

NATIONAL TRANSPORTATION
SAFETY BOARD



Third Triennial International Fire & Cabin Safety Research Conference

Trump Taj Mahal
Casino - Resort

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Investigations Involving In-Flight Fire

- MD-88, Covington, KY, September 17, 1999
- DC-9, Greensboro, NC, August 8, 1999
- DC-9, Washington, D.C., November 29, 2000
- DC-9, Covington, KY, , June 2, 1983

September 17, 1999

Cincinnati and Northern Kentucky Int'l Airport

- MD-88 with 113 passengers and 5 crew and 3 off-duty flight attendants onboard
- Shortly after takeoff flight attendants noticed a lit match smell and noticed smoke in the forward cabin by the floor vent.
- The airplane sustained minor damage and none of the passengers or crewmembers were injured.

MD-88 Covington, KY continued...

- A carry-on bag that was stowed next to the right sidewall was scorched
- F/A reported a flickering glow beneath the vent to the flight crew.
- The Captain told the No. 1 flight attendant not to use Halon in the cabin but another F/A had already discharged Halon into the vent and the glow disappeared.
- The No. 1 F/A became alarmed that a Halon fire extinguisher had been discharged in the cabin.





Safety Board's Investigation Revealed:

- Source of the smoke was a smoldering insulation blanket in the cargo compartment that was adjacent to a static port heater. Electrical arcing from the heater had ignited the blanket.
- The Safety Board issued 3 safety recommendations to the FAA regarding the static port heater and replacement of the insulation blankets with an alternate material.

August 8, 2000

Greensboro Intl. Airport

- DC-9 with 57 passengers and 5 crew on board
- Shortly after takeoff smoke in the cockpit prompted the flight crew to don their oxygen masks and return to Greensboro for an emergency landing
- A flight attendant debated whether to use Halon but was unsure where to aim it.
- 3 crewmembers and 2 passengers sustained minor injuries

Greensboro, NC continued...

- Shortly after takeoff F/A 1 smelled smoke and went to the cockpit where she saw smoke and noticed that the flight crew had donned their oxygen masks.
- F/A's 1 & 2 reseated themselves in business class because the smoke rapidly accumulated in the galley and around their jumpseats.

Greensboro, NC continued...

