

Swissair 111

Sensors Could Have Made A Difference

**In-Flight Smoke/Fire/Fume Events:
The need for improved aircraft systems.**

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- **Disclaimer: This presentation does not attempt to 'second guess' any crewmember, manufacturer, or operator mentioned in conjunction with a Smoke Fire Fumes (SFF) event.**
- **Any crewmembers, manufacturers, or operators mentioned in this presentation, used the best procedures they had available at the time of the event.**

Swissair 111

02 September 1998

229 Souls On Board

Peggy's Cove, Nova Scotia

THERE WERE NO SURVIVORS

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- **Some may ask: “Why use Swissair 111 as an example? There have been other Smoke/Fire/Fumes accidents/fatalities.”**
- **An aircrew needs to know the nature and seriousness of any emergency in order to take the proper actions to deal with the emergency.**
- **Even though corrective measures were taken in other SFF accidents, the issue of being able to identify, extinguish, and monitor a hidden fire has not been resolved.**
- **Swissair 111 is the most recent example and hence, was used in this presentation.**

0110:38 - The first officer referenced an unusual odour in the cockpit

0110:57 - The captain said "look," indicating something was visible in the cockpit

0111:29 - The first officer indicated that there was nothing more "up there"

0112:16 - The flight attendant confirms a smell in the cockpit but not in the cabin

0112:32 - The captain commented: "Air conditioning, is it?" The first officer answered "yes"

0113:14 - A discernable amount of smoke again became visible to the pilots

0114:15 - SR 111 made a Pan Pan radio transmission indicating that there was smoke in the cockpit, and requested a diversion, naming Boston (Distance 66 nm from the Halifax International Airport)

0115:06 - The controller asked the pilots whether they would rather go to Halifax

0115:36 - The captain advised the controller that they would prefer Halifax; descent begins

0117:20 - The instrument approach plates for the Halifax International Airport were not readily available to the pilots

0117:50 - The captain briefed the MC that there was smoke in the cockpit and that they will land in about 20 minutes to half an hour

| TIME (UTC) | HEADING (°M) | ALTITUDE (Feet) | GROUND SPEED (kt) | DISTANCE TO HALIFAX AIRPORT (nm) |
|------------|--------------|-----------------|-------------------|----------------------------------|
| 0110:38 | 085 | 33 023 | 532 | 97 |
| 0110:57 | 085 | 33 015 | 532 | 95 |
| 0111:29 | 085 | 32 989 | 532 | 90 |
| 0112:15 | 086 | 32 964 | 534 | 83 |
| 0112:32 | 085 | 32 945 | 532 | 81 |
| 0113:14 | 087 | 32 982 | 532 | 75 |
| 0114:15 | 087 | 32 968 | 532 | 66 |
| 0115:06 | 102 | 32 967 | 522 | 60 |
| 0115:36 | 123 | 32 978 | 502 | 57 |
| 0117:20 | 061 | 29 719 | 499 | 48 |
| 0117:50 | 054 | 28 335 | 483 | 44 |
| 0119:27 | 049 | 22 355 | 464 | 31 |
| 0119:37 | 049 | 21 714 | 462 | 30 |
| 0119:50 | 036 | 20 919 | 457 | 28 |
| 0119:57 | 032 | 20 572 | 451 | 27 |
| 0120:48 | 360 | 17 725 | 426 | 22 |
| 0122:27 | 348 | 12 383 | 397 | 17 |
| 0123:45 | 245 | 10 394 | 348 | 22 |
| 0124:09 | 211 | 10 166 | 368 | 24 |
| 0124:42 | 179 | 10 285 | 370 | 25 |
| 0125:33 | 178 | ---- | 352 | 26 |
| 0125:41 | 177 | ---- | 350 | 27 |
| 0126:04 | 177 | 9 700 | --- | 29 |



RWY 06 CENTRELINE

0125:41 - Flight recorders and VHF communication radios stopped functioning

0124:42 - SR 111 declared an emergency to controller

0126:04 - Transponder stopped

0125:33 - Flight displays degrade

0124:09 - Autopilot 2 disconnected (the first of several recorded system anomalies)

0123:45 - CABIN BUS switch selected to OFF

True North (Variation 20°W)

0131:18 - Impact

0122:27 - Closest point to Halifax International Airport

0120:48 - The pilots discussed fuel dumping

0119:27 - The flight attendant moved the crew bag with approach charts within the captain's reach

0119:50 - The first officer informed the controller that more than 30 miles would be required

0119:57 - The controller informed SR 111 to turn to a heading of 360° to lose altitude

0119:37 - The controller informed SR 111 that the approach to Runway 06 was a back-course, and advised the pilots that they were 30 miles from the threshold (altitude 21 714 feet)



Halifax Shearwater Airport

Halifax International Airport



| UTC Time | Elapsed Time (minutes) | Impact (minutes) | Event |
|------------------|------------------------|------------------|--|
| 110:38:00 | 0:00 | 20:40 | Unusual smell detected in the cockpit |
| 113:14:00 | 2:36 | 18:04 | Smoke assessed as visible at some location in the cockpit; no smell reported in cabin |
| 114:15:00 | 3:37 | 17:03 | SR 111 radio call: "Pan Pan Pan"; diversion requested naming Boston |
| 115:36:00 | 4:58 | 15:42 | Decision made to divert to Halifax, Nova Scotia |
| 124:42:00 | 14:04 | 6:36 | Emergency declared |
| 125:41:00 | 15:03 | 4:57 | Recorders stop recording |
| 131:18:00 | 20:40 | 0:00 | Impact with water |

Could They Have Made It?

