



National Transportation Safety Board

**Robert L. Swaim**

In-Flight Fire Data

January 24, 2001

# SwissAir 111



Photos by Canadian TSB



SwissAir MD-11, September 2, 1998,  
Peggy's Cove, Nova Scotia

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# Safety Recommendations Issued by Canadian TSB Resulting From SwissAir 111 Accident Investigation

- Pertained to:
  - In-flight Fire Fighting
  - Thermal Acoustical Insulation Materials and Flammability Test Criteria
  - Flight Recorder Duration and Power Supply



# MOST EVENTS ARE NON-FATAL

MKC83IA116, TRANS WORLD AIRLINES, INC.

Incident occurred Friday, May 27, 1983 at KANSAS CITY, MO

Aircraft:LOCKHEED L-1011-385-1, registration: N11006

Injuries: 180 Uninjured.

DURING DESCENT AN ELECTRIC WIRE BUNDLE SHORTED BEHIND THE FLIGHT ENGINEERS PANEL, A FIRE ERUPTED WITH SMOKE. THE FLIGHT ENGINEER USED A PORTABLE FIRE EXTINGUISHER TO PUT OUT THE FIRE.

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# NTSB Records Available

- NTSB Official Accident Data Base
  - Nine Part 121 Records
- NTSB Web-Site ([www.nts.gov](http://www.nts.gov))
  - 5,938 Total Records (includes GA)
  - Includes Both Accidents and Incidents
  - May be Sorted
  - Records Need To Be Checked Before Use



# Records Need Research

FTW83LA093

January 16, 1983, Bay City, Texas

DC-3

The Guatemalan registered aircraft collided with the ground while dropping bales of marijuana on a beach. According to witnesses, while the aircraft was making low passes...the propeller struck the beach...The crew unsuccessfully attempted to set the aircraft on **fire**.

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# Records Need Research

No evidence of **fire** was found...

Cessna 185 engine compartment **fire** originated by over-use of primer ...

Post-crash **fire** had consumed...

