual, the maximum pressure altitude for starting the APU was 30,000 feet. The Northwest Airlines DC-9 airplane operations manual did not contain an APU start envelope chart.

The Northwest DC-9 operations manual did contain a statement that if an APU start was unsuccessful, another attempt should be made at a lower altitude. However, another statement contained in the manual indicates that this procedure may have dangerous consequences. The second statement, in a Northwest operating bulletin, stated "DO NOT attempt to restart the APU after a false start until a check of the aft APU accessory compartment for fuel is accomplished." The referenced check of the APU cannot be accomplished in flight. This operating bulletin was placed in the manual in compliance with FAA Airworthiness Directive 88-24-04 to prevent a fire hazard in the aft accessory compartment due to residual fuel. These two statements contained in the same manual appear to be in conflict.

FAA Airworthiness Directive 88-24-04 requires checking for evidence of fuel on the APU exhaust ducting and in the surrounding area in the aft accessory compartment, including the insulation blankets. It also requires the installation of placards in the cockpit and on the Aircraft Logbook, and a statement in the FAA-approved Airplane Flight Manual, prohibiting a restart of the APU after a false start. However, the placards and AFM change may be removed upon accomplishment of the repair and modification of the APU exhaust duct assembly in accordance with McDonnell Douglas DC-9 Service Bulletin A49-40.

At the time of the occurrence, the repair and modification of the APU exhaust duct assembly had not been accomplished on the airplane. The operating bulletin contained in the Northwest operations manual which referred to the airworthiness directive was dated August 8, 1989, and

contained the statement "Maintenance estimates that it will take approximately one year to correct the problem."

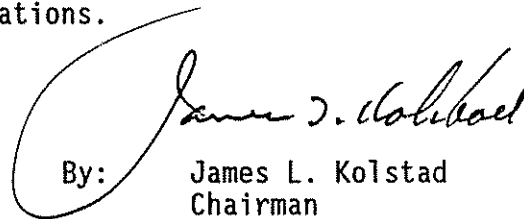
The Safety Board is concerned that flight operations manuals of other DC-9 operators may not contain an APU start envelope chart and that other flightcrews may not have adequate APU starting capability information available to them when needed in emergency circumstances. The Safety Board is also concerned that other flight operations manuals may contain conflicting information concerning the restart of an APU after a false start. It should be clearly indicated in the manual that restart attempts are permitted on those aircraft which do not contain placards or logbook statements to the contrary.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Require that McDonnell Douglas Aircraft Corporation redesign the flap and landing gear position indication systems of all models of the DC-9 airplane to ensure operation when the airplane's battery is the only source of electrical power. (Class III, Longer Term Action)(A-91-1)

Issue an Air Carrier Operations Bulletin to all Principal Operations Inspectors to review the flight operations manuals of all DC-9 operators to ensure that the manuals contain an APU start envelope chart, and that inconsistent statements regarding restarts of the APU be clarified. (Class II, Priority Action)(A-91-2)

Chairman KOLSTAD, Vice Chairman COUGHLIN, Members BURNETT, LAUBER, and HART concurred in these recommendations.


By: James L. Kolstad
Chairman

Brief of Incident

File No. - 5032 10/18/89 MONTE VISTA,CO A/C Reg. No. N922RW Time (Lcl) - 0015 MDT

Basic Information---

Type Operating Certificate-AIR CARRIER - FLAG/DOMESTIC Aircraft Damage
Name of Carrier -NORTHWEST AIRLINES MINOR
Type of Operation -SCHEDULED,DOMESTIC,PASSENGER Fire
Flight Conducted Under -14 CFR 121 NONE
Incident Occurred During -LANDING

Aircraft Information---

Make/Model - MCDONNELL DOUGLAS DC-9 Eng Make/Model - P&W J18D ELT Installed/Activated - NO -N/A
Landing Gear - TRICYCLE-RETRACTABLE Number Engines - 2 Stall Warning System - YES
Max Gross Wt - 108000 Engine Type - TURBOFAN
No. of Seats - 116 Rated Power - 17000 LBS THRUST

Environment/Operations Information---

Weather Data Itinerary Airport Proximity
WX: Briefing - NWS Last Departure Point ON AIRPORT
Method - IN PERSON MINNEAPOLIS,MN
Completeness - FULL Destination
Basic Weather - VMC PHOENIX,AZ
Wind Dir/Speed- 150/008 KTS ATC/Airspace
Visibility - 15.0 SM Type of Flight Plan - IFR Runway Ident - 02
Lowest Sky/Clouds - 1400 FT SCATTERED Type of Clearance - IFR Runway Lth/Wid - 6000/- 60
Lowest Ceiling - 3500 FT OVERCAST Type of Apch/Lnds - STRAIGHT-IN Runway Surface - ASPHALT
Obstructions to Vision- NONE Type of Landing - PRECAUTIONARY LANDING
Precipitation - NONE
Condition of Light - NIGHT(DARK)

