National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: 6 February, 2001

In reply refer to: A-01-03 through -05

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On September 17, 1999, a McDonnell Douglas[1] MD-88, N947DL, operating as Delta Air Lines flight 2030, experienced a fire in the forward cargo compartment shortly after takeoff from Northern Kentucky International Airport (CVG), Covington, Kentucky. The flight attendants reported to the flight crew that there was a sulfurous smell and then, shortly after that, fumes and smoke entered the forward cabin. The flight crew declared an emergency and performed a precautionary landing at CVG. During the descent, a flight attendant discharged at least one Halon fire extinguisher into a floor grill, through which a "glow" was reportedly seen. After the discharge of the Halon, the glow was no longer visible. None of the occupants were injured, and the airplane sustained minor fire damage.

McDonnell Douglas MD-88 airplanes are equipped with two static port heaters (one primary and one alternate) on the left interior sidewall and two on the right interior sidewall (see figure 1). The heaters are flush-mounted against the static air pressure sensing ports to ensure that the ports do not become blocked by ice.[2] The heaters are manufactured by Electrofilm Manufacturing Company, Valencia, California, and are powered by 115-volt alternating current through a 10-ampere circuit. The heaters are controlled by a switch in the cockpit and are normally on from before takeoff until after landing. The heaters have two resistive elements. One of the elements is always powered, whereas the other element receives power, as necessary, depending on the temperature of the heater. A thermostat on the heater controls whether power is applied to the second heater element; the thermostat applies power when the temperature is less than 80º Fahrenheit (F) and removes power when the temperature is 180º F. The maximum power used by the alternate static port heater is 225 watts.

[1] McDonnell Douglas Corporation is now known as Boeing, Douglas Product Division.

[2] MD-90 and DC-9 series airplanes have similarly designed static port heaters.

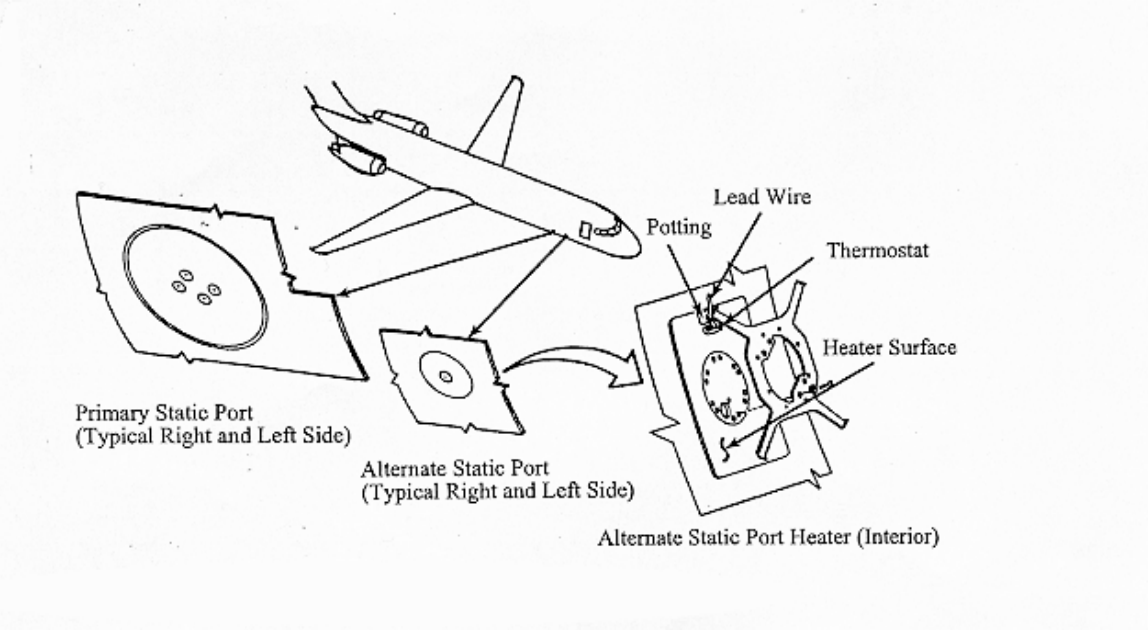

Figure 1. Static port heater installation.

The National Transportation Safety Board's investigation of the Covington, Kentucky, incident revealed that a spark from the right alternate static port heater ignited the fire and that the fire propagated by consuming the metalized Mylar covering on the sidewall insulation blankets surrounding the heater. There was substantial damage to the insulation blankets and soot and heat distress to components in the area, such as some floor structure and a potable water tank. Postincident examination of the right alternate static port heater revealed localized soot on the thermostat case, on the lead wire that carries the 115 volts to the thermostat, and on the red potting compound in the area where the lead wire is bent sharply around the thermostat case. The conductor of the lead wire was exposed at the point where the wire was bent around the thermostat case. Investigators concluded that the spark that ignited the metalized Mylar covering resulted from electrical arcing between the exposed conductor of the lead wire and the grounded thermostat case.

In response to the incident, Delta Air Lines initiated detailed visual, electrical, and functional inspections of the primary and alternate static port heaters on its entire fleet of MD-88s and MD-90s (136 airplanes) and published a report of the results.[3] The inspection revealed that 11 percent of the airplanes had at least one heater installation that exhibited some type of damage.[4] Nine of the heater installations had arced, burned, or melted parts in the area of the

[3] Delta Air Lines, Engineering Report 10-75275-20, "Failure Analysis of MD88/90 Static Port Heater Pads," issued February 23, 2000.

