REPORT TO FAA ADMINISTRATOR
JANE GARVEY

Prepared by John D. King, FAA Licensed Mechanic, IASA Member, May 18, 1999

DATABASE OMISSIONS, LACK OF INFORMATION SHARING IN REPORTS OF ELECTRICAL RELATED IN-FLIGHT EVENTS.

This report to the Administrator addresses specific examples of database omissions and lapses in other FAA methods of information sharing. This Report was done because inaccurate databases, or other records diminish the true scope of trend analysis and possible safety hazards, waste limited investigative resources and may result in perceived corrective measures that do not address the root problem.

This Report is based on FAA or NTSB Records and is but a sampling of a variety of ways the FAA's own documents fail to provide safety related informational sharing. A more complete investigation is needed to fully identify the scope of these problems.

CONTENTS

FAA's FOIA Responses Regarding FAA Tech Center Electrical Reports

Background

FAA's prior tests of wire insulation failures appear little known. Three FAA Tech Center reports of wire insulation construction faults and resultant failures (arc-tracking, ticking faults) appear largely unavailable to any but those who have specific knowledge of their existence. Contained in these three reports were observations of self-igniting, self-fueling wire insulation fires of 2,000 degrees(F.), excessive smoke generation, warnings about resetting tripped circuit breakers and the critical message that these were not mechanical faults (chaffing) but rather a "Electrical" failure of the wire insulation. A 1995 report specifically said; "This testing was conducted to evaluate the FIRE POTENTIAL that may result from ELECTRICAL faults". (Caps added).

The FOIA Trail

With that 1995 Tech Center report in-hand, a FOIA request was filed to the same authoring (N.J.) Regional that wrote that Report. As a test, the exact date was omitted and only the question for such "studies/reports since 1990" was made. The results demonstrated a lack of knowledge or worse.

a. FAA N.J. Tech Center response on 1/14/97 deflected my 1/6/97 FOIA request for "studies/reports… since 1990" to Washington. See both items at **Exhibit 1** (2 pgs).

b. FAA Northwest Regional response on 4/15/97 claimed nothing "within the scope …since 1990", but, as a courtesy, supplied Cahill's 1988 report [1/]. The N.W. Regional had authored many electrical related Airworthiness Directives and Bulletins but appeared ill informed to the other two FAA Tech Center reports. See response at **Exhibit 2** (4 pgs) .

c. Another FAA N.J. Tech Center response on 5/16/97 claimed; "all the reports associated with your request that have been prepared at the Tech Center" are now provided with another Cahill Report dated 1989 [2/.] (Underlining Added) See response at **Exhibit 3 .**

d. After another request, the N.J. Tech Center responded again with that elusive 1995 Report [3/] -- but then said; "This is the only report on the subject prepared at the William J. Hughes Tech Center". Contrary to that, all three reports are clearly marked as been generated at this N.J. Regional. Unlike the earlier 1988 and 1989 reports of bench tests, this included actual aircraft in-flight electrical insulation failures. (Underlining Added) See response at **Exhibit 4**.

[1/] DOT/FAA/CT-88/4, Aug 1988. AIRCRAFT ELECTRICAL WET-WIRE ARC TRACKING by_Patricia L. Cahill and James H. Dailey. 21 pages. Key words; Wet-Wire Arc tracking, Wire insulation, Carbonization.

[2/] DOT/FAA/CT-89/21, Jul 1989. FLAMMABILITY, SMOKE AND DRY ARC_TRACKING TESTS OF AIRCRAFT ELECTRICAL WIRE INSULATIONS. 21 pages. Key Words; Dry Arc Tracking, Sixty-degree Flammability Tests, Electrical Wire Insulations, Smoke Test.

[3/] DOT/FAA/CT-TN94/55, March 1995. ELECTRICAL SHORT CIRCUIT AND OVERLOAD TESTS ON AIRCRAFT WIRING. Author, Patricia L. Cahill. 13 pages. Key words; Short Circuit, Current overload, Ticking fault, Conductor. See **Exhibits 5** for each of these Reports.

FAA's Tech Center Database/Catalog Omissions Of Electrical Reports.

BACKGROUND

In November of 1997 an internet search of the New Jersey Tech Center's Library Database (http://www.tc.faa.gov/its/worldpac/ENG/wphome.htm) was made. Using the author name (Patricia Cahill), a search was made to see if any of the Tech Center Reports on wiring insulation failures could be accessed. None of those three Tech Center Reports [5/] generated on wiring insulation issues could be found. In January of 1998 a complaint to these omissions was filed with the NTSB chairman, Jim Hall.

In Mr. Hall's response of June 10, 1998, Mr. Hall countered with "a member of his staff had called the Technical Center Library and discovered that two of the three reports are available from the library (in fact, they are listed on the library's web-based catalog)." See **Exhibit 6** (page 2, last para) for this letter.

AFTER MY COMPLAINT, ACTIONS FOLLOWED

Not until the spring of 1998 were these author's (Patricia Cahill) works ("Flammability, Smoke, and Dry Arc Tracking Tests", 1989, DOT/FAA/CT-89/21; and "Electrical Short Circuit and Current Overload Tests on Aircraft Wiring", 1995, DOT/FAA/TN-94/55) posted as items 2 and 6.

