Summary of In-Flight Smoke Accidents

Swiss Air 330 21 Feb 1970
CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft flew past airport while attempting to return for landing. Flight crew unable to see due to heavy continuous smoke (transcript attached)

Varig 11 July 1973
Aircraft lost after off airport forced landing. Report specifies crew unable to see instruments due to smoke (excerpts attached).

Pan Am 3 November 1973
CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft crash landed in water short of the runway. Flight crew unable to see due to heavy continuous smoke (report excerpt attached)

Cubana de Aviacion 6 October 1976
CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft crash landed in water short of the runway. Flight crew unable to see due to heavy continuous smoke (report excerpt attached)

Air Canada 2 June 1983
This aircraft was nearly lost in-flight due to smoke and fire. The aircraft was destroyed by fire post landing. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

Gulf Air 23 September 1983
Aircraft lost in-flight. Report specifies Crew unable to see instruments due to smoke (excerpts attached).

Private Operator 31 December 1985
CFIT following in-flight fire and cockpit smoke. Flight crew unable to see due to heavy continuous smoke (pilot report attached)

South African Airways 28 November 1987
Aircraft lost in-flight. Report specifies probable cause “A” reduced cockpit visibility in smoke (excerpts attached).

SAS 2 February 1989
This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

Air Europe 17 December 1989
This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

Swiss Air 551 16 October 1993
This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached). Final German FUS report recommends the EVAS system.

Swiss Air 330 21 Feb 1970

CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft flew past airport while attempting to return for landing. Flight crew unable to see due to heavy continuous smoke (transcript attached)

Protokoll uber den Funkverkehr swischen Swissair 330

Und den Dienststellen der Flugsicherung Zurich-Kloten

Auszug aus der Tonbandaufnahme vom 21. Februar 1970

Zeiten: GMT in Stunden, Minuten und Sekunden
Rufzeichen: 330 = SR 330
GND = Zurich Ground
TWR = Zurich Tower
DEP = Zurich Departure
CTL = Zurich Control
APP = Zurich Approach
RAD = Zurich Approach Radar

GMT:	To:	From:	Text:
12 18 40	CTL	330	good afternoon
	330	CTL	good afternoon squawk alfa 01 report 150
	CTL	330	squawking alfa 01 will check passing 150
	330	CTL	roger
19 50	CTL	330	now intercepting radial 172 from Trasadingen turning to Monte Ceneri
20 00	330	CTL	roger
21 00	CTL	330	(schwach horbares Gesprach aus dem Cockpit: … returning ….. Gepack) we have trouble with the Cabin Compression we have to return to Zurich
	330	CTL	roger what is your actual level?

GMT:	To:	From:	Text:
	CTL	330	140 request reverse course
21 10	330	CTL	roger then make a right turn Swissair 330 back to Koblenz
	CTL	330	roger turning right back to Koblenz maintaining 140?
21 20	330	CTL	that is correct for the time beeing
	CTL	330	roger
	330	CTL	you are just east of Brunnen
	CTL	330	thank you
21 50	330	CTL	you may stop your turn onto heading 335 for positioning on the ILS runway 16
22 00	CTL	330	roger will stop turning on 335 and request descend
	330	CTL	roger I call you back
22 50	CTL	330	We suspect an explosion in the aft compartment of the aircraft every thing is ok at the moment but we request descend clearance immediately and fire fighting equipment on the ground for landing
23 10	330	CTL	roger descend to flight level 100 you are coming back to Brunnen
23 20	330	CTL	(Anruf)
23 30	CTL	330	roger we descend say again the level?
	330	CTL	100
	CTL	330	100? and we are leaving 140 for 100
	330	CTL	roger
24 00	330	CTL	what is your heading?
12 24 00	330	CTL	your heading?
24 10	CTL	330	is now 060

GMT:	To:	From:	Text:
	330	CTL	roger but do not turn back towards the south please
24 20	CTL	330	roger we are on 060 maintaining
24 30	330	CTL	turn left please on to heading 330
	CTL	330	oh roger now turning left to 330
	330	CTL	roger
25 30	CTL	330	reaching 100
	330	CTL	roger
25 40	CTL	330	we also request a police to investigate the
	330	CTL	say again please
	CTL	330	we also request a police to investigate the Incident
26 00	CTL	330	we have fire on board request an immediate landing
	330	CTL	that is understood descend to flight level 60
26 10	CTL	330	we descend to 60 as quickly as possible we have fire on board in the aft
	330	CTL	understood
26 20	CTL	330	this is an emergency Zurich from 330
	330	CTL	all understood
26 50	330	CTL	you are now 5 miles south east of inter-section ALFA
	CTL	330	roger we are leaving 80
	330	CTL	roger
27 20	330	CTL	continue heading 330 further instructions with approach on 118.0
27 30	CTL	330	ah GCA appro ah we have fire on board we have speed and request GCA approach our navigation is not ok
27 40	330	CTL	ok understood

