

Why should airline workers be trained to respond to fume events?

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**When fumes and smoke
are not fire:**

**Why should airline workers
be educated about
fume events?**

National Training Aircraft Symposium (NTAS)
Daytona Beach, FL
Oct. 25, 2022

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Industrial Hygienist
Association of Flight Attendants-CWA
Air Safety, Health, & Security Dept.





Another source of fumes/smoke worth knowing about

- Engine oil and hydraulic fluid fumes can contaminate the ventilation air supply to the cabin and flight deck. Widely discussed for three reasons:
 1. They happen daily
 2. They're preventable.
 3. Can seriously compromise flight safety/crew health.



What I will cover today--

- What is a **fume event**?
- **How often** are they documented?
- Why do these events **matter**?
- Importance of airline worker training to **mitigate and prevent exposure** to fumes
- Proposal to incorporate a **lecture on fume event education** into some Embry-Riddle pilot and mechanic degree programs

What is a fume event?

- Fume event is what happens when **engine oil or hydraulic fluid fumes** contaminate the ventilation air supplied to the cabin/flight deck through the vents (function of design and maintenance).
- Not usually any visible signs – **just a “bad smell.”**



Typical – no visible signs



Unusual – visible haze



Delta MD88 at Minneapolis on Sep 25th 2015, burning odour on board, smoke indication

Last Update: September 27, 2015 / 20:17:07 GMT/Zulu time

[The Business Journal reports](#) its pilots declared an emergency, and they were met by emergency vehicles on a taxiway at MSP. The plane was then checked over by fire crews.

4. Problem Description

(Note: Please limit your description to 1500 characters.)

THE FLIGHT RETURNED TO DEPARTURE FOLLOWING THE AFT LAVATORY SMOKE DETECTOR SOUNDING AND THE F/A SMELLING SMOKE. MAINTENANCE FOUND THE APU LEAKING OIL. THE APU WAS REPLACED, APU AND A PNEUMATIC SYSTEM DUCT BURNOUT WAS ACCOMPLISHED.