These additions occurred after our January 1998 complaint to the NTSB. The third Tech Report, ("Aircraft Electrical Wet-Wire Arc Tracking", 1988, DOT/FAA/CT-88/4) still remains unlisted. FAA's response to my FOIA request concurred that the additions were made in the spring of 1998.
See **Exhibit 7** for that response. See **Exhibit 8** for the present postings.

As seen in the earlier example here (page 2) a FOIA search for any Tech Center documents regarding these wiring related issues and a Tech Center Library search, as well, may indicate no such work has been done. No reports – implies no problems.

Moreover, none of the report numbers or 'keywords' ("short circuit, ticking fault, current overload, wet or dry wire tracking, wire insulation, carbonization, smoke test, electrical wire insulations, sixty-degree flammability tests") work in the FAA Cross System database search engine at http://nasdac.faa.gov/asp/fw_crosssys.asp. Only a concerted effort and with specific forehand knowledge would likely result in obtaining some of these reports.

FAA Omissions; Airworthiness Handbook Bulletins (Inspectors) Database

BACKGROUND

Because the internet search of the FAA's Tech Center Library database and the FOIA requests of the Tech Center's own copies of the 'Cahill Reports' were so elusive another means to see if information on wiring bundle insulation fires was also equally affected. The FAA maintains another database intended to inform it's own Airworthiness Inspectors.

The Airworthiness Handbook Bulletin (HBAW) database is intended to quickly pass interim information via 'Handbook Bulletins'. A reference to such a Handbook Bulletin was found in the NTSB Recommendations To FAA And FAA Responses Report(s) database at http://nasdac.faa.gov/asp/fw_crosssys.asp

There, a search at A-91-71 [6/] , it showed that in FAA's letter to the NTSB regarding a L-1011 wiring related in-flight fire below the aft cabin floor, the FAA arrived at a final agreement with the NTSB to publish a Handbook Bulletin 91-15. In that FAA letter on 08/13/92, the FAA claimed to have;

> "issued Handbook Bulletin 91-15, Origin and Propagation of Inaccessible Aircraft Fire Under In-flight Airflow Conditions. This bulletin provides information on the potential safety hazard applicable to all transport category aircraft from the accumulation of lint and other debris on wire bundles. This bulletin requests that principal maintenance inspectors of transport category aircraft operators ensure that programs are in place to address the inspection of aircraft wiring and the removal of contaminants, especially in inaccessible areas. This bulletin has been coordinated with the Aircraft Certification Service and will be distributed to all certification offices for their information and coordination with manufacturers for inclusion in future design considerations. I have enclosed a copy of the bulletin for the Board's information.

See **Exhibit 9** (2 pages) for complete text.

A FOIA response from the FAA Washington office produced a claimed 91-15 document. See **Exhibit 10**, 3 pages. However it appears the two page document was installed not in the "Airworthiness Inspectors Handbook 8300.10, but at the end, (appendix 3), to a larger inspection/maintenance document.

A search from the FAA's database at http://www.faa.gov/avr/afshome.htm shows that 91-15 was not listed [7/] among other such Bulletins. Bulletins 91-12, 91-13 and 91-14 are seen, but not 91-15. The listings continued, i.e. 92-05 and continued on. See **Exhibit 11** for a copy of this file.

[6/] Site search instructions; Search http://nasdac.faa.gov/asp/fw_crosssys.asp Select A-91-71

[7/] Site search instructions; Begin Search at http://www.faa.gov/avr/afshome.htm Select "FAA Aviation Safety Inspector Handbooks and Bulletins", Select "8300.10" "Airworthiness Inspectors Handbook", Scroll to bottom of page, Select "8300 Appendix 3", "Airworthiness Handbook Bulletins (HBAW)"

Another FOIA response from the FAA Washington office has not cleared this up. In this April 27, 1999 letter, the FAA claims these issues are questions, and not copies of records, and thus outside the scope of FOIA. The letter continued with a promised call from Mr. Albert Hughes at 202-267-9952.

I still await that call to address a serious lapse of information sharing between FAA's Washington office and its own inspectors.

I ask you, Madam Administrator, and hope you may more easily get to the bottom of it all. See this letter at **Exhibit 12** (2 pages). The question remains; Is this Handbook information missing from the Inspectors database it was claimed to have been placed. ?

MORE EVIDENCE THIS BULLETIN WAS LITTLE KNOWN

You may also wonder, as I, why it was necessary to revisit that A-91-71 (Exhibit 9) document dated in 1991, and again in December 3, 1996. Why, after five years had passed ? and why, now after ValuJet 592 and TWA 800, this document's issues regarding lint and debris on wiring bundles is now again becoming a concern ?

I see from your October 1, 1998 morning press release with Secretary Slater regarding "Aging Transport Non-Structural Systems Plan" that;

> "The team found that the wiring components on aged airplanes showed some deterioration and detected contamination of some wiring bundles with metal shavings, dust and fluids. In many areas, the wire bundles as well as some flight control components were difficult to inspect. Because of this difficulty, the team acknowledged that these were not getting inspected as much as we like."

