Cabin safety bulletin 13 – Management of odours, smoke and fumes during flight

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Who does this bulletin apply to?

This bulletin applies to all charter and regular public transport (RPT) operators of Australian registered aircraft.

What is the purpose of this bulletin?

The purpose of this document is to raise operator and cabin crew member awareness in how to recognise and respond to the presence of fumes, particularly aircraft air supply system-sourced fumes. Operators may already have in place programming which incorporates education, training and reporting related to fume events, however, are encouraged to conduct a gap analysis against the content presented.

The content in this bulletin does not address on-board exposure to smoke or fire nor does it address occupational health issues.

This bulletin provides information and guidance which may be considered in preparing for these events, reviewing strategies to mitigate risks, facilitating standardised reporting and comprehensive data collation for trend analyses. This bulletin describes an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. On its own, this bulletin does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

Background

In some instances, fume events may impair crew members and could potentially impact the safe operation of the aircraft. Cabin crew members should be able to recognise, characterise, respond to, and report fume events.

CASA continually reviews data relating to fume[1] events and the potential impact on flight safety. Between 2013 and 2017, CASA received 1318 (7%) reports relating to occurrences involving fire, fumes and smoke, out of a total of 19,454 air transport occurrences for that period.

Various types of fumes, smoke, haze and mist may contaminate the cabin and flight deck air supply system. Outside air may be contaminated with engine oil, hydraulic fluid, engine exhaust, ground service vehicle exhaust, fuel, de-icing fluid or ozone. Recirculation fans are another potential source of contaminated air. Also, electrical systems and cabin items such as carry-on baggage, galley equipment and food items, lavatories, cleaning products, disinfectants and disinsectants may contaminate the cabin and/or flight deck air. Of all of these potential contaminants, 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 (ICAO, 2015).

[1] ICAO circular 344 defines fume(s) as odorous, gaseous compounds which are not visible

Awareness and training content

Cabin crew should know that fumes in the cabin and/or flight deck can be sourced to either the ventilation supply air and items in the cabin and/or flight deck and be trained to understand the difference between the two sources. Operators should ensure cabin crew training encompasses the following:

- sources and types of on-board fumes
- odour descriptors to recognise the presence of oil and hydraulic fluid fumes
- potential for impairment
- procedures to apply in fume events
- reporting of fumes events.

Crew members should be provided with information that will enable them to quickly assess and attempt to distinguish between these two sources of contaminants and respond accordingly.

Sources and types of onboard fumes

Fumes in the cabin and/or flight deck can be sourced to:

- Ventilation air supply system. This system can distribute contaminants such as de-icing and/or anti-icing fluid fumes, electrical fumes, engine compressor wash fumes, engine oil fumes, exhaust fumes, fuel fumes, hydraulic fluid fumes, recirculation fan fumes. Oil fumes from the engines, APU or the environmental control system may also contaminate the aircraft air supply system. In such instances, the oil fumes may contaminate the downstream ventilation ducting and the air carried through those ducts to the cabin, flight deck or both.
- Items in the cabin and/or flight deck. Sources of fumes can include carry-on baggage, cleaning products, disinfectants, disinsectants, galley equipment, lavatories. Contaminants in the cabin and/or flight deck, whether sourced to the ventilation air, or an item in the cabin or flight deck, are typically odorous but are not usually accompanied by visible smoke or haze. Crew members should not assume that visible signs of contaminants (e.g. smoke or haze) must be present in order to note, assess and report them.

Odour descriptors

Cabin crew must be trained in how to recognise and describe odours in order to provide accurate information to flight crew and engineering personnel.

Sometimes oil fumes do not smell like oil and may typically be described as mouldy/musty or dirty socks. Hydraulic fluid often has a distinctive and recognisable odour that is described as acrid/unpleasant/pungent. Odour is subjective and olfactory fatigue reduces a person's ability to detect odours over time.

Training should include standardised odour descriptors typically used for air supply system-sourced oil and hydraulic fluid fumes in order that aircrew can effectively communicate and report the presence of fumes smoke/fumes.

