

Swissair 111 Reconsidered

By William Henry
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William Henry returns with an important perspective on the Swissair 111 tragedy. Henry Argues that numerous factors such as electromagnetic interference and defective wiring contributed to this tragedy in a more significant way than are currently accepted.

As a preliminary note, the author would like to mention that this investigation was initiated at the request of a family who suffered as the result of this tragedy, who will not be named. So often when these "closed" cases are reexamined, dissidents will chastise all those who dare to reconsider the facts, and it is therefore pertinent to remember that this investigative work was not the product of a conspiracy theorist, or a sensational journalist. Nobody wants these tragedies to occur, and nobody wants to further pain the affected families. However, there are many facts surrounding this tragedy that have been overlooked and downplayed, and herein we will examine them.

September 2, 1998, North Atlantic Ocean near Peggy's Cove, Nova Scotia 229 on board/229 fatalities

At precisely 8:19pm on September 2, 1998, Swissair Flight 111 departed New York's John F. Kennedy International Airport bound for Geneva, Switzerland. The relatively new McDonnell Douglas MD-11 jumbo jet (HB-IWF) was under the command of one of Swissair's most experienced pilot's, Captain Urs Zimmermann.¹ Only 72 minutes after takeoff, the MD-11 crashed into the frigid waters of the Atlantic Ocean, breaking into over one million pieces and killing all 229 persons aboard.² Ultimately, the destruction of the aircraft was the result of a truly unique sequence of events that involved defective wiring aboard the aircraft and adjacent flammable insulation, a faulty entertainment system, the Swissair flightcrew's handling of the emergency (the result of inadequate training and a poorly written emergency manual), and possibly also external electromagnetic interference.

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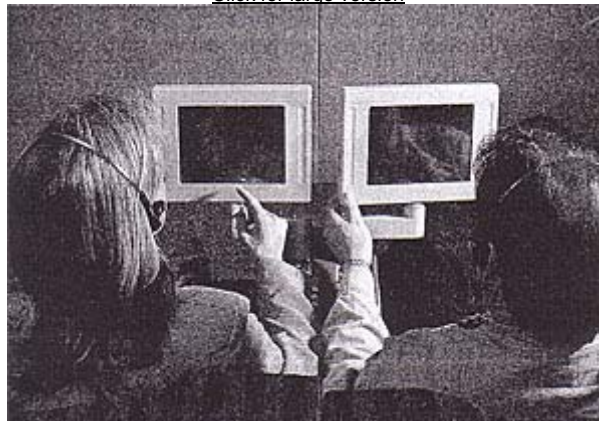
Photo © Paul Kanagie

The electrical design of the MD-11 was considered rather revolutionary when it was introduced in the early 1990s. Unfortunately, the MD-11 was one of the last aircraft equipped with Kapton-insulated wire, now banned for the most part by U.S. airplane manufacturers and completely by the U.S. military because of its tendencies to crack under normal conditions (bending, vibrating, aging, exposure to wind or moisture), then to ignite when exposed to heat, friction or moisture.³ The highly flammable Kapton wire insulation also demonstrated the undesirable characteristic of re-igniting with greater intensity upon restoring power to a damaged wire or wire bundle.⁴ These combustive events are called wire arcing. Adjacent to this defective component was Mylar/MPET-covered insulation (Metallized Polyethylene Terephthalate), which is also banned from aircraft in the United States and Canada.⁵ The Canadian Transportation Safety Board (TSB) asserts, "MPET-covered insulation material can be readily ignited from an arcing event."⁶

Furthermore, HB-IWF was one of 16 Swissair MD-11s equipped with an interactive in-flight entertainment network (IFEN) manufactured by Interactive Flight Technologies (IFT) that provided travelers with on-demand videos, music, games, and gambling.⁷ Since the Flight 111 tragedy, it was discovered that the IFT system would operate at 10-20°C hotter in an airplane, and was never tested at such temperatures. Also, the installation of the IFT system was deplorable; the installers

"mixed wire types, installed wires under metal clamps not designed to hold wire, ... installed coaxial cables with right angles," and connected the system "to the wrong electrical power source."⁸ Santa Barbara Aerospace (SBA) was contracted to certify the IFT system, and used myriad dubious techniques to do so, including utilizing false statements, misleading proposals, and incomplete paperwork. A supplemental type certificate (STC ST00236LA-D) was issued before the system was even installed or functional. Although the STC ensures that the aircraft passes electromagnetic interference tests mandated by the FAA, the IFT system was not tested for susceptibility to High-Intensity Radiated Fields (HIRF) after the installation was completed.⁹