Madam Administrator, why is this team currently revisiting this 1991 issue of debris on wiring bundles and various information sharing planned then, again, in 1998, as if it was new information ?

MY SEARCH RESULTS – BULLETIN 91-15 CANNOT BE FOUND

Other than the backside of an inspection/maintenance manual, this claimed Handbook 91-15 cannot be found. In Exhibit 9, and at the FAA's letter on 10/30/91, the FAA said the NTSB would get a copy "as soon as it is issued" (Underlining added). On January 13, 1999, NTSB's FOIA officer, Melba D. Moyle said the NTSB does not have it.

Without these complete records, FAA's own inspectors are left unaware of time critical safety matters. The Washington office appears little concerned once this matter was moved beyond the scope of this last FOIA.

NTSB Database Causal Factors CONTRARY TO FAA Reports.

BACKGROUND

From a FAA Tech Center Report [8/] several examples of in-flight fires were given. In each case, insulation blankets played varying roles in these actual fires. When viewed in the NTSB accident database at http://www.ntsb.gov/aviation/months.htm - the roles of the insulation blankets were removed. As such, important issues of 'flammability factors of aircraft insulation blankets' were also removed.

Contrary to that, the FAA has ruled for the removal of Mylar coated insulation blankets because of their undesirable flammability factors. Expected temperatures of common fires (trash, galley fires) are recognized to be about 1,700 degrees, however, from the Tech Center (Cahill) reports seen earlier in page 2 of this report, the wire insulation fires were about 2,000 degrees. Excluding the possibilities of wire bundle ignited fires served to diminish the possibilities that insulation blanket fires may follow.

EXAMPLES

First Example; a examination of the original text from that Tech Center Report , and then the comparison to the NTSB text follows.

Original Text with Underlining Added to illustrate words removed later.

From page 1, "Background".

"In August of 1985, an Eastern Airlines 727 was forced to make an unscheduled landing after a fabric handbag laying against a cabin return air grille along the floor caught fire. The initial ignition and fuel sources were a book of matches and a leaking bottle of flammable hair spray, both in the handbag. Flames from the burning bag were drawn into the return air grille and caused partial burning of some aircraft parts including insulation blanket, return air grille parts, air-conditioning duct, underside of floor panels, and overhead cargo compartment liner. The fire was eventually extinguished by flight attendants using several hand-held extinguishers."

NTSB Text (excerpts) as it now appears in the NTSB database [9/]

"The flt diverted to Richmond, Va. During descent, the flt crew performed the appropriate checklist and the lower aft body cvht (overheat) light went out about 3 to 4 mins. after it illuminated. Later examination revealed that a pax handbag that was on the floor against the cabin exhaust outlet adjacent to seat 28a was extensively fire damaged. The carpet under the handbag was unburned except for a small portion leading to the cabin air exhaust outlet. localized fire damage was present behind and below the outlet. Among the contents of the handbag was a bottle of hairspray, found with the cap loose. The label on the bottle warned that the contents were flammable. Row 28 was in the smoking section for that flt.

[8/] FAA Technical Center Report # DOT/FAA/CT-91/2, "Development and Growth of Inaccessible Aircraft Fires Under Inflight Airflow Conditions." By David Blake, February 1991. 30 pages. See relevant portions at **Exhibit 13**

[9/] Source; NTSB http://www.ntsb.gov/aviation/BFO/85A065.htm

EXAMPLES (continued)
Second Example; a examination of the original text from that Tech Center Report , and then the comparison to the NTSB text follows.

Original Text with Underlining Added to illustrate words removed later.
Page 1, "Background".

"In April of 1988, a Continental 737 had a fire above the cabin ceiling on final approach into Cleveland, Ohio. The fire started when a flourescent light ballast burned and ignited insulation blankets and foam air-conditioning duct insulation. The fire burned insulation blankets, damaged wire bundels, burned through the back of a stowage bin, and ignited a carryon bag inside the bin and burned some duct insulation. Smoke started to fill the cabin when an emergency evacuation was performed using all four evacuation slides. Fire department personnel extinguished the fire."

NTSB Text (excerpts) as it now appears in the NTSB database [10/]

"While on final approach smoke and flames developed in cabin above overhead luggage bins over seats 16a,b & c. Acft (aircraft) was within 2 miles of rwy (runway). Crew declared emergency, landed, turned off rwy expeditiously, stopped on rwy 18, & evacuated. Smoke poured from the opened cabin doors. Examination of the acft revealed that a ceiling flourescent light fixture shorted internally resulting in the fire. An AD (Airworthyness Directive) was issued which required the installation of a fuse assembly in the input wire to the ballast."

"Probable Cause
Passenger compartment light(s)..Shorted
Acft/equip, inadequate design..Manufacturer
Passenger compartment light(s)..Arcing"

CONCLUSION

The NTSB database does not accurately reflect valuable safety information seen from FAA reports. This disconnect appears systematic when flammability issues of wiring or adjacent aircraft materials are involved. Materials issues begin with the manufacture's responsibility but also remain under the responsibilities and certification methods enforced by the FAA. The systematic issue becomes clearer as this report continues.