[4] There are four heater installations per airplane. Three airplanes had two different heater installations with damage.

electrical connector; two had charred and exposed heater elements on the heater surface; and seven had cracked and flaked rubber on the heater surface, which can lead to electrical arcing if a liquid is introduced.[5] The report concluded that the sharp bends in the heater elements can concentrate the heat and cause disbonding, which can expose the heater elements.

Concurrent with its inspections of the static port heaters in its MD-88 and MD-90 fleet, Delta Air Lines removed the metalized Mylar-covered insulation blankets from around all of these heaters and stated that it plans to install metalized Tedlar-covered insulation blankets in those areas in the future. Further, after its examination of the damaged heaters, Delta Air Lines' Engineering Department recommended that all static port heaters in its MD-88 and MD-90 fleet be replaced and that the part be life limited to 6 years. Delta Air Lines' Engineering Department further recommended that the heater be redesigned to provide a more generous bend radius to the thermostat lead wires and heater elements.

On January 3, 2000, after the inspections and removal of the metalized Mylar-covered insulation blankets, another heater malfunction occurred, which caused smoke in the cabin of Delta Air Lines flight 1518, an MD-88, after takeoff from Columbia, South Carolina. The smoke dissipated as the flight returned to Columbia. Postincident inspection revealed evidence of arcing and thermal damage emanating from the right primary static port heater. Because the metalized Mylar-covered insulation blankets near the static port heater had been removed, the thermal damage was contained to the heater itself. Delta Air Lines concluded that the incident was likely caused by the heater element wires arcing near the thermostat case.

On the basis of the Covington, Kentucky, and Columbia, South Carolina, static port heater malfunctions and the Delta Air Lines inspection results, the Safety Board is concerned that the potential exists for additional fires caused by static port heaters on MD-80, MD-90, and DC-9 series airplanes to occur. Therefore, the Safety Board believes that the Federal Aviation Administration (FAA) should issue an airworthiness directive (AD) requiring operators of MD-80, MD-90, and DC-9 series airplanes to inspect the primary and alternate static port heaters on these airplanes for evidence of electrical arcing or thermal damage and, if such damage is found, replace the heaters. The Safety Board also believes that the FAA should initiate a design review of the primary and alternate static port heaters on MD-80, MD-90, and DC-9 series airplanes and, if feasible, require design changes to reduce the potential for arcing.

The FAA has already recognized that metalized Mylar coverings on insulation blankets will propagate fire and has published AD 2000-11-01, effective June 30, 2000, which requires that such blankets be replaced throughout DC-9-80 (MD-80) and MD-90 series airplanes and MD-88 airplanes with an approved substitute. However, the AD specifies a 5-year compliance time. Given the fire hazard posed by metalized Mylar-covered insulation blankets and the history of arcing/sparks from static port heaters, the Safety Board is concerned that the 5-year compliance period is too long for this particular installation. The Boeing Company has also recognized the heightened safety concern posed by metalized Mylar-covered insulation blankets in the area of the

[5] During flight, water condenses on the sidewalls of the airplane and then freezes. As the airplane warms during approach and landing, the ice melts and runs down between the sidewalls and the insulation blankets.

static port heaters and is developing alert service bulletins (ASB) (ASBs MD80-30A092 and MD90-30A023) for MD-80 and MD-90 series airplanes that recommend replacing the insulation blankets in these areas.[6] The Safety Board supports this recommended action and believes that the FAA should issue an AD requiring the replacement of metalized Mylar-covered insulation blankets near primary and alternate static port heaters on all MD-80 and MD-90 series airplanes with approved metalized Tedlar-covered insulation blankets at the earliest maintenance opportunit y, in accordance withASBs MD80-30A092 and MD90-30A023.

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

> Issue an airworthiness directive requiring operators of MD-80, MD-90, and DC-9 series airplanes to inspect the primary and alternate static port heaters on these airplanes for evidence of electrical arcing or thermal damage and, if such damage is found, replace the heaters. (A-01-03)
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> Initiate a design review of the primary and alternate static port heaters on MD-80, MD-90, and DC-9 series airplanes and, if feasible, require design changes to reduce the potential for arcing. (A-01-04)
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> Issue an airworthiness directive requiring the replacement of metalized Mylar-covered insulation blankets near primary and alternate static port heaters on all MD-80 and MD-90 airplanes with approved metalized Tedlar-covered insulation blankets at the earliest maintenance opportunity, in accordance with Alert Service Bulletins MD80-30A092 and MD90-30A023. (A-01-05)

Members HAMMERSCHMIDT, BLACK, GOGLIA, and CARMODY and Vice Chairman HALL[7] concurred with these recommendations.

Original Signed

By: Carol Carmody
Acting Chairman

[6] All DC-9 series airplanes have similarly designed static port heaters; however, Boeing reports that airplanes delivered before DC-9-80 series airplanes were delivered with insulation blankets covered by an elastomer-coated fabric, not metalized Mylar. This cover provides improved burn resistance; therefore, Boeing did not develop an ASB for these airplanes.

[7] At the time he cast his vote, Vice Chairman Hall was serving as the Board's Acting Chairman.