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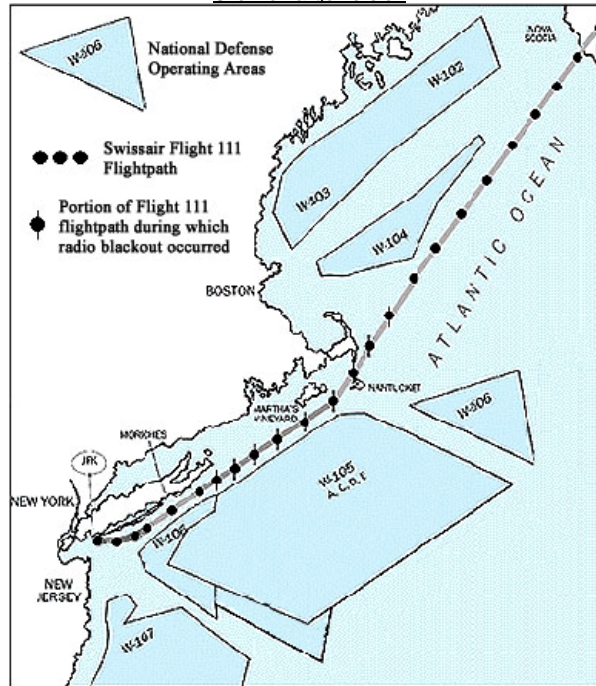
Interactive Flight Technologies Entertainment System
© Aviation Week & Space Technology

The U.S. Navy maintains a considerable presence in the Atlantic Ocean along the eastern coast of the United States. Consequently, when the Navy is operating in the Atlantic, all eastbound flights departing New York must fly through strict non-military corridors. The Department of Commerce describes the areas allotted for military use as "National Defense Operating Areas - operations hazardous to the flight of aircraft conducted within these areas."¹⁰

It is not uncommon for the Navy to use a variety of electromagnetic devices designed for surveillance and/or defense purposes within the restricted operating areas. Such electromagnetic devices are particularly problematic for commercial aircraft because they interfere with electrical, navigation, and communication equipment.¹¹

On September 2, the day of the Swissair Flight 111 crash, seven electromagnetically active craft (the USS Connecticut, USS Dallas, USS Billfish, two P-3 Orions from Patrol Squadron 26, a P-3 Orion from Patrol Squadron 10, and a KC-135 air-to-air refueling aircraft from McGuire Air Force Base), as well as "other aircraft of unknown type and origin" were present in both the restricted area bordering the non-military corridor through which Swissair Flight 111 traveled, and the commercial aviation passageway.¹² The P-3 from Patrol Squadron 10 was equipped with high-powered electromagnetic transmitters, similar to those used by electronic warfare aircraft. Because of the advanced technology aboard this particular P-3, other aircraft flying in its proximity would probably experience significant electromagnetic interference. In fact, during the afternoon of September 2, a P-3 from Patrol Squadron 26 was forced to land early because one of the P-3s from Patrol Squadron 10 was present in the same corridor, which spanned hundreds of square miles.¹³ It seems incredible that not only were three of these aircraft present in the same corridor, but also that the corridor within which they flew was situated next to a commercial aviation passageway. It was through this passageway that Swissair Flight 111 would travel.

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Schematic Chart of the Flight Path of Swissair 111
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Ultimately what brought down Flight 111 was an in-flight ignition of the aircraft's Kapton wiring and Mylar/MPET insulation.¹⁴ The publicly accepted explanation of this catastrophe begins when Captain Zimmerman radios for an unplanned landing nearly an hour into the flight. However, careful examination of the entire flight proves that the problem started much earlier, only 14 minutes after takeoff. At 8:33pm, Swissair Flight 111 completely lost radio contact with all ground controllers for an entire 13 minutes. During the 13-minute gap, Flight 111 remained on the radar constantly, multiple controllers attempted to contact Flight 111, and Flight 111 (as seen on the Flight Data Recorder) attempted numerous times to contact various ground controllers.¹⁵ Additionally, during that time, "an unknown aircraft, presumed to be military" flew directly underneath Flight 111 at a distance of approximately 22,000 feet. Although the Canadian Transportation Safety Board (TSB) concluded, "it is unlikely that an airborne HIRF emitter could have produced unsafe levels of HIRF energy from a distance of 22,000 feet," it is important to note that radio communications between Flight 111 and Air Traffic Control (ATC) were re-established directly following the incident.¹⁶ At this time, everything seemingly went back to normal, but this is likely to be the point at which the initial wiring incident occurred.