[10/] Source NTSB; http://www.ntsb.gov/aviation/ATL/88A147.htm

Omissions in the NTSB Database to Electrically Related Findings

BACKGROUND

The previous changes in the NTSB database were not the first. This next example demonstrates that another means of diverting electrically related casual factors was found – don't print it. Here, and a very rare case, a former Final NTSB Report (AAR 90/01) had to be corrected because an unexpected piece of critical evidence was later found. On February 24, 1989, United Airlines flight 811 had an in-flight loss of its forward cargo door and adjacent aircraft structure. Nine passengers were drawn overboard. Because the forward door lay several thousand feet below the ocean it was not immediately recovered. Absent that door, the NTSB Final Report was published finding a mechanical cause of worn locking parts, but the door was later recovered, and now a superceding and new NTSB Final Report (AAR 90/02) was written. This report laid blame at a "electrical or switch" problem. (No surprise here because in Boeing's October 16, 1997 letter to NTSB's, Bob Swain, Boeing cited seven "wiring fires" in 747 in 1996 alone. See **Exhibit 14**, 3 pages.)

Omissions

The corrected Final NTSB Report (AAR 90/02) is not listed in the present NTSB database [11/] . Instead, only the earlier AAR 90/01, laying blame to a non-electrical cause, is. Excerpts of AAR 90/01 Follow;

> "Investigation centered around design and certification of the door which allowed it to be improperly latched, and the operation and maintenance to assure airworthiness of the door and latching mechanism. (see NTSB/AAR-90/01). Probable cause; The sudden opening of the improperly latched forward lobe cargo door in flight and the subsequent explosive decompression. Contributing to the accident was a deficiency in the design of the cargo door locking mechanisms, which made them susceptible to inservice damage, and which allowed the door to be unatched, yet to show a properly latched and locked position."

THE SUPERCEDING REPORT, AAR 90/02, IS NOT ON FAA [12/] OR THE NTSB WEBSITES

NTSB/AAR 90/02, showing electrical system fault leading to fatalities is not on this web site. Excerpts of AAR 90/02 follow; (Underlining added to illustrate electrical issue)

> "The National Transportation Safety Board determines that the probable cause of this accident was the sudden opening of the forward lower lobe cargo door in flight and the subsequent explosive decompression. The door opening was attributed to a faulty switch or wiring in the door control system which permitted electrical actuation of the door latches toward the unlatched position after initial door closure and before takeoff. Contributing to the cause of the accident was a deficiency in the design of the cargo door locking mechanisms, which made them susceptible to deformation, allowing the door to become unlatched after being properly latched and locked. Also contributing to the accident was a lack of timely corrective actions by Boeing and the FAA following a 1987 cargo door opening incident on a Pan Am B-747."

Conclusions

Same problem, the true roles of electrical or insulation blanket flammability issues are being omitted from databases and record keeping. Trend/risk analysis data is inaccurate.

[11/] NTSB source; http://www.ntsb.gov/aviation/DCA/89A027.htm

[12/] http://nasdac.faa.gov/lib/vtopic.exe --- Search NTSB/AAR-90/02 and a wrong reference appears.

DATABASE OMISSIONS TO FAULTY MATERIALS ISSUES/NON-U.S. CARRIERS REPORTS

The FAA has acknowledged that the databases are inaccurate and incomplete, indeed they are as this report demonstrates. The traveling public depends on FAA honesty in accurate record keeping to recognize safety trends that may impact them and such trend analysis and risk assessments are meaningless without accurate records. It is clear that the databases exclude all materials related safety issues when they exclude mostly all non-U.S. carriers operating U.S. built and certified airliners. Materials issues such as the Mylar aircraft insulation blankets identified for replacement by the FAA know no aircraft color schemes. Neither does the wire insulation types identified in those three Tech Center Wire Insulation Reports.

Rule making Airworthiness Directives enforceable only to U.S. carriers offer no protection when code sharing non-U.S. carriers operate the same equipment and continue with the same faulty materials.

FAA & Evacuation of Cockpit Smoke, Historical Perspectives

As an addendum to this report, Exhibit 15 demonstrates yet more specific examples of FAA's lack of information sharing, this is the history of the FAA's resistance to acknowledging the issues of 'dense continuous smoke in the cockpit'. To some, and if only the lesser-known sources of ignition were used, (lavatory trash fires, galley fires, etc), existing cockpit smoke removal requirements may seem adequate. Turning up the rate of air flow, descending and opening a cockpit window may seem reasonable. However, when the FAA's knowledge of wire bundle fires and flammable insulation blankets are added in, these earlier assumptions become life threatening. The entire 'smoke hood for passenger' issue becomes moot if the cockpit crew cannot see the vital instruments or the outside world because of continuing dense smoke. There should never be any question to the crews ability to do so.