Potential for impairment

Cabin crew should be informed about symptoms that may be experienced following a fume event including:

- potential acute symptoms that could follow an exposure to oil or hydraulic fluid fumes which may include irritated eyes, sinus congestion, respiratory symptoms, gastrointestinal upset

- neurological symptoms that may impede crew member performance during flight operations such as alertness, attention span, information processing, working memory and response time. Symptoms may develop slowly, and degraded performance may not be initially obvious. Given the potential flight safety implications, cabin crew members should be trained to recognise and respond quickly.

Procedures to apply in fume events

Cabin crew should be trained to protect themselves from exposure to air supply system sourced fumes, whenever possible.

Operator procedures should also address the means by which the effects of fume events will be minimised for all aircraft occupants.

Cabin crew specific training

Cabin crew members should be trained to recognise and respond to fume events including:

- Location/source, type and intensity of fumes. Cabin crew should attempt to identify and locate the source of the fumes (air supply system or cabin equipment/item). They also need to identify the type, for example, musty/mouldy, acrid, dirty socks, and the intensity of the fumes, for example, mild, moderate, strong).

- How to communicate. During a fume event, cabin crew should communicate with each other and this communication should be established between the senior cabin crew member and flight crew. Training should outline the specific information to be communicated including, but not limited to:
    - nature and intensity of the fumes
    - any visible signs, such as haze or mist
    - apparent source, and for suspected air supply system fumes, confirmation that cabin sources have been ruled out to the extent possible
    - location within the cabin
    - solo crew member operations and interface with able bodied passengers
    - phase of flight when the odour was first noticed, as well as subsequent times when it was noticed
    - action(s) already taken (if any) and coordination with flight crew members on actions to be taken
    - barriers to communication with flight and cabin crew members, for example, wearing portable breathing equipment and potential impediments in speaking with aircrew or able-bodied passengers
    - presence of any affected passengers and/or crew members including the type of symptoms and the administration of first aid, if applicable.

- Passenger and cabin management. Cabin crew members should manage the passengers and the cabin, and this may include, but is not limited to:
    - relocating passengers, if required
    - informing passengers and providing reassurance
    - administering first aid to passengers and/or crew members
    - where smoke or fumes are heavy in the cabin, access to the flight deck is not advisable.

- Post-event procedures. Cabin crew members should apply post-event procedures for the remainder of the flight and this may include, but is not limited to:
    - monitoring the area
    - continued communication with the flight crew and other cabin crew members
    - applying crew member incapacitation procedures, if applicable
    - post event debriefing between flight and cabin crew.

- Applicable documentation. Cabin crew members should complete the applicable documentation, such as the smoke and fumes reporting form/witness reports (as applicable), in coordination with the flight crew in order to obtain as comprehensive information as possible.

Managerial personnel training

Managerial/supervisory personnel should receive an orientation to fume event causality and the potential impact on flight safety. The depth of training may be commensurate with the management role.

Training for this cohort should address the following elements:

- background—a description of the potential causes of the fume event and the potential impacts on flight safety
- role specific responsibilities—a description of the responsibilities specific to the role, for example, cabin crew manager, including raising awareness of the importance of reporting
- cooperation—highlighting the importance of cross disciplinary cooperation, for example, continued liaison with flight operations, engineering and cabin crew training areas
- safety management—the importance of monitoring the issue through the operator's safety management system and its existing processes, for example reporting events.

Training for senior managerial personnel may be achieved through a briefing, incorporating the above elements and should include specific responsibilities of senior managers.

Reporting of fume events

Aircrew should know how to report all fumes events, particularly fumes sourced to the ventilation air supply. Information contained within reports assists other disciplines such as engineering to establish the cause of fumes and safety departments to conduct trend analyses and disseminate learnings.

Standardised reporting

Standardised reporting will assist operators to systematically gather all information pertaining to a specific type of event and interpret results in a consistent manner. This information will enable an operator to monitor data trends over time, event causality, operational impact, determine potential causes and log increases and decreases in the frequency and severity of fume events.