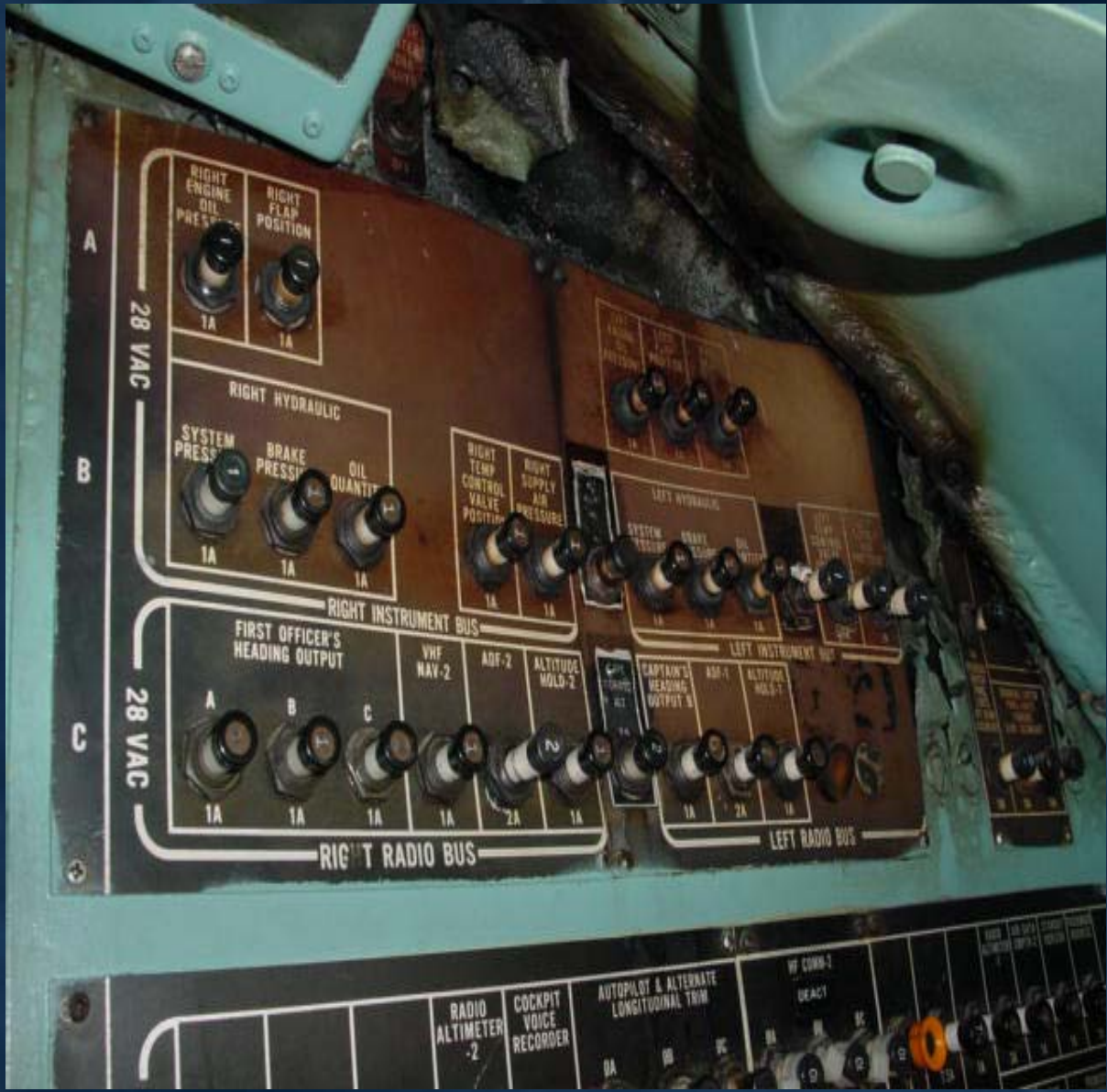
- Smoke became so dense in the cabin that the F/A's could no longer see the forward galley.
- Neither F/A made any effort to locate the source of the smoke or to use any fire-fighting equipment.
- F/A saw a large amount of electrical “arcing and sparking” and heard “popping” noises but debated whether to use the Halon because she was unsure where to aim it.





Safety Board's Preliminary Findings:

- Smoke in the forward cabin caused by electrical arcing in the bulkhead behind the captain's seat.
- The arcing ignited interior panels which continued burning after the airplane landed and passengers evacuated the airplane.
- The fire was extinguished by airport rescue and firefighting personnel.



A

28 VAC

RIGHT ENGINE OIL PRESSURE
1A

RIGHT FLAP POSITION
1A

B

RIGHT HYDRAULIC SYSTEM PRESSURE
1A

BRAKE PRESSURE
1A

OIL QUANTITY
1A

RIGHT TEMP CONTROL VALVE POSITION
1A

RIGHT SUPPLY AIR PRESSURE
1A

C

28 VAC

RIGHT INSTRUMENT BUS
FIRST OFFICER'S HEADING OUTPUT
A
1A

B
1A

C
1A

VHF NAV-2
1A

ADF-2
2A

ALTITUDE HOLD-2
1A

CAPTAIN'S HEADING OUTPUT
1A

ADF-1
2A

ALTITUDE HOLD-1
1A

RIGHT RADIO BUS

LEFT INSTRUMENT BUS

LEFT RADIO BUS

RADIO ALTIMETER -2

COCKPIT VOICE RECORDER

AUTOPILOT & ALTERNATE LONGITUDINAL TRIM

WF COM-2 DEACT

November 29, 2000

Reagan National Airport

- DC-9 with 61 passengers and 5 crew
- Struck by lightning shortly after takeoff
- None of the crewmembers or passengers were injured.