GMT:	To:	From:	Text:
	CTL	330	aah
	330	CTL	you may expect it Swissair 330
28 00	CTL	330	main ah descending now to ah 60 heading 330
	330	CTL	correct just east of ALFA
	330	CTL	approach on 118.0
28 10	CTL	330	118.0
			118.0 MHz Approach
12 28 20	APP	330	(ruft mit 338) we have electrical power failure (Kommandant und Copilot sprechen gleichzeitig) 330 330
	APP	330	go ahead
28 30	330	APP	we no delay for radar vector ILS runway 16 check wind 220 degrees 20 knots
29 00	330	APP	altitude?
29 40	330	APP	you are cleared to descend to 4000 SR 330 cleared to descend to 4000
30 10	330	APP	I can not read you any more I can not read any more please continue heading 330 …… zero (Pfeifton zufolge Doppelbe-aprechung)
12 30 50	TWR	330	on 118.1 how do you read?
31 00	330	TWR	read you three
	330	RAD	do you read here
	RAD	330	loud and clear come in we are 6000 feet We are think we are on heading 329
31 10	330	RAD	roger make your heading 330 descend to 4000 heading 330 4000

GMT:	To:	From:	Text:
	RAD	330	ok 4000 feet heading 330
31 40	330	RAD	according radar you are going off track turn to the right until I say stop
	330	RAD	(Anruf)
32 00	RAD	330	roger 330
	330	RAD	roger turn to the right until I say stop you are fully off track now
	RAD	330	we are turning to the right 330
	330	RAD	roger
32 10	RAD	330	can you give me my position about?
	330	RAD	you are passing Buden and stop your turn now
	RAD	330	…….. possible (Pilot and Verkehrs-Leiter sprechen gleichzeitig)
	330	RAD	roger what is your heading you are going through now
32 20	RAD	330	passing now 330 335
	330	RAD	thank you turn right 360
	RAD	330	360
	330	RAD	descend to 3500 feet (Pilot and Verkehrs-leiter sprechen gleichzeitig, Pilot unverstandlich)
32 30	RAD	330	say again say again
	330	RAD	descend to 3500 feet on QNH 1013
	RAD	330	3500 1013
32 40	330	RAD	do you wish a short final to be final over Rhine or a normal line up (Pilot and Verkehrsleiter sprechen gleichzeitig, Pilot Unverstandlich)

GMT:	To:	From:	Text:
32 50	330	RAD	do you wish a normal line up or a short line up?
33 00	RAD	330	…….. emergency we have …. Smoke on board I can't see anything
12 33 10	330	RAD	right heading 080 330 right 080
33 20	ORI	RAD	(Sabena RI) there is an aircraft below you on emergency can you see it? (Keine Antwort)
	RAD	330	is crashing
33 30	330	RAD	roger
	RAD	330	good bye everybody
	RAD	330	good bye everybody
33 40	RAD	330	……. Reducing power we cannot see anything can you give me a low altitude?
34 00	330	RAD	you are making a threesixty (Pfeifton zu-folge Doppelbesprechung) you are making a threesixty left hand side maintain at least 3500 feet and if possible set course heading 080 stop your turn heading 080 if possible
35 00	330	RAD	you are now you are now on heading 080 please stop turn on heading 080 this is direct to Rhine beacon
35 30	330	RAD	heading 080 please
	330	RAD	please open the window SR 330 open your window please

GMT:	To:	From:	Text:
35 40	330	RAD	heading 080 I can not read you any more please open your window
36 00	330	RAD	on 3500 feet you are now heading Rhine I say again open the window please
36 10	330	RAD	you are very very low speed now
36 30	330	RAD	you are at very low speed could you increase speed to a heading east please increase speed to heading east and open your window
36 40	330	RAD	you are still circling you are still circling continue a heading east if possible
37 50	330	RAD	continue you are proceeding now direction field maintain if possible 3500 feet

Varig 11 July 1973

Aircraft lost after off airport forced landing. Report specifies crew unable to see instruments due to smoke (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS
ALPA article

One of the most ignored truisms is that the ability to fly an aircraft has to be complemented by the ability to crash it competently.