To obtain standardised data collection, operators should ensure that there are clearly defined sections built into a report template. This will encourage reporters to input concise information in a systematic manner using common terminology. The sample template included with this bulletin sets out the following sections:

- flight and report details
- smoke or fire information, as appropriate
- fume information (including the nature and apparent source of fumes)
- other observations
- symptoms/reactions
- maintenance follow-up and information.

Note: Standardised smoke and fumes reporting forms should be developed and/or reviewed by a cross disciplinary team (for example, flight operations, engineering, cabin crew, safety departments) in order to validate user experience and verify data collection effectiveness.

Reportable matters

Under the *Civil Aviation Regulations 1988, part 4B Defect Reporting, CAR 51-53 reporting of defects in Australian Aircraft and Civil Aviation Safety Regulations 1998, 42.D.6.2–Reporting Defects,* smoke or fumes in the cabin is specifically referenced as a reportable event within the Defect Report Service web-page. Appendix 'A' to CAAP 51-1(2) Defect Reporting also mentions smoke, toxic or noxious fumes inside the aircraft as a reportable major defect.

All Australian airlines are legally required to report to the Australian Transport Safety Bureau (ATSB), a transport safety matter that has not had a serious outcome and does not require an immediate report, but transport safety was affected or could have been affected, within 72 hours of the event occurring.

Airlines are also required to carry out appropriate levels of analysis of an incident and determine any further action that may help improve aviation safety. This applies to all types of occurrences including those relating to fire, smoke, fumes or smells.

Fume event investigation

Following a fume event, an operator may decide that an investigation is warranted. Safety investigators may focus their attention on:

- gathering factual and standardised information from flight and cabin crew members, and engineering personnel
- gathering technical findings on any replaced components
- identifying the cause of the event, if possible
- developing recommendations to prevent recurrence.

Content of the investigation

The following points should be addressed in an investigation relating to a fume event:

- general information on the event flight (i.e. data from the smoke and fumes report form)
- relevant documentation (for example, maintenance logs, release forms, injury reporting forms)
- aircraft information (for example, condition of aircraft systems, types and results of troubleshooting procedures)
- human performance (that is, crew member and engineering actions)
- additional information (for example, medical reports, first responder reports)
- interviews, if applicable, including perspective of one or more flight crew, cabin crew members and engineering personnel.

Safety message

In the final report 'An analysis of smoke and fumes events' (ATSB, 2014), research revealed that data collected by CASA and ATSB provided visibility of occurrences from an operational and engineering perspective. A significant impediment to the information collected, however, was that many reports relating to smoke and fume events did not include enough detail for coding of the source or affected components.

The safety message in the report stated that smoke and fume events are generally managed appropriately by aircrew resulting in little consequence, and good reporting by operators with sufficient detail provided to CASA and the ATSB, where relevant, will assist ongoing efforts to monitor the risk of such events.

Further information

For more information, view the cabin safety page.

If you have an inquiry, please contact the CASA cabin safety team on 131 757 and ask to speak to a cabin safety inspector or email cabinsafety@casa.gov.au.

Subscribe to our mailing list to receive cabin safety bulletins on an ongoing basis.

Additional resources

Air Accidents Investigation Branch (2018). Fumes event Boeing 777-236, G-VIIJ. See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/734185/AAIB_Bulletin_9-2018_Hi_Res.pdf

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Civil Aviation Safety Authority (CASA) (2012). Contamination of aircraft cabin air by bleed air – a review of evidence. See: https://www.casa.gov.au/file/82021/download?token=gh4Wxle2

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Committee on Toxicity (2013). Position paper on cabin air. See: https://cot.food.gov.uk/sites/default/files/cot/cotpospapcabin.pdf

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European Aviation Safety Agency (EASA) (2017). Characterisation of the toxicity of aviation turbine engine oils after pyrolysis (AVOIL). See: https://www.easa.europa.eu/sites/default/files/dfu/EASA%20AVOIL_final%20report_final%20version_160217.pdf

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