**Be careful about what records are being counted!**



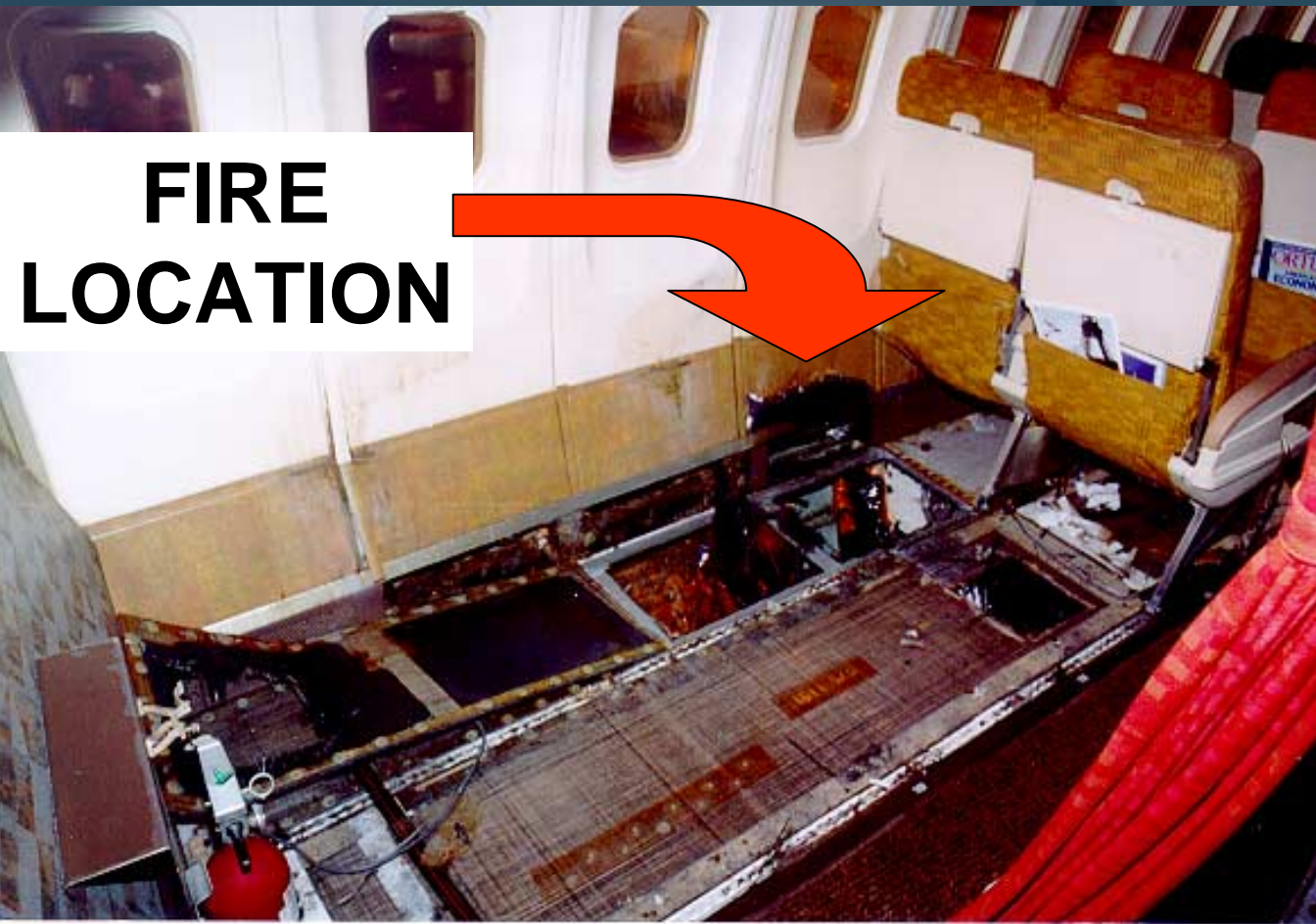
# Legacy Events vs Other Transport Events

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# NON-FATAL ACCIDENTS ARE INVESTIGATED

Delta Air Lines L-1011 , March 17, 1991, Near Goose Bay, Canada



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# BENEFIT OF INVESTIGATING NON-FATAL ACCIDENTS

Safety Recommendations (A-91-70 through -72) were issued that the FAA should:

- Require quality control & inspection procedures for wire installations.
- Notify FAA personnel and operators about fire hazards posed by accumulations and other debris.
- Require that maintenance manuals be amended to ensure thorough inspection & cleaning.

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# NON-FATAL ACCIDENTS CONTINUE

**DCA01MA005**, AIRTRAN AIRWAYS DC-9, November 29, 2000 at  
ATLANTA, GA

This is preliminary information, subject to change, and may contain errors. Any errors in this report will be corrected when the final report has been completed.

Numerous circuit breakers tripped during climb and indicator lights illuminated. The crew declared an emergency and returned to land with smoke in the forward cabin.

Examination revealed fire damage to the left fuselage below and aft of the forward passenger entry door, and to the adjacent forward cargo and main cabin floor areas. Wiring, ducts, and hydraulic lines located in this area were also burned.

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# FATAL ACCIDENTS



DCA96MA054, VALUJET AIRLINES DC-9, May 11, 1996,  
Everglades, Florida, about 10 minutes after take off.

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# Accident Investigations Can Lead to Sweeping Changes (Legacy Events)



- ValuJet Safety Issues Included:
- Minimization of the Hazards Posed by Fires in Class D Cargo Compartments;
- Equipment, Training, and Procedures for Addressing In-Flight Smoke and Fire;

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# Accident Investigations Can Result in Less Visible Improvements

- Other ValuJet Safety Issues Included:
  - Oversight of Contract Maintenance Facilities by Operator & FAA;
  - FAA Oversight;
  - And Lap Child Accounting.



