Airbus A330-323, N276AY	London Heathrow Airport	26 June 2016	Serious Incident

Investigation Synopsis

The cabin filled with smoke whilst the aircraft was on stand after boarding. The cabin crew were unsuccessful in making contact with the commander, and one of the flight attendants (FAs) initiated a passenger evacuation.

Several passengers exited using the emergency slides from the two aft doors, but most left using the jetbridge at exit 2L. Passengers opened the two emergency exits situated immediately aft of the wings (exit 3L and exit 3R). Exit 3L had not been armed, so the slides did not deploy and the passengers did not use the exit. Exit 3R was armed and opened by a passenger and the slide deployed, but this exit was not used either.

The commander attempted to halt the evacuation, (because he believed he had isolated the source of the smoke) which caused some confusion until the FAs encouraged all remaining passengers to exit via the jetbridge.

Air Traffic Control (ATC) observed the incident and alerted the emergency services, which reached the scene quickly. Three passengers and several FAs received treatment for the effects of smoke inhalation and one passenger suffered a minor leg injury while using an escape slide.

The source of the smoke was traced to a failure of the Auxiliary Power Unit (APU) load compressor carbon seal that allowed hot oil to enter and pyrolyse in the bleed air supply. Metallic debris in the shared oil system compromised the load compressor bearing, leading to the failure of the load compressor carbon seal.

The APU manufacturer has taken action to address this type of event, and the relevant section of the Master Minimum Equipment List (MMEL) has been reviewed and amended.

Six Safety Recommendations are made in the areas of interphone design, passenger briefings and the co-ordination of pilot and cabin crew training. A further two Safety Recommendations are made concerning modification to enhance automatic APU shut-down protection in the event of lubrication system contamination.

Safety Recommendation 2017-022

Safety Recommendation 2017-022

It is recommended that the Federal Aviation Administration mandate Service Bulletin GTCP331-49-7936 to add a system that shuts down the APU automatically if there is contamination of the lubricating oil.

Date Safety Recommendation made: 08 December 2017

LATEST RESPONSE

Response received: 08 May 2018

The FAA has reviewed the AAIB's report from the incident (AAIB Bulletin: 12/2017, N276AY, EW/C2016/06/02) and Honeywell Service Bulletin (SB) GTCP331-49-7936. The event APU was a Honeywell model 331-350[C].

In 2007, Honeywell published SB GTCP331-49-7936 that provides a cockpit indication of an impending oil filter bypass and, during non-essential (ground) APU operation, initiates an APU auto-shutdown. During essential (flight) operation, this APU auto-shutdown is inhibited and the flight crew may choose how to respond to the indication. The original 331-350[C] bypass indicators are visible only by visual inspection inside the APU compartment. The FAA did not mandate this SB by Airworthiness Directive (AD).

The incident airplane did not have the SB feature installed. Had it been installed, it is likely the APU would have shut down automatically prior to the filter bypass condition, thereby preventing the conditions allowing oil to leak into the bleed air and. Subsequently fill the cabin with smoke.

The held technical discussions with Honeywell and the European Aviation Safety Agency (EASA) to review the APU design, its contribution to the failure event, and current 331-350[C] fleet usage statistics. Our evaluation of the safety risk of this APU-caused smoke-in-cabin event found:

• The smoke did not obscure the flight controls or the instrument panel;

• The smoke did not incapacitate the flight crew;

• The smoke did not inhibit the flight crew from performing its duties;

• The flight crew terminated the generation of smoke by the single action of closing the APU bleed valve;

• The APU performed a safe auto-shutdown due to high oil temperature;

• There was no increased risk of fire, as all fluids that leaked into the APU core engine or APU compartment drained overboard and did not collect in hazardous quantities; and

• A recent review of historical APU bleed air quality events spanning three years found no instances of APU-caused flight crew incapacitation for this or any other APUs with the United States as the state of design.

Our evaluation concluded that mandating Honeywell SB GTCP33 l-49-7936 based on this event and the likelihood of a future event of the same severity or worse is below the safety threshold for issuance of an AD.