As the plane traversed the Atlantic Ocean, the existing damage to the electrical systems immediately became worse, and Pilot Zimmerman declared "Pan Pan Pan" (a minor emergency) and "We have smoke in the cockpit."¹⁷ Unfortunately it remains difficult to determine whether the cockpit smoke resulted from a gradually deteriorating electrical problem or an instantaneous one. Regardless, the crew began following the emergency procedure checklist for smoke in the cockpit. Unfortunately, the crew's precise adherence to the checklist was partially responsible for the eventual demise of Flight 111. Because the list itself is too long, completing all of the steps, especially during a serious emergency, wasted precious time. The Swissair MD-11 fire in the cockpit checklist contains 208 separate steps; comparatively, the same checklist for Delta Airlines MD-11 aircraft consists of only 43 steps.¹⁸ Furthermore, according to the TSB, "there was no integrated in-flight fire fighting plan in place for the accident aircraft ... [and] the aircraft crew did not have procedures or training directing them to aggressively attempt to locate and eliminate the source of the smoke, and to expedite their preparations for a possible emergency landing."¹⁹

SMOKE / FUMES OF UNKNOWN ORIGIN

CAB BUS P/B -----OFF

Pause long enough for cabin crew to evaluate whether smoke or fumes decrease.

◇ SMOKE / FUMES DECREASE ◇

NO
Continue with cabin bus inoperative.

(END)

CAB BUS P/B -----ON

SMOKE ELEC/AIR Selector -----PUSH AND ROTATE

Rotate SMOKE ELEC/AIR Selector clockwise, pausing at each position long enough to evaluate whether smoke or fumes decrease. When a decrease is noted, leave selector in that position for rest of flight. Continue with that generator channel and air system inoperative and observe associated consequences.

NOTE:

- When rotating the SMOKE ELEC/AIR Selector, the autothrottle will disengage and be unusable. The autopilot may disengage but then use another autopilot.
- Nuisance stick shaker may occur.
- (Stick shaker CBs on overhead panel: Captain E-1, F/O E-31)
- Following essential systems are inoperative or off in accordance with SMOKE ELEC/AIR Selector Pos:

SMOKE Selector Pos. 3/1 OFF:

- only Captains VHF 1 and interphone available.
- DU 4, 5, 6; MCDU 2; FMS 2; IRS 2 (after 15 min).
- Radar 2; All Nav aids 2
- BLEED AIR 1; PACK 1; ECON system; WING anti-ice.
- F/O pilot heat.
- Auto slat extension.
- Landing gear aural warning.
- Autobrakes

FOR APPROACH:

- Set FLAP LIMIT Selector to OVRD 1.
- Go-around mode is not available.

SMOKE Selector Pos. 2/3 OFF:

- BLEED AIR 3; PACK 3; WING anti-ice.
- Aux pitot heat.
- Fuel dump low level
- HORIZONTAL STABILIZER TRIM Switches on control column.
- Engine 2 reverser.

SMOKE Selector Pos. 1/2 OFF:

- only VHF 2 and 3 available.
- DU 1, 2, 3; MCDU 1; FMS 1.
- IRS 1 and AUX IRS after 15 min, (AP no longer available).
- Radar 1; All Nav aids 1.
- BLEED AIR 2; PACK 2; WING and TAIL anti-ice.
- Captain pilot heat.
- GPWS, GPWS BELOW G/S lights.
- Auto ground spoilers.
- Engine reversers 1 and 3.

FOR APPROACH:

- Set FLAP LIMIT Selector to OVRD 2.
- On CAPT SISF push FD P/B to OFF.
- Go-around mode is not available.

If smoke/fumes are not eliminated, land at nearest suitable airport.

(END) MD-11 41.1 Page 10

Swissair Smoke/Fumes of Unknown Origin Checklist
© Transportation Safety Board of Canada

Completion of the Swissair emergency checklist proved to be disastrous for Flight 111. The instructions called for the crew to alternately turn off and on the electrical circuits of the plane, one third of them at a time.²⁰ Because of the Kapton wire insulation's tendency to re-ignite with increased intensity when power is restored to a damaged wire, this step proved to be especially catastrophic. At this point, the fire consumed the front of the aircraft, and there was little left for the crew to do. One last radio transmission came through before the MD-11 plunged into the Atlantic Ocean: "And we are declaring emergency now Swissair one eleven."²¹