# IMPROPER PROCEDURE

Northern Air Cargo, DC-6A, July 20, 1996,  
Russian Mission (AK)

Cargo flight had fire erupt in or near #3 engine and wing failed in traffic pattern for landing. Investigation found master rod failure in #3 engine. According to CVR, crew pulled fire handle, then feathered propeller. The effectiveness of the fire suppression system is diminished if the propeller is not feathered first.



# Chronology

Federal Express, DC-10, September 5, 1996,  
Newburgh, NY,

In-flight Cargo Fire and Emergency Landing.

NTSB Found That Operator Was Not Aware of  
Hazardous Materials in Cargo and Wrote That

Inadequate Means Exist to Combat Fires in  
Airplanes and That Fire Departments Are  
Generally Unprepared.

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# CHRONOLOGY

**America West, B-737, December 30, 1989,  
Tucson**

As an example of systems disabled by fire, a wheel well fire rendered 3 hydraulic systems inoperative and crew landed with emergency manual reversion flight controls, but no brakes.

Investigation found that maintenance personnel in most recent C-check failed to observe and repair a wire chafing against a hydraulic line. Previous hydraulic check valve failures (due to mechanical wear) prevented use of braking function from backup hydraulic accumulator.

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# CHRONOLGY

**Horizon Air, DHC-8, April 15, 1988, Seattle, WA**

Fire may affect the fire protection devices:

The right nacelle had an in-flight fire, due to improperly reinstalled fuel filter cover. Directional control could not be maintained during landing.

Investigation found that fire & explosion opened engine access panels, reducing effectiveness of fire suppression system and allowing other systems to be damaged.

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# CHRONOLOGY

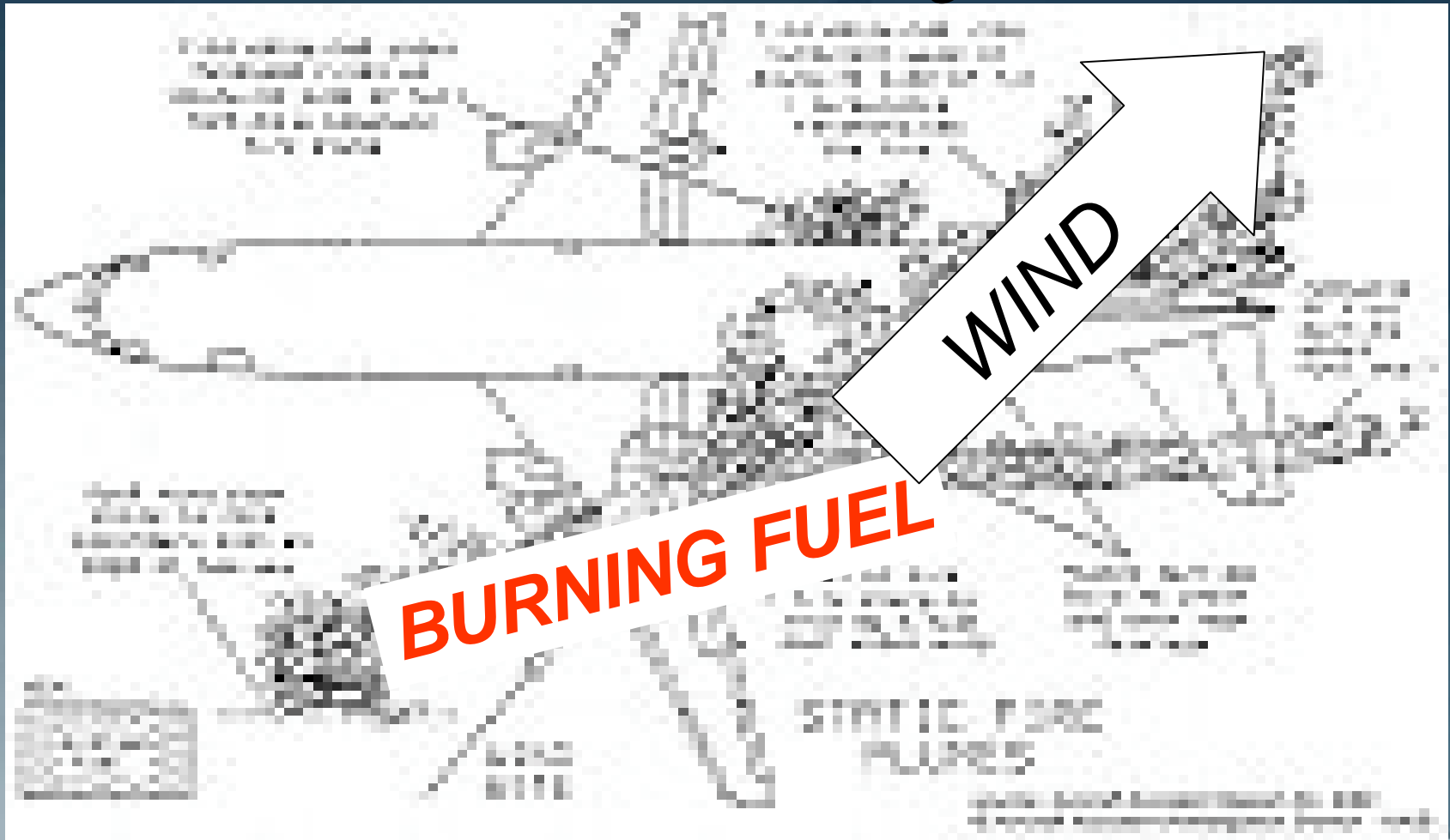
November 28, 1987, South African Airways 747  
(Fatal)