Additionally, most 331-350[C] APUs already contain the SB GTCP331-49-7936 auto-shutdown feature. All new 331-350[C] APUs have received this upgrade during production since 2007. To date, 55% of the worldwide fleet of 331-350[C] APUs (1,028of1,852) have this feature installed. The FAA expects that this incorporation rate will continue to increase as new A330 aircraft are produced and un-upgraded APUs are retired in aging A330 and A340 aircraft.

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0022)

Safety Recommendation 2017-023

Safety Recommendation 2017-023

It is recommended that the European Aviation Safety Agency mandate Service Bulletin GTCP331-49-7936 to add a system that shuts down the APU automatically if there is contamination of the lubricating oil.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 18 December 2018

EASA obtained the APU's and Airframe's manufacturer positions about this recommendation. They confirmed that the APU performed an automatic shutdown due to high oil temperature, with no release of high energy debris and no increased risk of fire. The high oil temperature protection logic is implemented in all GTCP331 APUs in service.

Regarding the smoke in the cabin, at no moment was its level sufficient to incapacitate the crew or passengers. According to the APU manufacturer, the contamination of the APU oil system had resulted from a mechanical failure of the APU generator. In such a situation, this unit has to be deactivated/removed before the aircraft can be dispatched under a mechanical failure condition Master Minimum Equipment List (MMEL) item. However, during this event, the applicable Aircraft Maintenance Manual (AMM) task could not isolate the mechanical failure, and the dispatch was allowed under an electrical failure condition MMEL item. Since this event, the applicable AMM task has been amended (January 2018) in order to enhance the assessment of the APU generator failed unit. That would allow application of the appropriate MMEL item, thus achieving an equivalent objective compared to the implementation of Service Bulletin (SB) GTCP331-49-7936.

The evaluation of this safety recommendation has been coordinated with the FAA which also concluded that mandating Honeywell SB GTCP33 I-49-7936 based on this event and the likelihood of a future event of the same severity or worse is below the safety threshold for issuance of an Airworthiness Directive (AD).

EASA Status: Closed - Disagreement

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

RESPONSE HISTORY

Response received: 08 February 2018

In order to obtain the information necessary to support the Agency decision about the safety recommendation, the EASA has contacted the Federal Aviation Administration (FAA), the primary certification authority of the APU.

AAIB Assessment – Not Adequate Open

(SRIS Reference: GB.SIA-2017-0023)

Safety Recommendation 2017-024

Safety Recommendation 2017-024

It is recommended that the Federal Aviation Administration regulate the operation of interphone handsets, including during emergency communications, so that it is standardised irrespective of aircraft type.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 21 December 2020

The FAA coordinated Safety Recommendation 17.138 with our office management, principal operations inspectors, cabin safety aviation safety inspectors, and subject matter experts for the United, American, and Delta Certificate Management Offices and determined the following:

•Currently, No FAA data exists to suggest that non-standardized aircraft interphone handsets is a systemic issue among US Air Carriers

•Most interphone handsets have written instructions on the actual handset.

•Standardizing aircraft interphone handsets across the entire fleet of all US Air Carrier aircraft would be unwarranted, burdensome, and cost prohibitive to the FAA.

•In response to National Transportation Safety Board Safety Recommendation A-18-8 (and others), the FAA published a major revision to Advisory Circular (AC) 120-48A, Communication and Coordination between Flightcrew Members and Flight Attendants, on January 27, 2020. This AC's primary audience are managers of flight operations training, in-flight managers, and air carrier curriculum designers who develop, implement, and revise operating procedures and training programs on crew communication and coordination. We believe this AC may provide information that addresses the intent of this safety recommendation.

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

Action Status **Planned Action Completed**

Feedback rationale

The AAIB acknowledges the work done by the FAA in response to Safety Recommendation 2017-024. Whereas Advisory Circular (AC) 120-48A does not regulate the operation of interphone handsets, it partially addresses the absence of standardisation by highlighting related training and procedural aspects of their use. (EU Regulation 996/2010 article 18 refers).