Consistent with my report's specific examples of FAA's lack of information sharing, this addendum illustrates the progression of FAA's position, documents and Advisory Circulars (AC) where FAA's own requirements to provide positive cockpit vision were diminished. Cigarette and galley fires aside, trivializing and denial of wire bundle fires and related insulation blanket fed fires are far more dangerous. These fires may begin anywhere amongst the many inaccessible areas these wire bundles are installed. Few can be reached with the minimum number of fire extinguishers found on fleet commercial aircraft.

CONCLUSSION

The FAA's own requirements to assure an unobstructed view for the cockpit crew are not being met. In-part, this is being done by denying database and records showing a problem – a problem limited to fires ignited by means other than wiring insulation ignited fires. Wiring ignited fires have been hidden under a cloak of mechanical reasons (chaffing, rough handling, non-conforming installations, etc.) when the FAA's own Tech Center determined that a "Electrical" fault exists in certain families of electrical wire insulation compositions. The Tech Center reports did not come about in a vacuum but rather followed other U.S. carrier [(5)] objections to the use of Poly-x and Kapton types of wire insulation constructions. The FAA's claim that the same objections by the military are moot because of their unique operating environment dismisses the many cargo and other non-high performance aircraft operated by the military. Inaccurate and incomplete databases and record keeping skew risk analysis formulas so that the true risk cannot be identified.

Finally, virtually none of the ‘keyword’ commercial aircraft types names (“DC-9, MD-80, Boeing 747, etc.) worked in available FAA/NTSB search engines. NTSB chairman, Jim Hall, recommended to me terms like “smoke in the cabin” or “smoke in the cockpit”. Only about 11% of the 264 such commercial in-flight electrically related fires or smoke events testified to by FAA’s Thomas McSweeny during Senate Aviation hearing (#103-397, 1993) were found. My laborious line-by-line search of over 1,000 items turned up but 35 such commercial emergencies.

We agree, Madam Administrator, the databases are inaccurate and incomplete. I hope this presentation has been helpful. If any questions, please direct them through the IASA chairman Lyn Romano as we all work towards a safe and honest air transportation system.

Sincerely,

(signed)

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Attachments

Addendum, Exhibit 15. Pages 11 to 18; Historical Perspectives and FAA History, ‘Smoke in the Cockpit’.

Exhibits 1 - 15.

ADDENDUM AND EXHIBIT 15 TO KING/GARVEY LETTER OF MAY 18, 1999

Thanks to James Stevenson<jamesstevenson@sprintmail.com for original data and text.

BACKGROUND

The Federal Aviation Administration (FAA) has a regulation that, if properly implemented, would mandate an aircraft manufacturer to demonstrate that the pilot can see to land while maintaining visual contact with his vital flight instruments when the cockpit is continuously filled with smoke. As currently enforced, however, the FAA only requires the aircraft manufacturer to show that temporary smoke can be evacuated within three minutes after the smoke source is turned off so they can discern their instruments. If the smoke cannot be stopped, the FAA directs the pilot to land at the nearest suitable airport or landing site. At issue is how are pilots are supposed to land if the smoke prevents seeing out the window, viewing their vital instruments, or performing FAA required tasks such as working through emergency check lists or reading approach plates.

The Federal Aviation Regulation states: If accumulation of hazardous quantities of smoke in the cockpit area is reasonably probable, smoke evacuation must be readily accomplished, starting with full pressurization and without depressurizing beyond safe limits.[1/]

The purpose of the regulation, in the words of a former FAA administrator Thomas Richards, is to provide "an adequate view of the instruments and the outside world." Yet, in spite of Richards interpretation, former Deputy FAA Administrator Tony Broderick said that the FAA has "never applied the regulation to require that the pilots be able to see in conditions of dense smoke. . . ."

The National Transportation Safety Board (NTSB) has recommended that a pilot should be able to see out of a smoke filled cockpit.[2/] The NTSB acknowledged the "smoke in the cockpit" problem after investigating the May 1996 fatal crash of ValuJet 592 in the Florida Everglades. The NTSB concluded in its final report of that accident that "emergency cockpit vision devices might have potential safety benefits in some circumstances." The Board formally recommended (A-97-61) that the FAA evaluate "the cockpit emergency vision technology and take action as appropriate." [5/]

[1/] 14 CFR 25.831 (d). [2/] On October 31, 1983, the NTSB recommended that the FAA "evaluate change as necessary the procedures contained in the FAA-approved airplane flight manuals (AFM) of transport category airplanes relating to the control and removal of smoke to assure that these procedures address a continuing smoke source. . . ." [5/] U.S. National Transportation Safety Board. "In-flight Fire and Impact with Terrain Valujet Airlines Flight 592 DC-9-32, N904VJ Everglades, Near Miami, Florida May 11,1996." Final Report. (PB97-910406. NTSB/AAR-97/06. DCA96MA054 (Aug. 19, 1997): 138

The recent "smoke in the cockpit" call from Swissair 111 was reminiscent of a 1970 Swissair accident in which the plane crashed because of smoke in the cockpit. The FAA has since acknowledged that continuous smoke in the cockpit was "reasonably probable." [6/]

However, it did not and does not require the manufacturers to demonstrate the ability for pilots to see to safely control and land the airplane at a suitable airport or landing site when the smoke cannot be stopped.[7/]

An analysis of the smoke evacuation regulation

In 1956, the Airline Pilots Association (ALPA) requested that the Civil Aeronautics Board address the issue of "heavy dense smoke" in the cockpit.[8/] The request led to the FAA adopting its current regulation. The regulation has three parts:

1. The presence of the smoke must be "reasonably probable;"
2. Smoke evacuation must be "readily accomplished;" and
3. The demonstration must start "with full pressurization and without depressurization beyond safe limits."

