"EXPLOSIVE DOOR OPENINGS"

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Subject: Explosive Door Openings on Parked Aeroplanes

Description:
There have been several occurrences of explosive door openings on parked aeroplanes, resulting in injuries, including fatalities, to persons inside or outside the aeroplane. The main factor leading to these occurrences was an inadvertent development of an excessive differential pressure between the inside and the outside of the aeroplane.

When an aeroplane is parked, cooling or heating of the aeroplane cabin can be provided through the air-conditioning system powered up by the auxiliary power unit (APU) or an external source of air (e.g. ground air-conditioning cart) ducted to the aeroplane cabin. Closing all aeroplane doors helps to reach and maintain the desired temperature. However, it may also result in an undesired build-up of excessive differential pressure between the cabin and the outside environment, if the outflow valve is closed. As a result, this may cause an explosive door opening. This may happen during normal operation of the aeroplane, during maintenance activities, or when conducting practical training of personnel on the aeroplane on ground. Therefore, operational procedures must be in place to mitigate this hazard.

Such procedures should ensure that there are always means to release the cabin air pressure before conditioning the cabin on ground with the APU or an external source, and before opening the aeroplane door. Such procedures must take into account the instructions provided by the aeroplane Type Certificate Holder (TCH).
The procedures should include:

- **Verifying, if possible, that the outflow valve(s) (component of the cabin pressurisation control system) or any other “external valves”, which should prevent the cabin pressure from building-up (such as the avionics extraction valves), are in the open position and whilst maintenance takes place, a pressure build-up relief mechanism is operated before opening a fuselage door of a pressurised aeroplane.**

- **Alternatively, ensuring that at least one aeroplane cabin fuselage door remains open, as the flight crew or maintenance personnel may not be able to control the aeroplane’s outflow valve or other “external valve” positions without the APU or an aeroplane engine running.**

**Recommendation(s):**

EASA recommends that:

1. **Air operators, ATOs, maintenance organisations and CAMOs** identify if the risk described in this SIB is present in their operations or activities, and **establish procedures that reflect the associated instructions** provided by the aeroplane TCH. Air operators ensure that all personnel involved in handling of the aeroplane (such as aircrew, aircrew instructors, maintenance, ground handling, personnel assigned to perform certain task(s) inside the cabin, etc.) **are made aware of the risks** and that their training and procedures include the case of explosive door opening and its prevention. Maintenance organisations and CAMOs ensure that all affected personnel are aware of the risk of explosive door opening.

2. **Aerodrome operators** ensure that rescue and firefighting personnel are **made aware of the risk of an explosive door opening**, if their intervention is required.

3. **Other individuals that need to access the aeroplane** seek the advice from the operator or the maintenance organisation in-charge before operating a door of a potentially pressurised aeroplane.
EXPLOSIVE DOOR OPENING – GVA, 16.02.2019
1. Night-stop
2. PCA connected to A/C
3. PCA is switched ON
4. Technician (SRT) tries to open door 1. Doesn’t work. Technical problem?
5. Technician foresees to try to open the opposite door. Go get a gangway!
6. In the meantime: crew member forces the opening of door 1
7. Explosive door opening occurs
CONSEQUENCES

Crew member lightly injured.

Severe damage to passenger bridge, none to the aircraft.
## Causes & Contributing Factors

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<th>Category</th>
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| **Human factors** | - The TRC (turnaround coordinator) that started the air conditioning did not make sure previously that the door of the plane was open.  
- The TRC did not ensure that the temperature sensor was inside the aircraft.  
- The TRC was not trained for this manipulation.  
- The crew who opened the door forced onto the handle. |
| **Procedures**  | - The internal procedure of the handling agent for the connection and implementation of the aircraft air conditioning (PCA) exists and is instructed to the ramp agents, only entitled to handle the PCA at DNATA (except TRC on BA). All the ramp SWP staff is trained in handling PCA’s. This is part of the basic ramp training.  
- The outflow valve was closed to prevent de-icing product infiltration ('ditching mode', winter procedure). |
| **Material**    | - The temperature sensor was not correctly placed on its support during the previous use. This enabled the activation of the air conditioning without regulation.  
- Booster pressure warning light was not working, because there was no electric power in the plane. |
| **Meteo**       | nil                                                                                                                                         |
SAFETY RECOMMENDATIONS