In July 1973, the crew of a four-engine jet transport asked the approach controller for an emergency descent since they had "a problem of fire on board." The flight had completed an 11-hour transatlantic crossing and had routinely descended to 8,000 feet. Five minutes after the emergency was declared, smoke in the cockpit made the situation so intolerable that the captain decided to make a forced landing. He had to open the sliding cockpit window to maintain ground reference. The aircraft was skillfully landed in open farm land, about three miles from the destination runway. Unfortunately, by that time most of the cabin occupants had already been incapacitated by the in-flight smoke and were unable to leave the intact fuselage which was subsequently destroyed in the ground fire.

RECREATION FROM ORIGINAL DOCUMENTS

FAA Statement:

July 11, 1973 – Boeing 707 (Varig) A fire which apparently started in one of the aft lavatories created dense smoke in the passenger cabin. The fire was not controlled and smoke eventually reached the cockpit. In spite of oxygen masks and goggles, the crew found it necessary to make a forced landing while using the openable side windows for vision. 123 fatal, 11 injured (both pilots survived)

Pan Am 3 November 1973

CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft crash landed in water short of the runway. Flight crew unable to see due to heavy continuous smoke (report excerpt attached)

1973, November 3rd. A Pan American 707-321C cargoliner, crashed, just short of the runway, at Boston Logan International Airport, killing the 3 pilots on board. Only 30 minutes after taking off from New York's JFK Airport, the pilot reported smoke in the cockpit. The smoke became so thick that it "…seriously impaired the flightcrew's vision and ability to function effectively during the emergency."

Cubana de Aviacion 6 October 1976

CFIT following in-flight fire and cockpit smoke. Otherwise flyable aircraft crash landed in water short of the runway. Flight crew unable to see due to heavy continuous smoke (report excerpt attached)

RECREATION FROM ORIGINAL DOCUMENTS

Aircraft Accident

Cubana de Aviation

DC8-43 Aircraft

CUT-1201

which crashed into the sea northwest of

Bridgetown, Barbados on October 6, 1976

with the loss of all on board

The Commission determines that the accident was due to the effects of an explosive device placed within the passenger compartment of the aircraft

REPORT OF THE COMMISSION OF ENQUIRY

PART ONE

Bridgetown, Barbados
March 1977

2.3 Events in the Flight Compartment

The following analytical reconstruction of probable events during the flight is based on assessment of evidence detailed elsewhere in this report and on related technical studies.

The take-off and climb-out from Seawell were normal. The First Officer was at the flight controls and the Captain was handling the radio communications. At 1723 the aircraft had reached an altitude of about 16,000 feet.

A few seconds later the crew heard violent explosive sounds which appeared to come from the rear of the aircraft. The Captain pressed his microphone button and shouted "cuidado" (be careful) as he assumed control. The First Officer then reported an explosion and fire to air traffic control.

The Captain commenced an emergency descent and at 1723:43 started a right turn toward Seawell Airport. During the rapid descent the crew carried out emergency procedures to effect smoke removal.

The flight compartment door had been locked in accordance with regulations. During the emergency a crew member opened the door**. Heavy smoke and noxious fumes entered the flight compartment causing the Captain to shout "Close the door! Close the door!"**

In the passenger cabin, an uncontrollable fire had started in the aft cabin making it impossible to reach the wall-mounted fire extinguisher or to open the galley access door to remove the smoke. Some occupants of the cabin died within minutes from the effects of noxious gases produced by burning plastic materials. They were still strapped to their seats. The cabin flight attendants were similarly affected. The fire was intensified by oxygen escaping from shattered supply lines in the rear.

The pilots continued to attempt to reach Seawell airport. They reduced speed and altitude, lowered flap and extended the landing gear. During the descent they flew through rain showers**. Heavy black smoke ad choking fumes continued to enter the flight compartment and the pilots had great difficulty seeing the flight instruments.** Nevertheless they managed to guide the aircraft almost to the extended centre-line of runway 09 at Seawell.