BE ELECTRICAL POWER
WILL BE AVAILABLE
UNDER SEAT

8



Safety Board's Investigation Found

- F/As saw a flash and heard a boom on the right side of the airplane.
- A F/A saw smoke coming from a fluorescent light fixture in the forward entry area and shut the light off and pulled the circuit breaker.
- Dark, dense black smoke also came from the ceiling panel above rows 7 & 8.

Safety Board's Investigation Continued...

- Smoke detectors in the aft lavatories sounded, and the ceiling panel above row 9 began to blister and turn yellow.
- F/A No. 1 notified the flight crew and the other F/A's began discharging the Halon toward the blistering ceiling panel.
- The F/A's also cut a circular hole in the blistered panel and fully discharged the Halon into the hole.

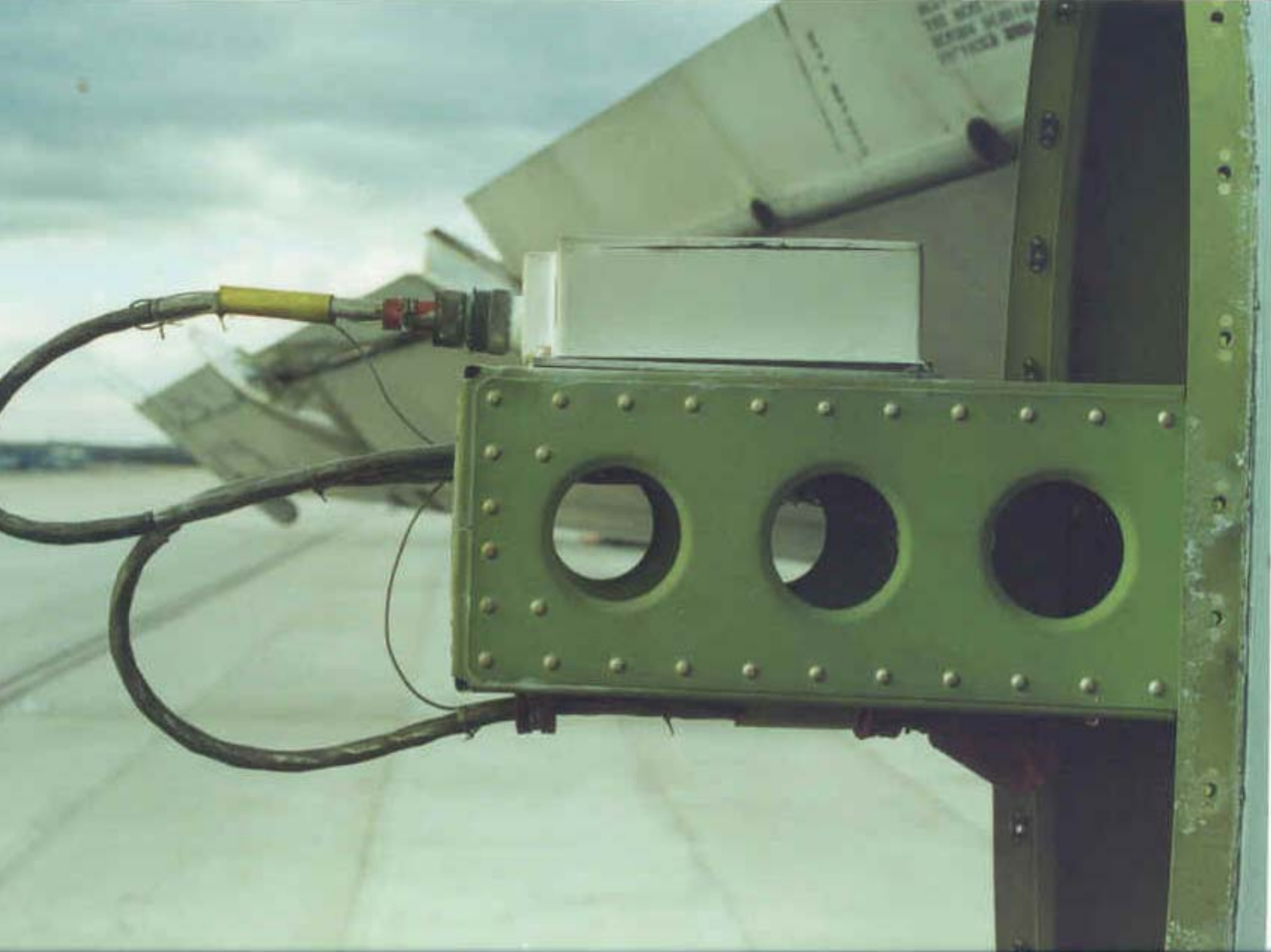
Safety Board's Investigation Continued...