RESPONSE HISTORY

Response received: 06 May 2020

We are continuing to gather information necessary to conduct our complete review and analysis. To date we have determined and are considering the following:

1. The recommendation calls for the promulgation of new regulation. Currently, Presidential Executive Order 13771 prohibits the promulgation of new regulation that do not remove two existing regulations.

2. Promulgating new regulation, in this matter, will have no impact on guaranteeing interphone communications between cabin and flight crew in future emergencies and emergency evacuations. Given that no two incidents of this kind are identical in all respects, and the fact that the principals will be different, it is impossible to guarantee how flight and cabin crew will react in similar incidents of lost communications between cabin and flight crew during an emergency and or emergency requiring evacuation.

3. The very detailed report does not demonstrate a systemic problem with data. We are not aware of any previous incidents of this kind.

4. The current FAA regulations governing air carrier operations and cabin and flight crew training, in addition to the FAA's Safety Assurance System (SAS), and Air Carrier Safety Management System (SMS) programs, provide sufficient oversight and safeguards to ensure aircraft crews perform competently to the best of their ability, training, and experience to facilitate the safest aviation environment possible.

5. We are currently reaching out to several Cabin Safety Aviation Safety Inspectors' to access their first-hand knowledge about crew training, specifically interphone standardization procedures and alternative communications procedures.

6. We are also considering consulting with FAA's Aircraft Certification Office about the handset keyboard layout.

We anticipate a formal response to be forthcoming by October 1, 2020.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0024)

Safety Recommendation 2017-025

Safety Recommendation 2017-025

It is recommended that the European Aviation Safety Agency regulate the operation of interphone handsets, including during emergency communications, so that it is standardised irrespective of aircraft type.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 12 February 2018

Use of interphones for emergency communications across aircraft types is, for EASA Member State operators, addressed under the existing EU air operations regulation (Commission Regulation (EU) No 965/2012) and related EASA Executive Director Decisions, as described below.

Commercial Air Transport operators are required to establish, and document in their Operations Manual (OM), standard operating procedures (SOPs) which should be tailored to suit their operations and fleet (see ORO.GEN.110(f)), taking into account the aircraft manufacturer's documentation, such as the Aircraft Flight Manual, Cabin Crew Training Manual, Operational Suitability Data (OSD).

The crew member interphone system, as required under CAT.IDE.A.175, should have a means for the recipient of a call to determine whether it is a normal call or an emergency call, and also have an alerting system incorporating aural or visual signals for use by flight and cabin crew (see AMC1 CAT.IDE.A.175). The operational methodology is not prescribed, which is in line with risk-based principles underlying rulemaking today.

European operators are required to provide training to cabin crew, including training on:

• Safety equipment and aircraft systems installed, relevant to their duties [see ORO.CC.125©(2)(ii)];

These systems include the interphone system, and associated training relies on the OSD information provided by the manufacturer (see CS CCD.310 & Appendix 1 to CS CCD.310 of the Annex to Executive

Director Decision 2014/006/R), which addresses, under the communication system:

(1) location of handset unit(s) (crew station/flight crew/crew rest compartment(s));

(2) description and use of interphone integrated keys;

{3) operation of interphone and initiating calls in normal and emergency circumstances (calls: cabin to flight crew compartment; cabin crew to cabin crew station; cabin/flight crew compartment to crew rest compartment(s); cabin crew/flight crew to purser and vice versa);

(4) aural/visual indications associated with interphone calls in normal and emergency circumstances;

(5) location and description of signalling panels associated with communication system;

(6) emergency communication alert system (ECAS) - description/location/operation in cabin and flight crew compartment;

• The operator's SOPs [see ORO.CC.125 (d)(2) and (d)(3)(iii)] and actions assigned to each member of the cabin crew in normal and emergency procedures and drills relevant to each aircraft type and/or

variant to be operated [see ORO.CC.140 (b)];

• For the senior cabin crew member (SCCM), the pre-flight briefing, including " … consideration of the particular flight, aircraft type, equipment, area and type of operation … " [see (a)(3) of AMC1 ORO.CC.200©].