In an effort to determine the cause of the accident, the TSB embarked upon the enormous task of recovering and analyzing as much of the aircraft as possible. The plane was destroyed to such an extent that an entire hanger had to be constructed simply to house the countless aircraft fragments. Because the smoke was initially reported in the cockpit, the TSB decided to reconstruct as much of the fore-section of the aircraft as possible. Although these extensive efforts were able to prove where the fire started and how it was propagated, they fell short of proving why it initially broke out.²² The conclusion of the TSB was that "within the localized area where the fire most likely started, a wire arcing event is the only plausible ignition source. ... [The TSB found 17] cable and wire segments with arcing damage, ... eight [of which] ... were from the IFEN installation."²³

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The Reconstruction Mock-Up
© Transportation Safety Board of Canada

Even though the use of Kapton wire and Mylar/MPET insulation in the construction of new aircraft has been banned, there is still an enormous number of aircraft flying that contain these dangerous and defective components. To ensure that the existing aircraft with Kapton wiring are safe, numerous safety advisories, safety recommendations, airworthiness directives, and service bulletins have been issued by the TSB, NTSB, FAA, and Boeing (previously McDonnell Douglas) which mandate the inspection of the wiring aboard such aircraft.²⁴ Although these measures are supposedly adequate to ensure the airworthiness of the existing fleet, it is simply impossible to inspect all of the 150 miles of wiring aboard each airplane. Dale Stolzer, the Engineering Director for Southwest Airlines remarks: "There are portions of the aircraft where the wiring is almost totally inaccessible, and the reason for that is the wiring is built into each section of the aircraft as it is originally manufactured, and then the large sections of the aircraft are assembled. So, completely re-wiring the airplane or gaining access to every inch of every wire...is just not feasible."²⁵

Interestingly, U.S. military operations in the Atlantic continue in a mostly unchanged manner, even though there is strong evidence that electromagnetic interference in almost precisely the same area has contributed not only to the crash of Swissair Flight 111, but also to the crashes of TWA Flight 800 and EgyptAir Flight 990. In response to this tragedy, Swissair amended its emergency procedures and revoked the certification of the IFT entertainment system, but has since gone out of business.²⁶ The FAA has mandated the repair of 18 other potentially unsafe entertainment systems, revised its STC issuance regulations, and issued more than 50 airworthiness directives regarding wiring aboard MD-11 aircraft.²⁷ In light of the IFEN system's significant contribution to the disaster, SBA, which certified the system, went bankrupt and ceased operations in 1999. Interactive Flight Technologies, the system's manufacturer, witnessed an exodus of its executives as the value of its stock dropped drastically, yet did not go out of business. Interactive Flight Technologies changed its name to Global Technologies and has stayed true to its dream of selling the best "at-seat multimedia and entertainment system."²⁸



Engine Number 3 Being Lowered on to the Deck of a Barge

¹Terence McKenna, "Fire In the Sky," CBC News- The Magazine (2000)
<http://www.cbc.ca/news/national/magazine/swissair/index.html>.

²"Fire In Flight: Finding the Spark," The Learning Channel, BBC, 1999.

³Gary Stoller, "Air Safety's Frayed Link," USA Today 27 November 2000, Final ed.: B1. "Fire in Flight: Finding The Spark." "Electrical Arcing Melted Aluminum on Flight 111," The Ottawa Citizen 21 November 1998, Final ed.: A5. Bob Dunham, US Naval Air Systems Command 1972-91, interview with The Learning Channel, "Fire in Flight: Finding the Spark," TLC, BBC, 1999.

⁴Armand Bruning, aircraft wiring expert, interview with The Learning Channel, "Fire in Flight: Finding the Spark." Bob Dunham, interview with The Learning Channel, "Fire in Flight: Finding the Spark."

⁵Vic Gerden, chief investigator, Transportation Safety Board of Canada, interview with Terence MckEnna, "Fire In the Sky," CBC News- The Magazine (2000).

⁶Canada, Transportation Safety Board (TSB), SR 111 Investigation Report (A98H0003) (Gatineau: Transportation Safety Board of Canada, 2003) 2.17.1.

⁷Gary Stoller, "Doomed Plane's Gaming System Exposes Holes in FAA Oversight," USA Today 17 Feb. 2003final ed.: 3B. SR 111 Investigation Report (A98H0003) 2.14, Supporting Technical Information, "IFEN".

⁸Stoller, "Doomed Plane's Gaming System" 3B.

⁹SR 111 Investigation Report (A98H0003) Supporting Technical Information, "IFEN – FAA Certification and Delegation Process." Stoller, "Doomed Plane's Gaming System" 2B.

¹⁰United States Department of Commerce, World Aeronautical Chart for the New York-New England Area, Section CF-19. (Washington: 1997).

¹¹Elaine Scarry, "Swissair 111, TWA 800, and Electromagnetic Interference," The New York Review of Books, 21 September 2000. 5 Sept. 2003 <http://www.nybooks.com/articles/13898>. SR 111 Investigation Report (A98H0003) Supporting Technical Information, "High-Intensity Radiated Fields."