As an aid to both the interpretation of and compliance with the regulation, the FAA wrote an advisory circular [9/] in July 1986 to accompany this specific regulation.[10/]

[6/] U.S. Department of Transportation. Federal Aviation Administration. Advisory Circular 25-9, "Smoke Detection, Penetration, and Evacuation Tests and Related Flight Manual Emergency Procedures," (July 29, 1986), hereinafter Advisory Circular 29-5 (July 1986). [7/] "Suitable airport" is a word of art which has a different meaning than "adequate airport." [8/] U.S. Civil Aeronautics Board. "Proposed Agenda for the 1956 Annual Airworthiness Review." Civil Air Regulation Draft Release No. 56-9. (April 16, 1956). [9/] "Certain requirements . . . must be complied with in a manner acceptable to the Administrator. FAA Advisory Circulars contain standards and procedures that are acceptable to the Administrator for compliance. . . . Some of these advisory circulars are referenced in specific sections of this part. The standards and procedures in them, or other standards and procedures approved by the Administrator, may be used to comply with those sections." 14 CFR 139.5 The Federal Courts have also interpreted the Advisory Circulars (AC): "The . . . Advisory Circulars are evidence of the standard of care among all pilots, [citations omitted], and it is assumed that all pilots have read and know their provisions. [Citations omitted.]" In re N-500L Cases. 691 F.2d 15 (1st Cir.) at 27. In another appellate decision, the Court wrote: "The relevance of the [Advisory Circular] to the (issue) of the defendant's negligence . . . is manifest. Evidence of custom within a particular industry, group, or organization is admissible as bearing on the standard of care in determining negligence. Compliance or noncompliance with such custom, though not conclusive on the issue of negligence, is one of the factors the trier of fact may consider in applying the standard of care." In re Air Crash Disaster at John F. Kennedy International Airport on June 24,1975. 635 F.2d 67 (2nd. Cir.)
[10/] Advisory Circular 29-5 (July 1986).

Reasonably Probable

The first requirement of the regulation is that the presence of smoke be "reasonable probable," a condition the advisory circular acknowledged. It found several "reasonably probable" sources of smoke including "fires caused by cigarettes, incendiary or explosive devices, cargo fires, and failures of electrical and pneumatic equipment. Fluid leaks or spills, e.g., hydraulic, glycol, etc., in combination with heat or ignition sources may also produce hazardous quantities of smoke."[11/]

Not only did the advisory circular find that smoke was "reasonably probable," it stated that "[i]ncidents of fire or smoke that cannot be extinguished continue to occur. Smoke and fire procedures should, therefore, be formulated considering that the fire or smoke exposure should be continuous."[12/]

As a testimony to this 1986 edition of the advisory circular, eight years of recent service difficulty reports indicate that fire and smoke-related incidents continue on an average of 10 per month.

Readily Accomplished

The second phase of the smoke evacuation regulation states that the evacuation of the smoke must be "readily accomplished." These everyday words should require no further explanation under the plain meaning doctrine of statutory construction [13/] question, then is whether the advisory circular's requirement fit, the definition of "readily accomplished."

Former FAA Administrator Thomas C. Richards stated, "[t]he approach envisioned by the regulations is that there be a means or procedure to evacuate smoke that may be present in the cockpit, thereby providing an adequate view of the instruments and the outside world."[14/] The issue is whether the FAA is properly enforcing the regulation by requiring tests that use only a temporary source of smoke as opposed to a continuous source, when the advisory circular states that continuous smoke is reasonably probable.

There can be no debate that the FAA wanted pilots to be able to land because the July 1986 advisory circular said that the Airplane Flight Manual (AFM) should instruct the pilots "to immediately proceed to the nearest suitable airport when fire or smoke is detected." [15/]

But in spite of the clarification that smoke in the cockpit would most likely be continuous, the Advisory Circular did not require testing with continuous smoke. Instead, test procedures for smoke evacuation provided that the smoke be turned off once the cockpit was filled.

[11/] Id. at p. 2. [12/] Advisory Circular 29-5 (July 1986): Par. 4 (e) (2). [13/] Readily means "1. in a prompt, timely manner; promptly," and accomplished means "1. to succeed in doing; bring to pass 2. To reach the end of; complete." American Heritage Dictionary (Electronic Edition.) [14/] Richards to Werjefelt (Jan. 14, 1993). [15/] Id. at p. 4

When the cockpit instruments are obscured (standard dial indicator numbers or letters become indiscernible), smoke generation should be terminated, and the appropriate AFM [airplane flight manual] fire and smoke procedures should be initiated. The smoke should be reduced within three minutes such that any residual smoke (haze) does not distract the flight crew nor interfere with operations under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).[16/]

By this wording, the July 1986 advisory circular exempted the aircraft manufacturer from demonstrating that the crew would be able to fly and land under the very circumstances the advisory circular said were most likely to lead to an unsafe condition, i.e., smoke from a continuous source.