Sub-paragraph (d)4 of 21.A.15 of Annex I (Part-21) of Commission Regulation (EU) No 748/2012, as amended by Commission Regulation (EU) No 69/2014, on initial airworthiness, requires, as applicable, the type certificate holder, under the OSD process, to determine aircraft types and variants for cabin crew operations, and to establish the associated cabin crew type-specific data. The related Certification

Specifications-Cabin Crew Data (CS-CCD) contain type design requirements enabling such determinations at the level of the aircraft certification process.

Furthermore, the EU air operations regulation limits the number of aircraft types that cabin crew can operate to three, and, if certain conditions are met, cabin crew may operate on four aircraft types (see ORO.CC.250).

Proper implementation, by EU operators, of the afore-mentioned EU regulatory provisions is expected to provide an acceptable level of safety.

Safety Recommendation Status **Closed**

AAIB Assessment **Partially Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0025)

Safety Recommendation 2017-026

Safety Recommendation 2017-026

It is recommended that the Federal Aviation Administration reconsider the requirements for briefings given to passengers seated at exits, to ensure they offer appropriate guidance on exiting the aircraft rapidly in an emergency without implying undue responsibility for opening the exits.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 03 April 2019

The FAA's Flight Standards Service office (AFS) has evaluated the United Kingdom's AAIB report. We have determined that our current regulations already address this proposed safety recommendation. Title 14, Code of Federal Regulations (14 CFR) 121.585 lists a set of neutral, non-discriminatory selection criteria, as well as a list of functions that may be required of a passenger seated in an exit seat. The selection criteria are designed to evaluate the suitability of a passenger to perform the required exit functions. The regulation prohibits an air carrier from seating a passenger in an exit seat if the passenger does not appear able to meet the selection criteria or perform the listed exit functions. The FAA has provided guidance material to air carriers on how to apply the selection criteria.

Air carriers establish their own procedures in order to comply with the exit seating regulation, and those procedures are approved by the principal operations inspectors assigned to that air carrier. Approval is based solely upon the safety aspects of the certificate holder's procedures. Air carrier procedures may vary from air carrier to air carrier. For example, several air carriers have elected to not allow the use of seat belt extensions in exit rows for the safety of all passengers to preclude the hazard of entanglement with the additional length of the extension by those passengers attempting to expeditiously exit the aircraft. Passengers can find information about exit seat programs on each air carrier's website or can contact the air carrier directly.

Passengers have several opportunities during the purchase of an airplane ticket and the boarding process, prior to actually being on the airplane, where they are made aware that they have been assigned to a seat in an exit row. This allows the passenger to decide if he or she is capable of performing the applicable exit row functions. Title 14 CFR 121.585 also permits a passenger who does not wish to perform exit row functions to identify themselves to the flight attendant for reseating. At any time that a passenger does not wish to be seated in an exit row seat, he or she may choose to occupy a different seat. Occupying a seat in an exit row is purely voluntary.

The FAA requires air carriers to orally brief passengers before each takeoff on various safety features and requirements of the aircraft. The requirement to conduct a briefing prior to each takeoff enhances passenger safety, as it reiterates safety information prior to a critical phase of flight. The FAA also requires air carriers to carry on each passenger-carrying airplane, in convenient locations for use of each passenger, printed cards supplementing the oral briefing. It is expected that passengers will become familiar with emergency equipment to ensure that, in the event there is an emergency, the passenger will be able to successfully evacuate the aircraft.

By purchasing a ticket or accepting transportation, a passenger agrees to the terms and conditions with respect to the operation of the flight, including accepting the responsibility of sitting in the exit row. Passenger safety briefings and safety information cards provide information that ensure each passenger receives clear and accurate information about his or her flight. If a passenger does not understand any aspect of the contract, we encourage him or her to seek clarification from an airline representative.