➢ Remind all personnel that PCA shall only be manipulated by authorized personnel.
➢ Remind all ramp personnel about the PCA process.
➢ Remind all ramp personnel to use the temperature sensor base.
➢ Organise spotcheck for temperature sensors.
➢ Remind technicians that overpressurization can cause door resistance to opening.
➢ Remind airline personnel not to force a door.
➢ Remove unused metal box in the passenger bridge.
➢ Add proper labeling of temperature sensors.
SAFETY ALERT

PCA et Sonde de température

Pour rappel, la PCA ne peut être manipulée que par les personnes formées. Avant d’enclencher le système d’air conditionné à l’avion, celles-ci doivent s’assurer que :

✓ une porte de l’avion (ou à défaut l’outflow valve) est ouverte
✓ la sonde de température est à l’intérieur de l’avion

Le non-respect de ces règles peut entraîner une augmentation de la pression en cabine et de sérieux dommages corporels et matériels à l’ouverture de la porte.

Après utilisation, la sonde de température doit impérativement être remise correctement sur son support. Ceci permet un arrêt total et sûr du système PCA.

ENSEMBLE, AMÉLIORONS LA SÉCURITÉ SUR NOTRE PLATEFORME.
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES
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Cabin pressurization

Cabin pressurization is a process in which conditioned air is pumped into the cabin of an aircraft, in order to create a safe and comfortable environment for passengers and crew flying at high altitudes. Cabin pressure is regulated with the outflow valve.

Cruise Altitude: 36,000' → 3.3 psi
Cabin Altitude: 7000' → 11.3 psi
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES

During winter period A320

During winter, when aircraft is parked outside, as part of the daily check, the aircraft is set in ditching mode, therefore the outflow is closed to prevent de-icing fluid to enter into the aircraft.

In this situation, an unwanted aircraft pressurization will occur if the gound air conditioning is connected, therefore AHM must be followed. Ensure that at least one door is open!

The outflow is re-opened as part of PFC departure check.
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES

Outflow valve open

- When the outflow valve is open, it prevents the cabin pressure from building-up.
- No risk of explosive door.
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES

Outflow valve closed

- When the outflow valve is closed and all doors are closed, the cabin is pressurized by the air-conditioning system powered by the APU or by the PCA.
- It will result in an undesired build-up of excessive differential pressure between the cabin and the outside environment.
- Risk of explosive door opening.
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES

WARNING
MAKE SURE THAT AT LEAST
THE FWD AVIONICS-COMPARTMENT ACCESS DOOR
IS OPEN AND STAYS OPEN
OR ONE OR MORE PASSENGER DOORS
 OR THAT ALL OUTFLOW VALVES ARE FULLY OPEN AND STAY OPEN
WHEN AN EXTERNAL AIR SOURCE IS CONNECTED TO THE AIRCRAFT
DURING THIS PROCEDURE YOU MUST ATTACH A WARNING NOTICE TO THE OPEN DOORS
TO TELL PERSONS NOT TO CLOSE THEM
THIS PREVENTS ACCIDENTAL PRESSURIZATION OF THE AIRCRAFT

- Warning notice on Airbus A330 on Ground External Air.
- Source connector (PCA connector).

- Residual Cabin Pressure indicator on Airbus A/C’s.
- Flashing red when cabin is still pressurized – Door should not be open. Risk of explosive door.
- This indicator will only work if the A/C is powered.
EXPLOSIVE DOOR OPENINGS ON PARKED AEROPLANES

Accident resulting in the death of a Captain at Kittilä Airport on 4.01.2018

The midsize jet was being prepared for its flight, with an attendant on board, the auxiliary power unit (APU) running and the cabin heat on. However, the doors and the air pressure outflow valve were closed.

Safety Investigation Authority, Finland

Finnish investigators concluded that the cabin was "over-pressurized", and once the door-locking mechanism was released, it "blew open with excessive force, hitting the captain".
The pressure relief valves were secured shut and not released.
THANKS FOR YOUR ATTENTION!