Article

Sources of Onboard Fumes and Smoke Reported by U.S. Airlines

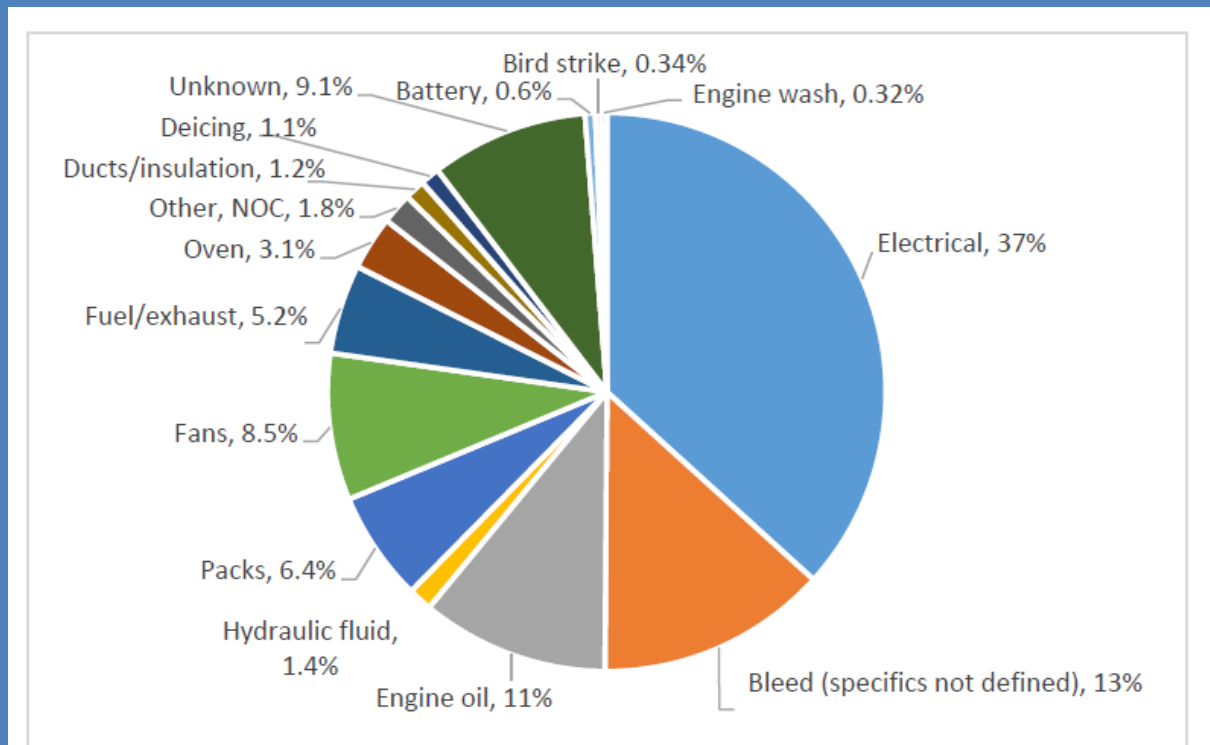


Figure 1. Sources of onboard fumes/smoke reported by U.S. airlines, 2002–2011 ($n = 12,452$).

US airline reports to FAA 2002-11 (10 years)

Oil/hydraulic fumes: How often??

Characterization of the frequency and nature of bleed air contamination events in commercial aircraft

Abstract Contamination of the bleed air used to pressurize and ventilate aircraft cabins is of concern due to the potential health and safety hazards for passengers and crew. Databases from the Federal Aviation Administration,

M. Shehadi, B. Jones, M. Hosni

Mechanical and Nuclear Engineering Department,
Kansas State University, Manhattan, KS, USA

- FAA-funded researchers published analysis of FAA, NTSB, NASA fume reporting databases
- US airlines report **5.4 bleed air events** fleet-wide per day (on average); **0.22 events / 1,000 flights.**
- FAA defn. “probable” failure = **1 / 100,000 flights**

<https://pubmed.ncbi.nlm.nih.gov/25864418/>

Why do fume events matter?

Flight safety



- When pilots are impaired or incapacitated in flight from breathing fumes, flight safety is compromised.
- Potential for pilots to be impaired from breathing oil fumes has been documented since 1939.
- Many air accident boards have investigated incidents of pilots breathing oil fumes in flight and issued recommendations.

Anderson, 2021: <https://www.mdpi.com/2226-4310/8/12/389>

Loraine, 2019: https://zenodo.org/record/3605134/files/ACA2017_Loraine.pdf

Armstrong, 1939: <http://ashsd.afacwa.org/docs/Armstrong1939.pdf>

Why do fume events matter?

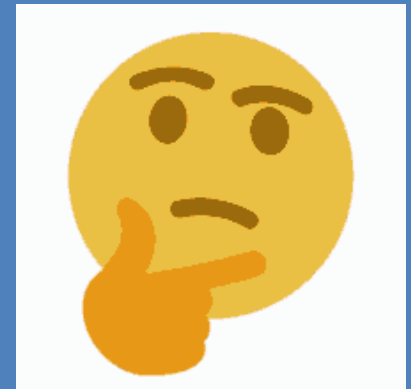
Crew health, loss of license

- **For crews** -- ill health, disability, reduced quality of life, PTSD from near misses, lost earnings; can lead to loss of license.
- **For airlines** -- costs of medical care, lost work time, diversions, ground time, losing skilled employees and having to train new ones.