Safety Recommendation Status	**Closed**
AAIB Assessment	**Adequate**

RESPONSE HISTORY

Response received: 13 March 2018

The FAA has assigned these recommendations to the Part 121 Air Carrier Operations Branch. This branch will be responsible for assessing these recommendations and proposing an action plan, if needed. The review and analysis will require time. We plan to provide an updated and conclusive response by September 30 2018.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0026)

Safety Recommendation 2017-027

Safety Recommendation 2017-027

It is recommended that the Federal Aviation Administration require cabin crew on aircraft that are parked, and with passengers on-board who are neither boarding nor deplaning, to be evenly distributed throughout the cabin and in the vicinity of floor-level exits in order to provide the most effective assistance in the event of an emergency.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 03 April 2019

The FAA's Flight Standards Service office has evaluated the AAIB report and has determined that our current regulations address the proposed safety recommendation. Title 49 of the United States Code (49 U.S.C.) authorizes the Secretary of the Department of Transportation (DOT) to conduct inspections of program managers. Statutory requirement empowers the FAA "to carry out the functions, powers, and duties of the Secretary relating to aviation safety." One of our most significant duties is to conduct surveillance in all areas of air transportation safety.

Surveillance is a continuing duty and responsibility of all aviation safety inspectors (ASI) in the AFS organization of the FAA. The term "surveillance" is equivalent to safety assurance, as it relates to an oversight systems approach. Surveillance programs provide us with a method for continual evaluation of approved programs, compliance with 14 CFR, and safe operating practices. Information generated from the surveillance programs allow the FAA to act upon deficiencies, which potentially impact aviation safety. For surveillance programs to be effective, ASIs must carefully plan and execute surveillance during the conduct of specific inspection activity. Inspections provide specific data, which can be further evaluated. Therefore, they support continuous operational safety.

The primary objective of a Safety Assurance System (SAS) surveillance plan is to provide us, through a variety of inspections, with an accurate, real-time, and comprehensive evaluation of the safety status of the air transportation system. Inspectors accomplish this by:

- Determining each safety program's compliance with regulatory requirements and safe operating practices;
- Detecting changes as they occur in the operational environment;
- Detecting the need for regulatory, managerial, and operational changes; and
- Measuring the effectiveness of previous corrective actions

Title 14 CFR 121.391 of the Federal Aviation Regulations (FAR) stipulates that flight attendants must be uniformly distributed throughout the operation of flight. This includes when the aircraft is parked at the gate, during movement on the surface, takeoff, and landing. The most important part of this requirement pertains to placing flight attendants in locations that will provide the most effective egress of passengers in the event of an aircraft evacuation.

We will use SAS Data Collection tools to ensure that not only American Airlines but all assigned certificate holders are aware of the need for flight attendants to be evenly distributed during flight operation. In addition, the next scheduled design assessments and performance assessments will ensure the assigned certificate holder's manuals and training properly reflect this requirement.

Safety Recommendation Status	**Closed**
AAIB Assessment	**Adequate**

RESPONSE HISTORY

Response received: 13 March 2018

The FAA has assigned these recommendations to the Part 121 Air Carrier Operations Branch. This branch will be responsible for assessing these recommendations and proposing an action plan, if needed. The review and analysis will require time. We plan to provide an updated and conclusive response by September 30, 2018.

AAIB Assessment – Partially Adequate Open

(SRIS Reference: GB.SIA-2017-0027)

Safety Recommendation 2017-028

Safety Recommendation 2017-028

It is recommended that the European Aviation Safety Agency require cabin crew on aircraft that are parked and with passengers on-board to be evenly distributed throughout the cabin and in the vicinity of floor-level exits, in order to provide the most effective assistance in the event of an emergency.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 12 February 2018

Distribution of the cabin crew throughout the cabin of parked aircraft with passengers on-board is, for EASA Member State operators, addressed under the existing EU air operations regulation (Commission Regulation (EU) No 965/2012) and related EASA Executive Director Decisions, as described below.

Commercial Air Transport operators are required to establish, and document in their Operations Manual (OM), standard operating procedures (SOPs) for their operations, including:

• Crew member duties and responsibilities when the aircraft is parked on the ground (see ORO.GEN.110(f));

• Cabin crew stations and surveillance of the passenger cabin during the pre-take-off phase (see AMC1 ORO.GEN.110(f)(h)].