Although the FAA attempted to address the loss of pilot vision by requiring the one-time reduction of a small amount of temporary smoke, it has never mandated any means of ensuring pilot vision in the presence of continuous smoke. Therefore, one could reasonably discern that the elimination of continuous smoke cannot be "readily accomplished."

Although the FAA has steadfastly refused to enforce its regulations with respect to ensuring pilot vision in a smoke filled cockpit, the FAA has taken other measures to deal with the consequences of continuous smoke in the cockpit. For example, in August 1991, the FAA reported that an amendment to 14 C.F.R. 25.1439, "Protective Breathing Equipment," was in the process of being drafted. The purpose of the amendment was to require protective breathing equipment (PBE) for each crew member of the flight deck. According to the FAA, "[t]his proposal is necessary because it is likely that any Part 25 type design airplane will experience smoke in the cockpit from sources not effectively dealt with by emergency smoke clearance procedures (e.g., electrical smoke)."[17/] As the Protective Breathing Equipment regulation is currently written, it does not require PBE for aircraft with a Class D cargo hold, such as the one flown by ValuJet 592, because Class D cargo holds are defined as cargo holds from which fire and smoke cannot escape.

No one can doubt the importance of providing the flight crew with the ability to breathe in the presence of continuous smoke. It should be equally apparent that the ability to breathe without the ability to see is meaningless.

Faced with the FAA's inaction, Congress began its own inquiries into the Agency's position on loss of pilot vision. In Senate Report 102-148 on the Department of Transportation and Related Agencies Appropriations Act for FY 1992, the FAA was asked to review its regulations and certification requirements to determine what actions should be taken to ensure "pilots critical vision needs are not obscured."[18/]

[16/] Id. at p. 12. [17/] "Transport Airplane Directorate Designee Newsletter," (Aug. 1, 1991): 47. [18/] U.S. Department of Transportation. Federal Aviation Administration. "Report to Congress: Safety Impact of In-Flight Cockpit Smoke Emergencies." (May 15, 1992).

Congress's request was reasonable. After all, the FAA Administrator is required to "exercise and perform his powers and duties . . . in such a manner as will best tend to reduce or eliminate the possibility of, or recurrence of, accidents in air transportation, . . ."[19/] More specifically, the FAA is required to certify that, for an aircraft, "no feature or characteristic makes it unsafe . . ."[20/] When an unsafe condition exists, the FAA Administrator is required to issue an "airworthiness directive, and "[n]o person may operate a product to which an airworthiness directive applies, except in accordance with the requirements of that airworthiness directive." [21/]

In May 1992, the FAA submitted its report to the Senate Subcommittee on Transportation. The report concluded: No airplanes certificated since the [July 1986 advisory circular] was published have been lost due to the inability of the flightcrew to see the instruments or view the outside world through the windshield. We see no indication that such an event can reasonably be expected to occur. . . .[22/]

Ironically, two months later, FAA staff started to address the problem of loss of pilot vision during incidents involving continuous smoke in a draft revision to the July 1986 Advisory Circular.[23/] Significantly, the 1992 draft incorporated the sections of advisory circular 25-9 regarding reasonably probable sources of smoke, and again, emphasized that since the 1986 edition of the Advisory Circular, "[i]ncidents of fire or smoke that cannot be extinguished continue to occur."[24/]

Of more importance, the Advisory Circular added the requirement to generate continuous smoke:

"To demonstrate protection from smoke generated by a continuous source in the cockpit, smoke should be generated continuously. The crew should don protective breathing equipment and initiate smoke evacuation procedures and/or activate smoke displacement devices, if needed, as soon as smoke becomes evidence. The ability of the crew to safely operate the airplane should not be impaired by loss of vision due to smoke from a continuous source in or contiguous with the cockpit." [25/]

Clearly, the FAA staff was attempting to take stronger measures to address the problem of loss of pilot vision at the very same time the FAA hierarchy was attempting to convince Congress that no such problem existed. Apparently inconvenienced by the FAA's May 1992 report, Congress directed the FAA to study and report to it on the effects of continuous smoke in the cockpit on pilot vision.[26/.] The FAA also failed to convince the ALPA. In December 1992, the Chairman of the ALPA Accident Survival Committee, Capt. Ricky R. Davidson, submitted comments endorsing the proposed changes in Advisory Circular 25-9A to test for continuous smoke.