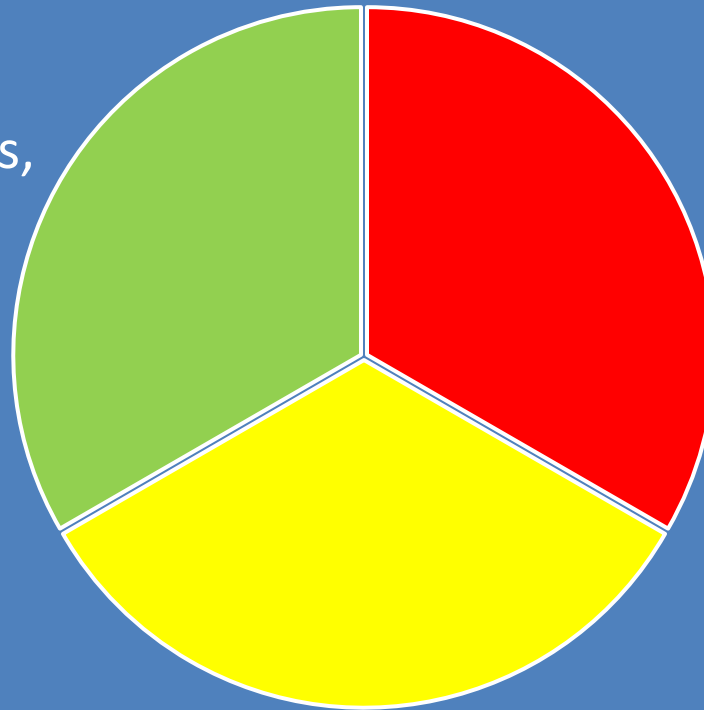
Dear Mr. Hill:

A careful review of your reports, test results, and neuropsychological report after your Jan 16, 2010 fume incident on Flight 1041, discloses that you do not meet the medical standards prescribed in Title 14 of the Code of Federal Regulations (CFR), Part 67. By virtue of your adjustment disorder with mixed anxious and depressed mood, chronic pain disorder associated with both psychological factors and general medical condition, dizziness, imbalance, and chemical exposure, it has been determined that you are not qualified for any class of medical certificate at this time.

How to stop fume events?



Design changes – non-bleed systems, bleed air filters, sensors, etc.



Preventative maintenance – train workers not to overfill oil and hydraulic reservoir, after an engine wash, clean the bleed air system prior to returning to service

Training/education – make sure crew and mx workers know how to recognize and respond to the presence of onboard fumes

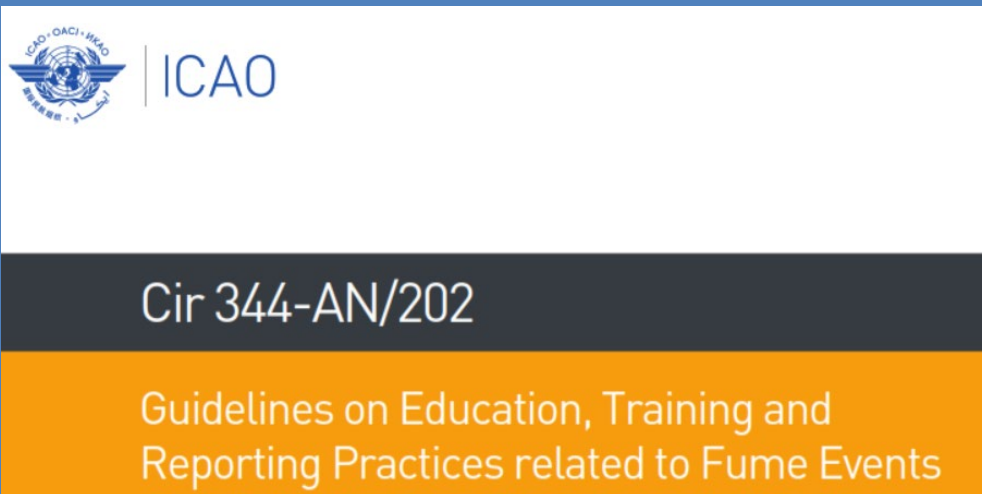


Benefits of training pilots, mechanics on fume events

- Enable a quicker and more confident response from flight deck to mitigate exposure
 - Better flight safety if pilots feel alert
 - Fewer flight disruptions if pilots can respond to and control fumes promptly
 - Better flight security if flight attendants feel alert
 - Prevent more significant (and expensive) impacts like long-term sick time, loss of license
- Enable a faster and more targeted/successful maintenance response

International Civil Aviation Organization (ICAO, 2015)

1.1.2 Of all of these potential contaminants in the cabin and flight deck, particular concerns have been raised regarding the negative impact on flight safety when crew members are exposed to oil or hydraulic fluid fumes or smoke, and experience acute symptoms in flight. Due to the potential flight safety implications, it is beneficial to provide guidance and instructional material to enable crew members to promptly recognize and respond to suspected air supply system-sourced fumes, as well as to enable aircraft maintenance technicians (AMT) to identify the source of the contaminants and to correct the issue.