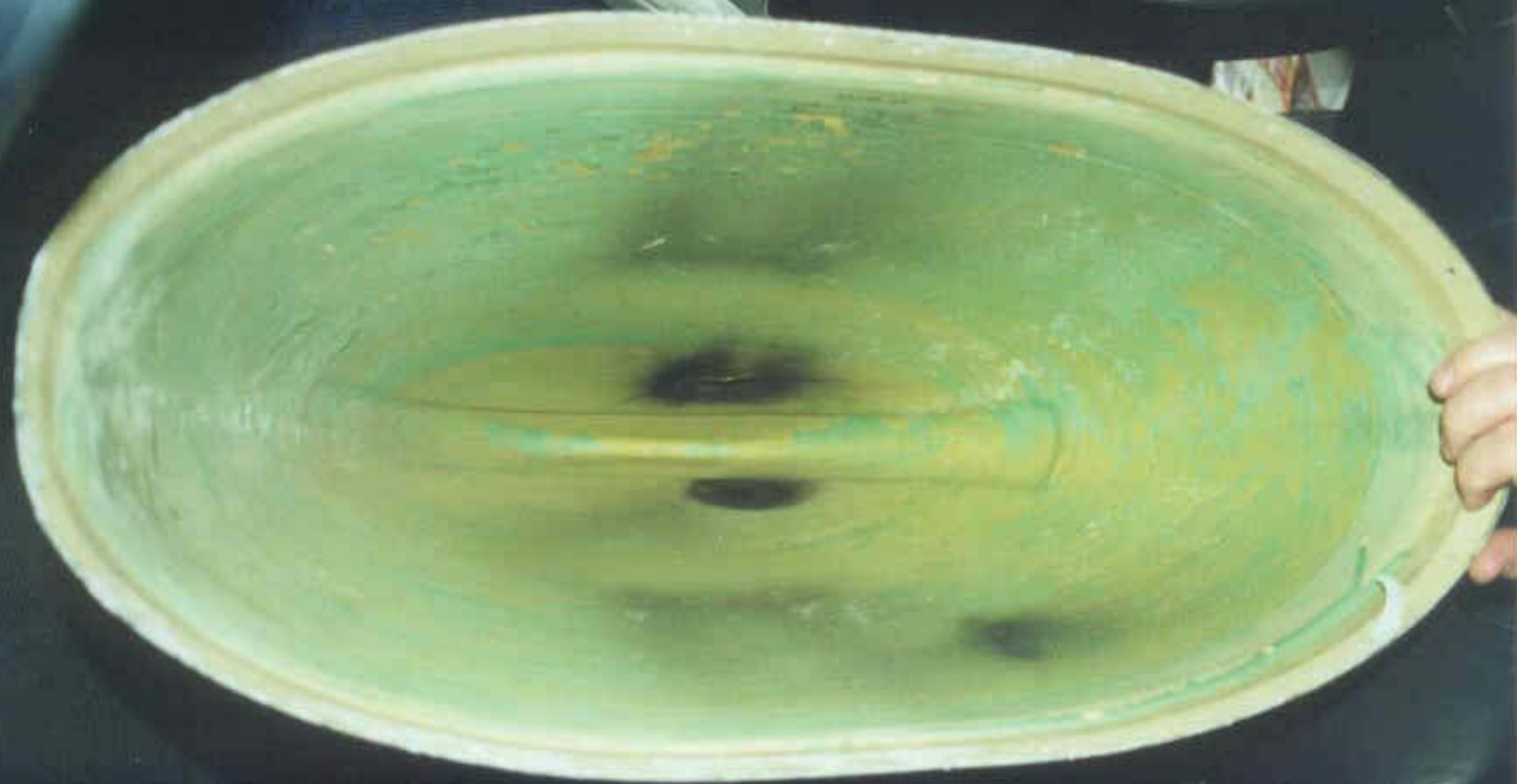
- Before the emergency landing the F/A gave the passenger in seat 9E a Halon fire extinguisher, instructed him on its use, and told him to “use it as needed”
- The Safety Board's investigation is ongoing, but preliminary findings indicate that a lightning strike caused arcing in the airplane wiring above the ceiling panels and ignited adjacent materials.



