PRESSURIZATION PROBLEMS. DECOMPRESSION

SPEAK ON "PRESSURIZATION PROBLEMS". FOLLOW THE CHECKLIST

- it is always an emergency (Why?/Why not)
- differences between a pressurization problem and depressurization
- differences between a slow, rapid and explosive depressurization
- the most dangerous type of depressurization
- possible reasons for pressurization problem/depressurization
- related problems due pressurisation problem/depressurization
- emergency descent is necessary or not
- actions and requests of the crew
- controller's assistance
- what vehicles/services are alerted

(from "Steps to Proficiency" Test Preparation)

Any pressurization issue in flight presents a real threat for aircraft because it can deteriorate into decompression, which is considered to be a serious emergency for aircraft flying at cruising altitudes. In case of decompression a diversion to the nearest available aerodrome and emergency landing are likely, although if decompression is non-explosive the aircraft may continue to the destination.

REASONS FOR DECOMPRESSION

The most common reasons for decompression include pressurisation system malfunction and structural failures such as the impaired sealing of a door or window, cracked windows, improperly closed doors, loss of a complete door or window and a fuselage rupture**.** The other possibility is the combination of corrosion and metal fatigue. Cracks can develop from the constant cycle of pressurizing aluminum-skinned fuselage for the flight, then releasing the pressure upon landing, so it expands and contracts, which potentially can weaken the metal. Also in-flight explosion, shooting on board, dangerous cargo or an explosive device detonation and an accidental or incorrect activation of a critical pressurisation control can cause decompression.

RISKS OF DECOMPRESSION

The primary danger of decompression for aircraft occupants is hypoxia. Lack of oxygen leads to loss of consciousness, lung damage and heart failure. The flight crew incapacitation will have catastrophic consequences. If the cause of decompression is structural damage, for example a hole in the fuselage, there may be a risk of some passengers and crew being hit by debris, extreme cold temperatures, or even being sucked out of the aircraft unless fastened by seat belts.

TYPES OF DECOMPRESSION

Any malfunction in the pressurization system, damage or a puncture in the aircraft fuselage will lead to loss of pressurized air. When this happens in flight, the air bleeds out causing decompression which is normally classified as explosive, rapid, or gradual, based on the time interval over which cabin pressure is lost. Explosive and rapid depressurization occurs in a matter of seconds and is normally accompanied by a loud bang. A gradual depressurisation poses grave risk because it occurs over a longer time and due to the gradual change in air pressure it can stay undetected until it's too late to respond appropriately.

ASSOCIATED PROBLEMS

A number of associated problems can arise during decompression and emergency descent. The most typical are:

• communication problems including poor message quality due to oxygen masks on, use of non-standard phraseology, late reaction, wrong read back and non-compliance with ATC instructions;

• medical issues, such as bleeding noses, burst eardrums and decompression sickness; possible heart arrest, high blood pressure due to panic during decompression; injuries during emergency descent and from flying debris;

• problems with the control of the aircraft: damage to aircraft systems or structural damage affecting the aerodynamic characteristics of the aircraft.

PILOT ACTIONS

In case of decompression flight crew conduct a series of emergency procedures. The pilots' number one priority is to retain consciousness by fitting oxygen masks, then to commence an emergency descent to approximately 10 000 feet or to the lowest safe altitude where people can breathe without supplemental oxygen. An emergency should be declared and ATC should be told that the aircraft is in descent, though sometimes pilots initiate emergency descent even without warning. Pilots can turn out from track to reduce risk of loss of separation with other aircraft in the area. Their requests about vectoring to the nearest suitable aerodrome, its data (runway-in-use length and width, PCN, landing systems available) and metreport as well as emergency and medical services on standby will follow.

ATC ASSISTANCE

In case of decompression ATC should:

- acknowledge emergency on radiotelephony
- clear the airspace below the aircraft to safeguard all aircraft concerned
- ask for pilot's intentions and other important information, such as diversion, injuries, aircraft damage
- inform other aircraft of emergency descent in the area
- impose radio silence condition
- provide separation, suggest a heading or issue traffic information, if necessary
- in case of diversion provide the pilot with the divertive aerodrome data and meteorological information
- facilitate rerouting and ensure priority for landing
- alert medical, emergency and search and rescue service (if required)

Reasons for decompression	***Possible consequences***	***Pilot actions***
• pressurization system failure • unsecured doors • damaged windows, doors, fuselage (e.g. after bird strike) • explosion on board • shooting • metal fatigue	• emergency descent without warning ATC • possible turn off track • poor communication due to the high ambient noise and the use of oxygen masks • hypoxia (crew with hypoxia will read back instructions incorrectly or will not follow ATC instructions) • medical problems like nose bleeding, injuries in case of explosive decompression • additional technical problems	• immediate descent to approximately 10,000 ft (or Minimum Safe Altitude, if higher) • handling check before commencing approach If structural damage is suspected • diversion • request for medical attention upon arrival