Available for purchase
online via

<https://www.icao.int>

ICAO (2015) “Guidelines on education, training, and reporting practices related to fume events,” Circular 344-AN/202, International Civil Aviation Organization, Montreal, Canada

ANSI/ASHRAE Standard 161-2018
(Supersedes ANSI/ASHRAE Standard 161-2013)
Includes ANSI/ASHRAE addenda listed in Appendix B

Air Quality within Commercial Aircraft

Available for
purchase via
techstreet.com

Control measures to minimize contamination, potential air monitoring to evaluate contamination (notwithstanding the technological limitations for such monitoring), and remedies to control the impact of contaminants/sources are listed in Sections 8.2 through 8.19. In many cases, to implement these provisions it will be necessary to train relevant personnel, which may include the mechanics, ground staff, flight attendants, and pilots; see Circular 344-AN/202¹¹ for guidance. The need for training is considered to be understood by the users of this

Or search for:
“read-only
versions of
ASHRAE
standards”;
Standard 161
and Guideline
28 – access
without
charge.



U.S. Department
of Transportation
Federal Aviation
Administration

SAFO

Safety Alert for Operators

SAFO 18003
DATE: 3/26/18

Flight Standards Service
Washington, DC

SAFO 18003
March 2018

Subject: Procedures for Addressing Odors, Smoke and/or Fumes in Flight

Purpose: This SAFO serves to identify a need to enhance flight crew procedures that mitigate the risk to passengers and crew in the event of odors, smoke and/or fumes.

Background: Inflight odor, smoke and/or fume events can occur without overt visual and/or olfactory cues. To mitigate adverse health consequences to passengers and crew, prompt and decisive action is critical.

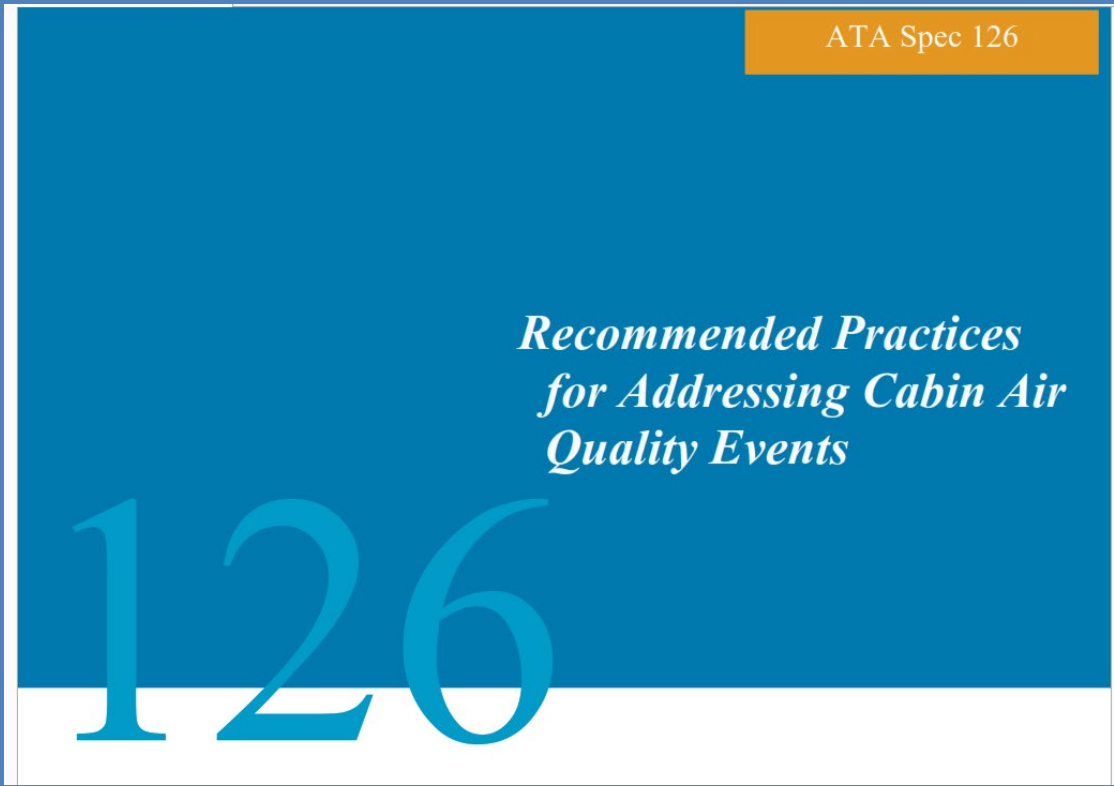
- Assess current policy and procedures regarding odor, smoke and/or fumes recognition, differentiation and mitigation;
- Collaborate with original equipment manufacturers, other operators and regulators to continuously enhance mitigation procedures and to identify potential risks; and