¹²SR 111 Investigation Report (A98H0003) Supporting Technical Information, "High-Intensity Radiated Fields, Mobile Emitters." Scarry.

¹³Patrol Squadron 26: "Patron Twenty-Six Flight Schedule, Wednesday 02 September 1998," Event 4 (taking off at 4:50pm and landing at 9:55pm), and Event 5 (taking off at 6:30pm and landing at 9:55pm). Patrol Squadron 10: "Patron Ten Flight Schedule, Wednesday 02 September 1998," Event 8 (taking off at 7:20pm and landing at 11:30pm). Both schedules included in a letter and accompanying documents obtained by Elaine Scarry in 1999 through Mark E. Newcomb, Commander, Judge Advocate General's Corps, US Navy, Force Judge Advocate, by the direction of the Commander Naval Air Force, United States Atlantic Fleet, Norfolk, Virginia. "Fleet Area Control and Surveillance Facility, Virginia Capes (FACSFAC VACAPES)" Messages 162000Z, August 1998, Item E, also obtained by Elaine Scarry.

¹⁴SR 111 Investigation Report (A98H0003) 1.14.12, 3.1.

¹⁵Comparison of seven separate FAA tapes covering five radar sectors, obtained 19 May 1999 by Elaine Scarry through a freedom of information request. FAA Tape for Nantucket Associate Position covering the periods 8:48-9:01pm and 8:42-9:04pm Eastern Daylight Time. FAA Tape for the Augusta, Maine Radar Sector covering the period 8:41-8:53pm Eastern Daylight Time. FAA Tape for the Hampton Associated Air Controller covering the period 8:31-8:45pm Eastern Daylight Time. FAA Tape for the Hampton Radar Sector covering the period 8:23-8:45pm Eastern Daylight Time. FAA Tape for the Cape Associated Air Controller covering the period 8:31-8:44 Eastern Daylight Time. FAA Tape for Swissair Flight 111 covering the period 8:23-8:45pm, Eastern Daylight Time. SR 111 Investigation Report (A98H0003) 5.0 "Appendix D – Timeline."

¹⁶SR 111 Investigation Report (A98H0003) Supporting Technical Information, "High-Intensity Radiated Fields, Mobile Emitters."

¹⁷"Air Traffic Control Preliminary Transcript of the September 2, 1998 accident of Swissair Flight 111," Aviation-Safety Network (2001) http://aviation-safety.net/cvr/atc_sr111.shtml.

¹⁸McKenna, <http://www.cbc.ca/news/national/magazine/swissair/doc3.html>, <http://www.cbc.ca/news/national/magazine/swissair/doc4.html>.

¹⁹SR 111 Investigation Report (A98H0003) 3.1, "Supporting Technical Information, Personnel Training."

²⁰McKenna, 1. SR 111 Investigation Report (A98H0003) 3.1, 4.1.8

²¹"Air Traffic Control Preliminary Transcript of the September 2, 1998 accident of Swissair Flight 111."

²²SR 111 Investigation Report (A98H0003) 1.12.2.2, 3.1.

²³SR 111 Investigation Report (A98H0003) 2.17.2.

²⁴Jim Hall, Chairman, National Transportation Safety Board, Safety Recommendation A-99-3 1 November 1999. J. L. Maxwell, Director, Air Investigations, Transportation Safety Board of Canada, "MD-11 Wiring," Safety Advisory 980031-1 22 December 1998. William T. Tucker, Director, General Investigation Operations, Transportation Safety Board of Canada, "MD-11 Flight Crew Reading Light (Map Light) Installations," Aviation Safety Advisory A000008-1 2 March 2000. United States, Federal Aviation Administration, "McDonnell Douglas MD-11 Series Airplanes," Airworthiness Directive 98-25-11 10 December 1998. "FAA Orders Inspection of MD-11 Cockpit Switches," Federal Aviation Administration 12 November 1998 <http://www.faa.gov/apa/pr/pr.cfm?id=576>.

²⁵Dale Stolzer, interview with The Learning Channel, "Fire in Flight: Finding the Spark."

²⁶Swissair, SairGroup Press Release, "Search for the cause of SR111 tragedy continues," Swissair 30 August 2000. Stoller, "Doomed Plane's Gaming System" 3B.

²⁷Stoller, "Doomed Plane's Gaming System" 3B. SR 111 Investigation Report (A98H0003) 4.1.

²⁸Stoller, "Doomed Plane's Gaming System" 3B.