Finally it became impossible to see the flight instruments because of the smoke. Irritation from the chemical fumes made wearing the oxygen masks uncomfortable**. One pilot opened a cockpit window but the only effect was to draw more smoke; the other shouted "That's worse! Go near the water! Go near the water!".**

4.0 RECOMMENDATIONS

The Commission of Enquiry recommends that the Government of Barbados brings the following items formally to the attention of the International Civil Aviation Organization for dissemination to member states:

(a) Flight crew members in large Commercial aircraft should be provided with an adequate number of effective portable devices to protect the eyes and respiratory tract, for use in emergencies related to fire and toxic gases.

(b) Research and regulatory action should be expedited to develop and require the use of materials in aircraft cabins that do not support combustion and do not produce toxic gases when exposed to high temperatures.

(c) The criteria for the certification of large Commercial aircraft should include requirement for a positive means of smoke removal, particularly from the cockpit area.

For reasons of security, other recommendations are being made in a separate document.

By the Commission of Enquiry

Denys Ambrose Williams
Chairman

Thomas Edwin Went
Member

William Maurice Howes
Member

Bridgetown Barbados March 1977.

Air Canada 2 June 1983

This aircraft was nearly lost in-flight due to smoke and fire. The aircraft was destroyed by fire post landing. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS

AVIATION SAFETY
(Aircraft Passenger Survivability and Cabin Safety)

(98-64)

HEARINGS

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND

OVERSIGNT

OF THE

COMMITTEE ON PUBLIC WORKS AND

TRANSPORTATION

HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

JULY 12, 13, 14, 1983 – AIRCRAFT PASSENGER SURVIVABILITY
NOVEMBER 1, 2, 1983 – CABIN SAFETY

(text unintelligible) for the use of the Committee on Public Works and Transportation

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1985

In order to simplify procedures for the flightcrew, arrival control maintained control of communication with Flight 797 throughout the approach and this procedure was coordinated with the tower. Arrival control then provided the flightcrew with range calls during the final approach.

The flight attendants had dispensed one tray of wet towels to the passengers. The flight attendants also selected able-bodied passengers to sit near overwing exits and instructed them to open these exits after the airplane was stopped. According to the cabin crew, the smoke remained in the aft portion of the cabin until the start of descent, **thereafter it increased and spread throughout the cabin. The smoke was described as heavy, and black and the cabin visibility decreased to a few feet.**

A maximum rate of descent was made at 310 knots and the airplane was leveled off initially at 3,000 feet and thereafter a descent was made to 2,000 feet**. Smoke was now entering the cockpit and both pilots donned oxygen masks and smoke goggles**. The flaps and the landing gear were extended**. The smoke in the cockpit had by this time become so thick that the captain had difficulty seeing his airspeed indicator during the final approach.** After touchdown, a maximum effort stop was made. Since the electrical system had failed and had rendered the antiskid system inoperative, the main wheel tires blew out during the stop. After the airplane was stopped, the flightcrew executed emergency shut-down procedures. They then attempted to enter the cabin to assist the cabin crew with the passenger evacuation; however, the heat and smoke in the cabin were so intense they were not able to enter the cabin, and they exited the airplane through the cockpit windows.

Gulf Air 23 September 1983

Aircraft lost in-flight. Report specifies Crew unable to see instruments due to smoke (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS

3737 CRUISE NR ABU DHABI 23 SEP 83 8302756D S

FOREIGN ACC AC CRASHED IN DESERT NEAR ABU DHABI CAUSE UNDERTERMINED NO SURVIVORS

AC CRASHED IN DESERT NEAR ABU DHABI. ALL PASSENGERS AND CREW WERE KILLED. INVESTIGATION BEING CARRIED OUT TO DETERMINE THE CAUSE OF THE ACCIDENT. POSSIBILITY OF SABOTAGE. EYEWITNESS REPORTED "HEAVY SMOKE SUDDENLY CAME FROM THE "PLANES FRONT AND REAR. IT MADE SEVERAL TURNS BEFORE IT EXPLODED AND CRASHED". PILOT REPORTED AN ENGINE MALFUNCTION JUST BEFORE CONTACT WAS LOST WHEN AC WAS 20 MINUTES FROM ABU DHABI AIRPORT. TWO DISTRESS SIGNALS SENT BELIEVED THAT AN INCENDIARY DEVICE HAD BEEN PLACED IN THE FORWARD FREIGHT HOLD**. CVR INDICATES CREW UNABLE TO SEE INSTRUMENTS DUE SMOKE**. ALL OCCUPANTS APPEARED TO HAVE DIED FROM SMOKE INHALATION.

