Decompression

Depressurization or decompression of the aircraft cabin is the reduction of air pressure as a result of structural failure, pressurization system failure, or deliberate act of the crew.

CATEGORIES OF DECOMPRESSION:

- **1. Explosive Decompression**
- **2. Rapid Decompression**
- **3. Slow/ gradual decompression**

- **Explosive decompression** is defined as a change in cabin pressure faster than the lungs can decompress. Therefore, it is possible that lung damage may occur. Most authorities consider any decompression which occurs in less than 0.5 seconds as explosive and potentially dangerous.
- **Rapid decompression** is defined as a change in cabin pressure where the lungs can decompress faster than the cabin. Therefore there is no likelihood of lung damage.
- **Gradual decompression** – slow, or gradual, decompression occurs slowly enough to go unnoticed and might only be detected by instruments.

Decompression can occur due to:

- pressurization system malfunction
- damage to the aircraft structure
- breach in the aircraft fuselage due to an explosion
- human error
- metal fatigue
- faulty door seal
- cracked window

The extend of decompression and its impact on cabin occupants depend on:

- ✔ **The size of the cabin**: The larger the cabin, the longer the decompression time
- ✔ **The damage to the aircraft structure**: The larger the opening, the faster the decompression time
- ✔ **The pressure differential**: The greater the pressure differential between the cabin pressure and the external environmental pressure, the more forceful the decompression.

Rapid/Explosive decompression can be recognized by the following signs:

Physical Hazards

- ✔ A **loud bang or clap** that is the result of the sudden contact between the internal and external masses of air
- ✔ **Cloud of fog or mist** in the cabin that is due to the drop in temperature, and the change of humidity
- ✔ **Rush of air**, as the air exits the cabin
- ✔ **A decrease in temperature**, as the cabin temperature equalizes with the outside air temperature
- ✔ **The release of the cabin oxygen masks**, when the cabin altitude reaches 14 000 feet.

In case if **the aircraft structural damage** is the cause of the decompression:

- ✔ Unsecured items, even people, in the immediate area are sucked out of the aircraft
- ✔ Debris may fly around the cabin
- ✔ Loose items may become projectiles
- ✔ Dust particles may limit visibility.

PHYSIOLOGICAL HAZARDS

- ✔ Hypoxia
- ✔ Gas Expansion
- ✔ Hypothermia
- ✔ Decompression sickness
- ✔ Impaired human performance (The time of useful consciousness can vary from 4 to 30 seconds)

United Airlines Flight 811

United Airlines Flight 811 was an airline flight that experienced a cargo door failure in flight on February 24, 1989, after its stopover at Honolulu International Airport, Hawaii. The resulting decompression blew out several rows of seats, resulting in the deaths of nine passengers.

The aircraft involved was a Boeing 747-122 , delivered to United Airlines on October 20, 1970.

WHY IS SLOW DECOMPRESSION ALSO DANGEROUS?

Slow decompression may not always be obvious. The cabin crew may not notice the changes in the cabin, until the oxygen masks drop down from the Passenger Service Units (PSUs).

Helios Airways Flight 522

Helios Airways Flight 522 was a scheduled Helios Airways passenger flight that crashed into a mountain on 14 August 2005 at 12:04 pm EEST, north of Marathon and Varnavas, Greece, while flying from Larnaca, Cyprus, to Athens, Greece. A lack of oxygen incapacitated the crew, leading to the aircraft's eventual crash after running out of fuel. Rescue teams located the wreckage near the community of Grammatiko, 40 km (25 mi) from Athens. All 115 passengers and six crew on board the aircraft were killed.

SIGNS THAT COULD INDICATE A SLOW DECOMPRESSION:

- an unusual noise, such as whistling or hissing sound around the door areas, may be an indication of a slow decompression.

- one of the first physiological indications of a slow decompression may be ear discomfort or ‘popping’, joint pain, or stomach pain due to gas expansion.

IN CASE OF PRESSURIZATION PROBLEMS, THE PILOTS SHALL:

1)put on an ***oxygen mask*** and check if the oxygen masks were activated in passenger cabin automatically

2) start ***emergency descent*** to the ***safe altitude*** (3000-4000 meters) where people can breathe easily without masks. In case of structural damage is suspected, reduce the speed as appropriate

3)simultaneously, ***inform ATC*** about the situation. If ATC can't be contacted they need to set ***squawk 7700*** or transmit a ***distress message*** on emergency frequency

4)after reaching the safe altitude evaluate the situation and make up decision to proceed to the nearest alternative or direct to the airport of destination at low altitude.

ATC HAS TO REACT QUICKLY:

A S S I S T

A 'Acknowledge' – S 'Separate' – S 'Silence' – I 'Inform' – S 'Support' – T 'Time'

- !! Acknowledge emergency on RTF(to receive pilot's report as for emergency)
- !! Take all necessary action to vacate the airspace below affected aircraft and provide safe separation with other aircraft
- !! Impose radio silence if necessary
- !! Inform supervisor and other concerned services
- !! Provide pilots with all necessary information
- !! Give pilots enough time to make the decision
- !! After emergency descent, request intentions: diversion, injuries, ACFT damage

Thank you for your attention

Questions?