In particular, the cabin crew procedures should address:

• Cabin crew positioning in the cabin during the different phases of flight or whenever deemed necessary in the interest of safety (see 8.3.10 of AMC3 ORO.MLR.100);

• Passenger embarkation and disembarkation (see 8.3.15 © of AMC3 ORO.MLR.100);

• Re-fuelling/de-fuelling with passengers embarking, on board or disembarking (see 8.3.15 (d) of AMC3 ORO.MLR.100);

• Passenger briefing procedures (see 8.3.16 of AMC3 ORO.MLR.100).

In addition, cabin crew numbers and stations/seating positions in the cabin should be taken into account in the SOPs, covering, for example, cabin layout, doors/exits, and even distribution of cabin crew stations [see AMC1 ORO.CC.100 (a) and AMC1 CAT.OP.MPA.210(b)].

Typically, the minimum number of cabin crew is determined, during the certification process, taking into account the positioning of the floor-level exits, which are associated with the cabin crew assigned stations. More specifically, the numbers are derived from the emergency evacuation demonstrations and analysis conducted at the time of type certification of the aeroplane types and variants.

Proper implementation, by EU operators, of the afore-mentioned regulatory provisions is expected to provide an acceptable level of safety in the event of an emergency evacuation when passengers are on-board parked aircraft.

Safety Recommendation Status **Closed**

AAIB Assessment	**Adequate**

RESPONSE HISTORY

N/A

(SRIS Reference: GB.SIA-2017-0028)

Safety Recommendation 2017-029

Safety Recommendation 2017-029

It is recommended that the Federal Aviation Administration require that flight and cabin crew participate in joint training to enhance their co-ordination when dealing with emergencies.

Date Safety Recommendation made: 07 December 2017

LATEST RESPONSE

Response received: 15 March 2021

As previously noted, the FAA coordinated Safety Recommendation 17.141 with the Air Carrier Training Aviation Rulemaking Committee (ACT ARC). Upon final review, it was concluded that flight and cabin crew joint training should be adopted. Although the ACT ARC recommended that flight and cabin crew joint training be included in the update to Advisory Circular (AC) 120-51E, Crew Resource Management Training, ultimately, the FAA applied and published the updates to AC 120-48A, Communication and Coordination Between Flightcrew Members and Flight Attendants, on January 27, 2020 (attached). In addition, we also 2 believe this recommendation is addressed by Title 14, Code of Federal Regulations Part 121.417 (b)(1), Crewmember Emergency Training, which may be found at: rgl.faa.gov.

Safety Recommendation Status **Closed**

AAIB Assessment **Adequate**

Action Status **Planned Action Completed**

RESPONSE HISTORY

Response received: 10 July 2018

The FAA assigned this recommendation to the Air Carrier Training Systems and Voluntary Safety Programs Branch, which will assess this recommendation and propose an action plan, if needed. This review and analysis will require time. The FAA anticipates providing an updated response by September 30, 2018.

AAIB Assessment – Partially Adequate Open

Response received: 23 August 2018

The FAA's Air Carrier Training Systems and Voluntary Safety Programs Branch is still assessing this recommendation and the events of the emergency outlined in the initial submission. This review and analysis will require additional time. We anticipate providing an updated response by January 24, 2019.

AAIB Assessment – Partially Adequate Open

Response received: 15 April 2019

FAA Comment. The FAA's Air Carrier Training Aviation Rulemaking Committee (ACT ARC) concluded that flight and cabin crew joint training should be adopted, and recommended that it be included in the update to AC 120-51E, Crew Resource Management Training.

Currently, the update to the AC is being reviewed internally in the FAA's Flight Standards Service. Once completed, it will then return to the ACT ARC for final review.

We intend to provide an updated response by December 31, 2019.

AAIB Assessment – Partially Adequate Ope

(SRIS Reference: GB.SIA-2017-0029)