Available online via <https://www.faa.gov>



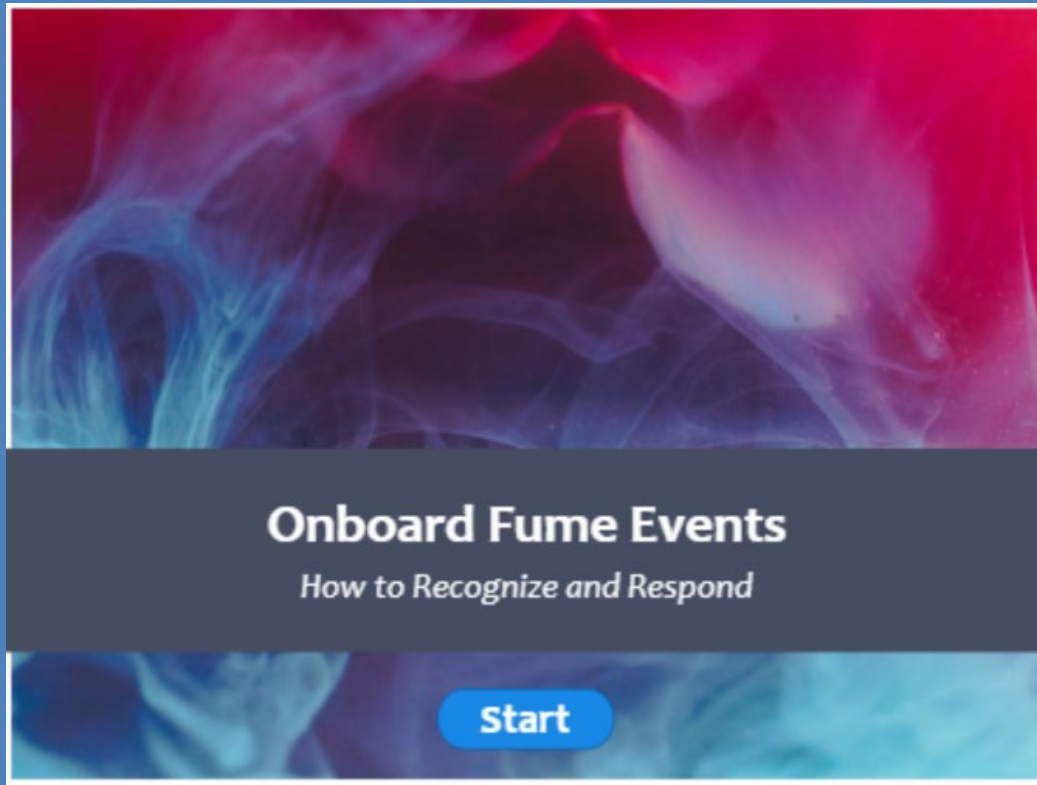
Inspired A4A Task Group: Developed airline worker training recommendations for fume events

