



# National Transportation Safety Board Aviation Incident Final Report

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<b>Location:</b>	Lyon, France	<b>Incident Number:</b>	SEA04IA010
<b>Date &amp; Time:</b>	10/02/2003, 0740 UTC	<b>Registration:</b>	N479EV
<b>Aircraft:</b>	Boeing 747-100	<b>Aircraft Damage:</b>	Minor
<b>Defining Event:</b>		<b>Injuries:</b>	3 None
<b>Flight Conducted Under:</b>	Part 121: Air Carrier - Scheduled		

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## Analysis

While the aircraft was in cruise flight at flight level 400, the right wing overheat light illuminated. The crew accomplished the appropriate checklist, and then about five minutes later the engine number three and engine number four B fire loop indicators illuminated. Soon thereafter an acrid odor was detected by the flight crew, and smoke was seen coming from behind the P-6 circuit breaker panel. The crew then became aware of a small fire in the fire detection card file, which they extinguished with a hand-held fire extinguisher. The crew then diverted to a nearby airport and completed an uneventful precautionary landing. The post-event investigation revealed that the fire detection card for engine number four B Loop fire detection (card A16), and its associated socket connector, had suffered severe thermal damage to include partial destruction. A series of tests and examinations were not able to detect evidence of any specific anomalies in the A16 card, the card file, the card file protection circuit, or any of the aircraft's systems. There was no evidence of a lightning strike being the initiating event, and the aircraft has continued in service since the time of this event without generating any other maintenance discrepancies known to be directly related to the fire detection card files.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: An undetermined malfunction in an aircraft system while in cruise flight leading to a fire in the engine number four B Loop portion (Card A16) of the fire detection controls cardfile.

## Findings

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

### Findings

1. (C) OVERHEAT WARNING SYSTEM - MALFUNCTION  
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Occurrence #2: FIRE  
Phase of Operation: CRUISE

### Findings

2. (C) OVERHEAT WARNING SYSTEM - FIRE  
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Occurrence #3: MISCELLANEOUS/OTHER  
Phase of Operation: EMERGENCY DESCENT/LANDING

### Findings

3. PRECAUTIONARY LANDING - INTENTIONAL - PILOT IN COMMAND

## Factual Information

On October 2, 2003, approximately 0740 Universal Time Coordinated (UTC), a Boeing 747-100, N479EV experienced an in-flight fire in the fire detection card file while in cruise flight approximately 35 miles from Lyon, France. None of the three crew members on board were injured, and the damage to the aircraft was limited to the heat/fire damage within the card file container. The aircraft, which is owned and operated by Evergreen International Airlines, was in visual meteorological conditions at the time of the incident. The aircraft was on an IFR flight plan from Kuwait City, Kuwait, to Frankfurt, Germany. The aircraft departed Kuwait City at 0148 UTC.

According to Evergreen Airlines, while the aircraft was in cruise flight at flight level 400, the right wing overheat light illuminated. The crew accomplished the appropriate checklist, and then about five minutes later the engine number three and engine number four B Loop fire indicators illuminated. Soon thereafter an acrid odor was detected by the flight crew, and smoke was seen coming from behind the P-6 circuit breaker panel. The crew then became aware of a small fire in the fire detection card file, which they extinguished with a hand-held fire extinguisher. The crew then diverted to Lyon, France, where an uneventful normal landing was executed. After landing at Lyon, French civil aviation personnel came aboard the aircraft, interviewed the crew, and then departed. Prior to the aircraft's departure from Lyon, the entire card file was removed and an airworthy unit was installed, and circuit breaker C431, which protects the A16 card, was replaced. The fire detection card file was then returned to the United States for analysis. After its arrival in the United States, the card file was eventually shipped to Boeing Equipment Quality Analysis (EQA), where a series of inspection and test activities were performed under the guidance of the NTSB.