MOISTURE BARRIER
NO GAPS, TEARS OR HOLES MUST BE

ALL JOINTS SHALL BE SEALED WITH
A TYPE 1 ELASTIC SEALANT





June 3, 1983

Greater Cincinnati Intl. Airport

- DC-9 with 41 passengers and 5 crew
- Experienced an in-flight fire and made an emergency landing
- Smoke was coming from the seams between the walls and ceiling in the aft lavatory, and a flight attendant discharged CO₂ into the lavatory.
- 23 passengers were unable to evacuate the airplane and died in the fire.

Greater Cincinnati Intl. Airport continued..

- After the F/A discharged the CO₂ into the lavatory he closed the door.
- When the 1st Officer came back he felt the door and noticed it was hot and told the F/A not to open it, and then informed the captain that they better land the airplane.
- During the descent the smoke increased and moved forward in the cabin.





The Safety Board's Findings:

- The discharge of the fire extinguisher into the lavatory “had little or no effect on the fire...in order for the extinguishing agent to be effective it must be applied to the base of the flames.”
- Probable Cause: “A fire of undetermined origin, an underestimate of fire severity, and conflicting fire progress information provided to the captain.
- Contributing: The flight crews delay to institute an emergency descent.





The Safety Board's Recommendations

- A-83-70 – Smoke detectors in lavatories
- A-83-71 – Automatic fire extinguishing adjacent to and in lavatory waste receptacles
- A-83-72 – The installation of Halon fire extinguishers on transport category airplanes

The Safety Board's Recommendations continued...

- A-83-76 – POI's review training programs to ensure flight crews take immediate aggressive action to determine the source and severity of the fire and begin an emergency descent to land, and for F/As to recognize the urgency and inform flight crews, and be knowledgeable of proper methods of aggressively attacking cabin fires via hands on training in the use of fire axes, protective breathing equip., and the discharge of the appropriate fire extinguisher.

Recommendation A-83-76

- FAA – 14 CFR 121.417 crewmember training for fire emergencies, emergency drills, and the operation of emergency equipment
- NTSB – Closed “Unacceptable Action”; current training is directed at exposed fires that are relatively easy to control and not at hidden fires.

Advisory Circular 20-42C

“Hand Fire Extinguishers for Use in Aircraft”

- Halon type fire extinguishers are 3 times as effective as CO₂ extinguishers
- Although exposure to Halon vapors may result in dizziness, impaired coordination, and reduced sharpness and should be avoided, maximum allowable levels of Halon vapors cannot be achieved by discharging a single hand-held extinguisher in a transport sized cabin.

Conclusions

- Immediate and aggressive action by crewmembers to extinguish in-flight fires
- Training to include firefighting drills with actual & simulated fires recognizing, locating and fighting hidden fires
- Training to include gaining access to areas behind interior panels to apply extinguishing agent
- Training to explain the properties of Halon and its negligible effects compared to its safety benefits.

National Transportation Safety Board's Website

www.nts.gov