- Written in response to SAFO 18003; ATA Specification 126 published on **March 1, 2020**



Available at no charge via:
<https://publications.airlines.org/>

AFA developed online flight attendant training to recognize/respond to fume events (2019)



- Six modules; takes about 45 minutes to complete
- Interactive
- Includes written material, videos, quizzes throughout

Accessible to members via: <http://afacwa.org/fumes-onboard>

Cabin Air Safety Act of 2022

A BILL

To improve the safety of the air supply on aircraft, and
for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Cabin Air Safety Act
5 of 2022”.

6 **SEC. 2. IMPROVEMENTS TO THE SAFETY OF THE AIR SUP-**
7 **PLY ON AIRCRAFT.**

8 (a) **IN GENERAL.**—Subpart III of part A of subtitle

If passed, would require annual training for crews, mechanics, and airport first responders to respond to and report fume events.



How about teaching fume event basics to undergrads?

- Mary O'Connor, PhD, REHS
 - CAPT, U.S. Public Health Service; CDC/NIOSH
- Cynthia Pugh, PhD
 - School of Graduate Studies, ERAU
- Eric Tellmann
 - Captain at Spirit Airlines
- Judith Anderson, MSc CIH
 - Industrial Hygienist
 - Assoc. of Flight Attendants-CWA





Introduce class at aviation-focused schools

- Introducing material to pilots- and mechanics-in-training is a small **investment** with the potentially for big dividends; “plants a seed” for their career.
- **Global** student population (so a farther reach for the course materials);
- **Suitable courses exist** in the pilot/mechanic degree programs for one lecture of material to be added.
- Because of aviation focus at these schools, **potential to reach other students/professionals, too**; e.g., lunch-time lecture, panel, update at NTAS, etc.

Our team's vision

- Goal is to **increase awareness, recognition, and prevention of fume events** and to limit crew and passenger exposure to harmful fumes.
- EITHER one class added to existing course within ERAU's **Aeronautical Science** and **Aviation Maintenance (Science)** degree programs, OR add content on different aspects of fume events into relevant courses .
- Excited to work with other aviation-specialty schools or training centers.
- Use ICAO Circular 344 (2015) as a framework for the class material; some segments **common** to both the pilot and mechanic cohorts; some segments **tailored** to the different and specialty roles of pilots, mechanics.

Example of how education can help

- Jan. 19, 2017 - Mx documented oil in the APU; MELd APU and but didn't clean ducting; released aircraft for service.
- Jan. 20, 2017 - Captain on inbound flight reported "dirty sock" fumes from the vents prior to departure and during descent.
- Jan. 21, 2017 - Captain Myers was asked to board and assist mx with troubleshooting engine runs (out-station; contract maintenance).
- Oil fumes filled the flight deck; he was taken off aircraft with seizures; developed long-term neurological disability, lost license to fly.

jetBlue Captain Suffered Toxic Encephalopathy from Contaminated Cabin Air, Court Concludes

In summary

- By design and as a function of maintenance practices, the air supplied to the cabin can be contaminated with oil and hydraulic fumes/smoke.
- Important that pilots and mechanics know about this source of fumes and smoke so that they can recognize and respond promptly.
- Team is developing a proposal to add one class to pilot and mechanic training degree programs at ERAU.



Thank you for your attention today -
Q&A time at the end of our panel.

For more information, visit AFA's
“practical information” fume event website:

www.afacwa.org/fumes-onboard

Meet our team!

- Captain Mary O'Connor, PhD, REHS
- Captain Eric Tellmann
- Cynthia Pugh, PhD
- Judith Anderson, MSc CIH
judith@AFAnet.org – 206-251-1203

The small print (references)



- **A4A (2020)** “Recommended practices for addressing cabin air quality events,” ATA Specification 126, Airlines for America, Washington DC, 1 March 2020.
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