Private Operator 2 October 1992

CFIT following in-flight fire and cockpit smoke. Flight crew unable to see due to heavy continuous smoke (pilot report attached)

RECREATION FROM ORIGINAL DOCUMENTS

31 Dec 85 DC-3 Rickie Nelson – Texas – 7 dead

Pilot's account (on US network TV):

2 October, 1992 – What Happened (NBC) IN their investigative report, they recreated the circumstances involving Rickie **Nelson's death following a smoke in the cockpit air disaster. The pilot and co-pilot were the only survivors. "Pilot - - had to make a life or death choice, he needed to see the ground to land, but he knew if he opened the window he would risk fanning the flames" Pilot: "I'm going to pop my window." Co-Pilot: "It drew flames up around my seat and my body, however there wasn't any option."**

CNN/Headline News Report (7/12/91), Pilot's Final words prior to crash landing, "We have smoke in the cockpit, we have smoke in the cockpit!"

South African Airways 28 November 1987

Aircraft lost in-flight. Report specifies probable cause "A" reduced cockpit visibility in smoke (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS

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smoke from the occupied compartments using criteria for testing which had been developed from years of transport experience". In the Board's view, however, the effects of thermal expansion were not adequately demonstrated in the tests.

4.11 The fire/smoke detection systems in the Boeing 747-244D Combi main deck cargo compartment were inadequate. Although the evidence indicates that the fire/smoke detection systems functioned, the extent to which the fire developed and the fact that smoke penetrated the passenger cabin suggest that the fire was not discovered early enough to prevent these consequences.

4.12 The fire fighting facilities provided for the main deck cargo compartment were inadequate.

4.13 The aircraft crashed into the sea some three minutes after the last transmission from the captain, acknowledging clearance for a further descent to flight level 50.

4.14 The aircraft was not under control when it crashed into the sea.

4.15 The only possible causes for the loss of control were one or more of the following:

(a) pilot incapacity from carbon monoxide and carbon dioxide poisoning, and/or smoke inhalation, or disorientation consequent on reduced cockpit visibility in smoke, or pilot distraction;

(b) damage to the structure and/or to the control systems of the aircraft directly or indirectly caused by the fire.

4.16 Irrespective of which of these causes might have been operative in the crash itself, there is a strong possibility that the quantity of carbon monoxide and carbon dioxide released by the fire caused loss of consciousness in or the death of some, if not all, of the occupants before the aircraft crashed into the sea.

4.17 There was no connection between the accident and the omission of Station ZUR to communicate with the Helderberg at the pre-arranged time. Nor is there any significance in the fact that the ZUR tape covering that time was mislaid or wiped out by later use.

4.18 The Board agrees with and supports the findings and conclusions of the FAA Review Team (in its Report of June 1st 1988 (Appendix F Volume 2 pp 25-51).

4.19 Despite intensive investigation the Board was unable to find or conclude that fireworks or any other illegal cargo were carried in the aircraft.

SAS 2 February 1989

This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS

SAS		**Incident Investigation Report** (Major Incident)		No. DC989013
Prepared by Tore Hultgren	Date 01 Dec 89	A/C Type DC-9-41	A/C Reg. SE-DAK	ATA No. 24.5

Title

Emergency Landing at Trondheim Airport, Norway after electrical fire.

Reference and Enclosures

FOR DC989013 date 89-02-02

Investigation team

Conny Boholm, STOMD Ulla Bolter, STOOK
Magne Naesbakken, OSLOA, Randi Kile, OSLOK
Tore Hultgren, STOOF Chairman

Summary

On 02FEB89 Flight SK378, a DC-9-41, SE-DAK carrying 103 passengers and a crew of 5, experienced an electrical fire with heavy smoke generation both on flight deck and in cabin, 70 NM North of Trondheim (TRD) Norway.

The flight was at FL 310 normal cruise at night IMC when the incident started.

Emergency descent and return to TRD was initiated and preparations for emergency landing at TRD was started in cabin.

The engine driven generators were switched off line and emergency power selected. The descent, approach and landing was performed on emergency battery power only.

Smoke intensity on flight deck seriously impaired the Pilot's ability to see the flight instrumentation.

After landing an emergency evacuation was performed without delay.

No injury to passengers or crew.

Primary cause was an electrical short circuit in the Acx-tie Relay.