The initial inspection of the fire detection card file (Boeing P/N 65B47509-33) revealed severe thermal stress/destruction to card A16 (engine number four B Loop fire detection), and minor thermal discoloration to components adjacent to this card. Card A16 was manufactured by Walter Kidde (S/N 4538) and is identified as Boeing P/N 60B00023-96. The thermal distress on card A16 included melted/burned circuit traces, failed IO (transient protection) devices, partial or total destruction of a number of the card-to-file connecting pins, and burning of the phenolic board itself (see photo #1). In addition there was severe dishing under portions of the K2 relay, an orange residue in the area of the destroyed card pins, and two globs of unidentified material near the point where one of the destroyed connecting pins attached to its circuit trace near the edge of the card (see photo #2). The area of maximum thermal distress on the card was located in an area between the inboard half of the K2 relay and the inboard ends of the third and fourth card-to-file connecting pins at the K2 end of the card.

In addition to the damage to card A16 itself, there was also severe thermal damage to the card file electrical harness socket connector that the A16 card was connected to. This damage included melting/burning of the connector structure, loose sockets still connected to their associated wires, missing sockets, and open wires that had been attached to sockets that were now missing (see photo #3).

Further investigation determined that the proper fire detection element was installed on engine number four of the subject aircraft, and that the C431 circuit breaker installed in the aircraft at the time of the event was of the correct 2.5 amp rating. In addition it was determined that the two globs found on the card, as well as the orange residue, were consistent with

material used to manufacture the card, and not consistent with evidence indicating foreign materials. It was also determined that there was no clear evidence of an initiating short in the aircraft's systems, the card file, or the card itself. The investigation was also not able to find any indication that the aircraft had been struck by lightning during this flight, or that a lightning strike had contributed to the initiation of the card fire. Furthermore, regardless of the fact that card A16 displayed indications of extreme heat distress, there was no clear evidence indicating that an anomaly or malfunction in any of the sub-components contained on the card itself initiated the sequence that lead to the overheat event.

After a series of follow-up conference calls and additional tests, the investigative team determined that they were not able to identify a specific component or event that initiated the sequence that lead to the card fire. According to Evergreen Airlines, the subject aircraft has continued in service since the time of this event, and has generated no other maintenance discrepancies known to be directly related to the fire detection card files.

### Pilot Information

<b>Certificate:</b>	Airline Transport	<b>Age:</b>	53, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	05/14/2003
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	10/31/2003
<b>Flight Time:</b>	11783 hours (Total, all aircraft), 6253 hours (Total, this make and model), 115 hours (Last 90 days, all aircraft), 35 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

### Co-Pilot Information

<b>Certificate:</b>	Airline Transport	<b>Age:</b>	38, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane Single-engine	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	07/17/2003
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	03/28/2003
<b>Flight Time:</b>	4650 hours (Total, all aircraft), 409 hours (Total, this make and model), 206 hours (Last 90 days, all aircraft), 48 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Boeing	<b>Registration:</b>	N479EV
<b>Model/Series:</b>	747-100	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	19898
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	8
<b>Date/Type of Last Inspection:</b>	04/01/2002, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	750000 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	4 Turbo Fan
<b>Airframe Total Time:</b>	98622 Hours at time of accident	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	JT9-7A
<b>Registered Owner:</b>	Evergreen International Airlines	<b>Rated Power:</b>	46150 lbs
<b>Operator:</b>	Evergreen International Airlines	<b>Operating Certificate(s) Held:</b>	Flag carrier (121)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	EIAA

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>		<b>Distance from Accident Site:</b>	
<b>Observation Time:</b>		<b>Direction from Accident Site:</b>	
<b>Lowest Cloud Condition:</b>	Scattered / 25000 ft agl	<b>Visibility</b>	20 Miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	Light and Variable /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	Variable	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>		<b>Temperature/Dew Point:</b>	
<b>Precipitation and Obscuration:</b>			
<b>Departure Point:</b>	Kuwait City (OKBK)	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Frankfurt (FRA)	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	0148 UTC	<b>Type of Airspace:</b>	Class A

## Wreckage and Impact Information

<b>Crew Injuries:</b>	3 None	<b>Aircraft Damage:</b>	Minor
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	In-Flight
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	3 None	<b>Latitude, Longitude:</b>	

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Orrin K Anderson	<b>Report Date:</b>	09/01/2004
<b>Additional Participating Persons:</b>	Terry Wilmeth; Portland FSDO; Hillsboro, OR Mark Smith; The Boeing Company; Seattle, WA Kirk Carrillo; Evergreen Airlines; McMinnville, OH		
<b>Publish Date:</b>			
<b>Investigation Docket:</b>	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).