- Flight 295 (Combi) had 159 persons and 6 cargo pallets on the main deck.
- In-flight fire of undetermined origin developed.
- Accident investigation resulted in changes to fire protection, cargo compartment classification, & operations.



# Fatal RTO Fire

British Air Tours B-737, August 22, 1985



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# CHRONOLOGY

**Air Canada, DC-9, June 2, 1983, Cincinnati, OH**

In-flight fire originating after 3 lavatory circuit breakers tripped and were reset.

Probable Cause: A fire of undetermined origin, an underestimate of fire severity, and conflicting fire progress information provided to the captain. Contributing to the severity of the accident was the flightcrew's delayed decision to institute an emergency descent.

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# CHRONOLOGY

## Air Canada DC-9, June 2, 1983

Safety Recommendations and Other Actions Led to Major Changes in:

- Cabin and Lavatory Materials
- Wiring Inspection and Protection,
- Emergency Evacuation Procedural Changes



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# CHRONOLOGY

**Saudia L-1011, August 19, 1980, Riyadh,  
Saudi Arabia,**

Cargo compartment C-3 smoke warnings began about 7 minutes after take-off, followed by smoke in the aft of the cabin, & #2 throttle stuck, then fire entered the cabin.

Probable Cause: "The initiation of a fire in the C-3 cargo compartment.



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# CHRONOLOGY

Recommendations developed as a result of investigating lavatory fires aboard a B-747 on July 17, 1974 and aboard a B-727 on August 9, 1974, resulted in automatic-discharge fire extinguishers in lavatory waste-paper containers.



# CHRONOLOGY

Pan Am B-707, November 3, 1973

Recommendations resulted in:

Standards for smoke and fire fighting procedures and equipment, including eye protection and breathing equipment.

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# CHRONOLOGY

**Varig Airlines B-707, July 11, 1973, near Paris, France.**

Crashed after fire began in an aft lavatory and safety recommendations resulted in:

- Lavatory Smoke Detectors,
- Walk-around oxygen bottles,
- Organization of a Government /Industry task force. (Note that FAA went beyond recommended action to organize SAFER in May 1988, which also addressed cabin interior materials)

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# SUMMARY

Certification Standards, Safety Equipment, Procedures, and Training Have Been Developed During Prior Investigations.

Most Events Are Non-Fatal.

Data Exists, But May Be Difficult to Extract and Must Be Carefully Analyzed.

Safety Recommendations Remain Pertinent

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