[19/] Federal Aviation Act of 1958, as amended, Title VI, Section 601(b). [20/] 14 C.F.R. 21.21(b)(2). [21/] 14 C.F.R. 39.1, 39.3. [22/] Id. at p. 3. [23/] Advisory Circular 25-9A, Smoke Detection, Penetration and Evacuation Tests and Related Flight Manual Emergency Procedures, (July 14, 1992) Exhibit 36. [24/] Id. at p. 6 [25/] Id. at pp. 17-18. [26/] See, Airport and Airway Safety, Capacity, Noise Improvement, and Intermodal Transportation Act of 1992, Pub. L.102-581, Sec. 207.

Capt. Davidson stressed ALPA's concern that the flight crew be able to "safely land the aircraft." [27/]

In October 1993, the FAA made its report to Congress under Pub. Law. 102-581.[28/] The FAA concluded that there was no "indication that existing regulations and guidance have resulted in an unsafe condition." [29/]

Ironically, this report was issued at the same time the FAA staff, working on Advisory Circular 25-9A, maintained its position that incidents involving fire or smoke that could not be extinguished continued to occur.

Curiously, when the January 1994 revision to the July 1986 advisory circular emerged in final form, in January 1994, the FAA staff position was deleted. Instead, the following language appeared:

> “Protection against continuously generated smoke in the cockpit, although not specifically required by the regulations, is provided by present smoke evacuation procedures. Present smoke evacuation testing demonstrates the ability of the smoke evacuation system to handle smoke emanating from reasonably probable continuous smoke sources.” [31/]

Also gone from the Advisory Circular was the staff's position that testing for evacuation of continuous smoke should ensure that pilot vision was not impaired. Instead, the final version of the Advisory Circular provides:

> “Although not mandatory, if the applicant wishes to demonstrate protection from smoke generated by a continuous source in the cockpit, smoke should be generated continuously. The crew should don protective breathing equipment and initiate smoke evacuation procedures as soon as smoke becomes evidence and, activate any optional vision enhancement devices, if approved.” [32/]

The Historical FAA Position

The historical Federal Aviation Administration position has been that there is virtually no proof that accidents have been caused by smoke in the cockpit. If there have been any accidents, they have been so few as to not justify the added expense. As former Deputy Administration (Certification & Regulation) Broderick said: "The only airplane I know of . . . is an airplane accident that occurred because of smoke in the cockpit, and resulted in any kind of fatalities, is the freighter accident in Boston in 1974. . . . The measures that are used every day in the United States are quite clearly able to cope with the hundreds of in flight fires that occur every year. . . . Mr. Broderick was heard to say “Nineteen years ago we had one accident in a freighter."

[27/] Davidson to Federal Aviation Administration (ANM-110) In re: "Draft Advisory Circular (AC) 25-9A." (Dec. 11, 1992). [28/] U.S. Department of Transportation. Federal Aviation Administration. "Report to Congress: Smoke in the Cockpit of Transport Category Airplanes." (October 1993).
[29/] Id. at p. 1. [30/] (Id.). [31/] (See, p. 3). [32/] Id. at p. 20.

Broderick made this statement prior to the ValuJet 592 accident. In that accident, the pilots' conversation indicated they were experiencing major electrical failures. The pilots asked for an immediate return to Miami . When asked why, the copilot radioed, "smoke in the cockpit." While the final NTSB report attributed the probable cause to oxygen canisters, there are other facts that tend to indicate that the aircraft was flying around for a longer period looking for a place to land.

The statement that Broderick made regarding only one accident, however, is not supported by the evidence. Broderick's argument hangs on the assertion that some of the cases were not air carriers subject to U.S. regulations. But that misses the point: the regulation addresses the aircraft manufacturer not airlines. Boeing, McDonnell Douglas, and Lockheed aircraft had to pass the smoke evacuation regulation regardless of which airline, U.S. or foreign, would ultimately acquire it.

The FAA announced in late September 1998 that it was taking a fresh look at the "aging aircraft" problem. Indeed, Deputy Administrator Tom McSweeney, who holds Tony Broderick's former position, referring to the smoke evacuation test described in the 1994 revision of advisory circular 25-9A, said the FAA was taking another look at it. He said;

> "The test is designed to distinguish pass and fail very accurately. . . . [T]hey are required to let the entire cockpit fill up with smoke. They are required to let it fill up to the point you can't see your hand in front of your face. Then they must be able to evacuate the smoke. . . . We realize that that is not what pilots are going to do in service. We believe in letting that smoke build up there is a lot of benefit that's not really a part of that test that you get in real life and that is when you get the first sign of smoke you start evacuating. But do we stop there, no, because we are continuing to look at exactly that question: Should we have a different test for continuous smoke. At this point we have not concluded that we should but we are still looking."

The question is what has changed since the FAA lasted responded to the NTSB's recommendation on continuous smoke in the cockpit. At that time, the FAA said that the solutions were "optimized." It said:

> "the industry design effort" was "already optimize[d] for the use of fire extinguishing, cabin pressurization, air conditioning, and ventilation systems to extinguish or control fires and/or smoke." [34/]

The only question now is whether or not the FAA will enforce the smoke evacuation regulation and that the pilot of the airplane will be able to see to safely control and land the airplane in the event that the cockpit fills with smoke from a continuous source. The FAA makes it optional; it should be mandatory.

[34/] FAA date of response 1/27/84.