- MD 11 Simulator.
- MD 11 Captain in left seat.
- Non qualified pilot (me) in right seat.
- Simulator configured the same as Swissair 111.
- Simulator crew knew they had a serious SFF issue.
- Simulator crew made 'aggressive' diverts to Halifax.

Test Case #1

- The simulator was placed on the 264 degree radial, **95** miles from Halifax **FL 330**. This approximated the first indication Swissair 111 had of their problem which occurred at **0110:38**. The configuration was: Idle, speed brakes out, max airspeed, fuel dumping, no winds.
- **RESULT:** Simulator landed on Runway 05 Halifax* approximately **16 minutes** later, speed 169 kts.
 - * (At the time of the accident the runway at Halifax was 06. It is now 05.)
- From 0110:38, SwissAir111 struck the water approximately **20 minutes and 40 seconds** later at 0131:18.

Test Case #2

- We used Swissair 111 time of **0115:36** when the crew asks to divert to Halifax. The simulator is on the 238 degree radial, **60 mi** from Halifax **FL 330**.
- This time the simulator crew makes a more aggressive descent. Configuration: Idle, Speed brakes out, Gear down, Fuel dump, Speed at times exceeding max speed limits.
- **RESULT:** The simulator landed on Runway 05 Halifax approximately **10 minutes 15 seconds** later, speed 169 kts.
- From 0115:36, SwissAir111 struck the water approximately **15 minutes and 42 seconds** later at 0131:18.

Test Case #3

- Same configuration as Case #2. This time we added tailwinds. We used a tailwind of 60 kts from FL330 to FL200. 30 kts from FL200 to 6K'. 100/10 from 6K' to touchdown.
- **RESULT:** The Simulator landed on Runway 05 Halifax approximately **9 minutes 47 seconds** later, speed 169 kts.
- Once again, from 0115:36, SwissAir111 struck the water approximately **15 minutes and 42 seconds** later at 0131:18.

Test Case #4

- Same set up as Case # 2 & 3. This time we used a less aggressive descent. Delaying gear extension, no fuel dumping, do not exceed max airspeed(s).
- **RESULT:** The simulator landed on Runway 05 Halifax approximately **9 minutes 19 seconds** later, speed 169 kts.
- Once again, from 0115:36, Swissair111 struck the water approximately **15 minutes and 42 seconds** later at 0131:18.

Test Case #5

- Same set up as Cases # 2, 3 & 4. This time even less aggressive. Didn't use gear until the last minute to slow down.
- RESULT: The simulator landed on Runway 05 Halifax approximately **9 minutes 19 seconds** later, speed 169 kts.
- Once again, from 0115:36, SwissAir111 struck the water approximately **15 minutes and 42 seconds** later at 0131:18.

What has been done?

SFF Steering Committee

- **Accomplished to date:**
 - Standardized SFF checklist, definitions and philosophy
 - Emphasis on consideration of landing
- **FAA research on material flammability**

What needs to be accomplished?

- A non-alerted SFF event of unknown nature and intensity is the worst scenario a pilot can face.
- Standardized SFF checklist still requires knowledge of the nature and intensity of the SFF event.
- **Current aircraft systems do not provide adequate protection, detection or feedback.**

WHY?

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Tombstone Mentality

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History has shown that there has **NOT** been a major safety initiative that was **NOT** predicated by a significant aircraft accident / fatalities.

Tombstone Threshold

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PSA 182



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Delta 191



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Air Canada 797



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Valujet 592

UPS DC-8 Philadelphia, Feb. 2006



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Swissair 111



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Legacy of Swissair 111?

- **SFF Checklist Template**
 - Boeing / Airbus implementation - but yet to be industry-wide
 - Not mandated by FAA
- **FAA research on material flammability**
 - Insulation Changes

HOWEVER

- **Pilots still do not have system feedback regarding aircraft status during a SFF event.**
- **No FAA aircraft mandates for SFF detection, protection, monitoring systems.**

CONCLUSION

- Data from the simulator testing clearly indicates that SFF sensors could have made the difference with Swissair 111.

RECOMMENDATION

- The time has come to be **PROACTIVE** instead of **REACTIVE** when it comes to inaccessible aircraft fires.

229

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1

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