Air Europe 17 December 1989

This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached).

RECREATION FROM ORIGINAL DOCUMENTS

CAA Report

Date 1989	Aircraft	Regn	Operator	Location	Nature of Flight	Total Aboard		Injury to Occupants F	S	M/N	Damage to Aircraft
17.12	Pokker 100	PH-ZCL	Air Europe	Copenhagen	Scheduled Passenger	88	Crew	0	0	7	Substantial
							Pass	0	0	81	

Some 8 (text unintelligible) before landing, the autopilot disconnected and multiple cautions were announced. Smoke began appearing from the electrical panel behind the co-pilot's seat. **The crew donned oxygen masks and in seconds thick smoke severely impaired vision on the flight deck.** The 'ESS and emergency power only button was pushed to isolate the electrics and **by this time neither pilot could see each other.** An emergency was declared and a visual landing was carried out with very limited visibility. The aircraft was brought to a halt and both engines shut down. The public address system did not appear to work so the flight deck door was opened and the order to evacuate was given and was successfully accomplished. The manufacturer issued an all operator's message concerning sequence of events and maintenance instructions on torque values to generator contractors and terminals. (ICAO Summary 5/89)

Swiss Air 551 16 October 1993

This aircraft was nearly lost in-flight due to smoke and fire. Flight crew reported loss of vision on final approach, continued flight would have been impossible (excerpts attached). Final German FUS report recommends the EVAS system

Recently Translated German Investigation of In-flight Fire Underscores Need to Land and Evacuate

June 14, 1999

although smoke from a smoldering electrical fire was filling the DC-9's cockpit, at first the crew did not declare an emergency. Rather, after deciding it would be prudent to return to the departure airfield, at this point some 10 minutes into the flight, the flightcrew donned their oxygen masks and smoke goggles. The captain informed the passengers: "Ladies and gentlemen: due to a small technical fault we are returning to Munich for investigation...For the time there is no reason for concern..."

About 4 minutes later, the captain radioed air traffic control, "The smoke is becoming heavier. We are declaring an emergency now." Moments later, the captain told the first officer, "I can't fly any more. Have no instruments. Your controls!"

After the right generator was restored, the captain resumed command. But the density of smoke in the cockpit increased, obscuring the instrument panel. The first officer tried to clear the view by "wagging" the emergency checklist. As the stricken airplane approached for landing, the captain thought the speed indicator was at the 4 o'clock position, which would correlate with 150 knots. He asked the first officer to flap the checklist more vigorously to clear the smoke.

Unable to see anything outside the airplane during rollout, the captain applied emergency braking to stop as quickly as possible. An emergency evacuation was conducted.

This Oct. 16, 1993 case involving Swissair Flight 551 nearly ended in disaster. According to the Oct. 24, 1995 report of the German Aircraft Accident Investigation Branch (FUS), a report which is not well known in the industry because it is in German, the source of the smoldering fire was traced to the emergency power switch. The switch, as it turned out, had a history of short-circuits and malfunctions. Indeed, Swissair had reported problems to the manufacturer. The German investigators found that unfastened screws and connectors, and damage to the switch's "roll contacts," could lead to short circuits.

The fire wiped out the overhead panel. A life-limit of 10,000 activations was recommended and the manufacturer issued a service bulletin to this effect. The German investigators went further, though, expressing dismay over the toxicity of the smoke and the intensity of the fire which, if prolonged, could have had fatal results. They also expressed dismay at the design: "High current from the Emergency DC bus going to the Emergency Power Switch... (and) relays and wire, which are subject to high current, should not be installed in the overhead panel..."

They also suggested the use of an "inflatable view channel between the crew, their instruments and the cockpit windows," which sounds remarkably like the Emergency Vision Assurance System mentioned recently in this publication (see ASW, Dec. 21, 1998).

The case is presented here for its remarkable similarities to salient issues raised in the more recent Swissair Flight 111 accident, including: the swift passage from concern to emergency, smoke in the cockpit, emergency procedures, adequacy/logic of checklists, electrical system design and installation, and the imperative in the face of an uncontrollable fire to land quickly. Indeed, a 1986 article on this last point was suggested as required reading for the Canadian investigators of the Flight 111 tragedy -- to which, we might suggest, the FUS report of this 1993 near-disaster could be added (see ASW, May24). (Note, our thanks to aviation journalist Tim van Beveren for translating the FUS report)