Personnel Information---

Pilot-In-Command Age - 46 Medical Certificate - VALID MEDICAL-WAIVERS/LIMIT
Certificate(s)/Rating(s) Biennial Flight Review Flight Time (Hours)
ATP Current - YES Total - 15730 Last 24 Hrs - 4
ME LAND Months Since - 2 Make/Model- 12335 Last 30 Days- 70
Aircraft Type - DC-9 Instrument- 1673 Last 90 Days- 176
Multi-Eng - 12600 Rotorcraft - UNK/NR

Instrument Rating(s) - AIRPLANE

Narrative---

WHILE IN CRUISE AT FL350 THE NO. 2 GENERATOR CONSTANT SPEED DRIVE (CSD) FAILED AND THE CREW INADVERTENTLY DISCONNECTED THE NO. 1 GENERATOR CSD. ATTEMPTS TO START THE APU ABOVE THE START ENVELOPE WERE MADE BUT ABORTED DUE TO A HOT START. A DESCENT WAS MADE ON EMERG ELECTRICAL POWER AND A LANDING WAS MADE AT AN ARPT WHICH WAS INADEQUATE FOR THE ACFT. THE CREW CHOSE TO MAKE A NO FLAP APCH AND TO LOWER LANDING GEAR BY EMERG METHOD WHEN BOTH SYSTEMS WERE OPERABLE BY NORMAL MEANS. THIS DECISION WAS INFLUENCED BY THE LACK OF LANDING GEAR AND FLAP POSITION INDICATORS WHEN THE ACFT IS OPERATED ON BATTERY POWER. THE LANDING SPEED WAS FAST AND THE ACFT DEPARTED THE END OF THE RWY DAMAGING THE LANDING GEAR AND THE NO. 1 ENGINE. THE CREW FAILED TO MANUALLY DEPRESSURIZE THE ACFT AND THE EVACUATION WAS DELAYED UNTIL A KNOWNLEGEARLE PASSENGER WENT TO THE COCKPIT AND DEPRESSURIZED THE ACFT. THE OPERATORS ACFT OPERATING MANUAL DID CONTAIN APU STARTING PROCEDURES BUT NOT AN APU START ENVELOPE CHART.

Brief of Incident (Continued)

File No. - 5032 10/18/89 MONTE VISTA,CO A/C Reg. No. N922RW Time (Lcl) - 0015 MDT

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

Findings(s)

1. ELECTRICAL SYSTEM, CONSTANT SPEED DRIVE UNIT - LEAK
2. ELECTRICAL SYSTEM, CONSTANT SPEED DRIVE UNIT - FAILURE, TOTAL
3. GENERATOR - INADVERTENT DEACTIVATION - PILOT IN COMMAND
4. AFU - NOT ATTAINED - PILOT IN COMMAND
5. AIRCRAFT MANUALS, SYSTEM INFORMATION - INADEQUATE
6. INADEQUATE SUBSTANTIATION PROCESS, INADEQUATE DOCUMENTATION - COMPANY/OPERATOR MGMT
7. ELECTRICAL SYSTEM - FAILURE, TOTAL

Occurrence #2

Phase of Operation OVERRUN LANDING - ROLL

Findings(s)

8. IN-FLIGHT PLANNING/DECISION - IMPROPER - PILOT IN COMMAND
9. UNSUITABLE TERRAIN - SELECTED - PILOT IN COMMAND
10. LOWERING OF FLAPS - NOT PERFORMED - PILOT IN COMMAND
11. LANDING GEAR, GEAR INDICATING SYSTEM - INOPERATIVE
12. INSUFFICIENT STANDARDS/REQUIREMENTS, AIRCRAFT - MANUFACTURER

-----Probable Cause-----

The National Transportation Safety Board determines that the Probable Cause(s) of this incident was:
THE POOR INFLIGHT PLANNING AND DECISIONS MADE BY THE FLIGHT CREW FOLLOWING THE FAILURE OF THE NUMBER TWO GENERATOR
CONSTANT SPEED DRIVE UNIT, CONTRIBUTING FACTORS TO THE ACCIDENT WERE THE FAILURE OF THE NO. 2 GENERATOR CONSTANT SPEED
DRIVE UNIT AND THE CREW'S INADVERTENT SHUT DOWN OF THE WRONG GENERATOR WHICH RESULTED IN A COMPLETE LOSS OF ELECTRICAL
POWER.