

CHAPTER!

HISTORICAL PERSPECTIVE

AERO MEDICAL EVACUATION (AME) has made an enormous contribution to improving the well being of both military and civilian patients who have been injured or who require rapid transfer from one medical facility to another. Although a relatively new branch of medical practice, AME has undergone an enormous evolution. With changing demographics and economics, a larger number of elderly passengers are travelling far and wide, aboard commercial flights. Older and less healthy passengers often fly and it is expected that the airlines will look after them, should the need arise. Passengers with medical and physical disability also expect that all necessary facilities will be provided to them in-flight, without discrimination. Air travel, unfortunately although rarely, can precipitate medical problems in previously healthy passengers. Uncertainties and delays in scheduled flights, prolonged immigration formalities and cumbersome security checks often add to the stress of flying. For the commercial airlines, in-flight emergencies mean unscheduled diversions, increased cost of operations and more often than not, bad publicity.

CHAPTER II

INTRODUCTION

Air Transportation is the quickest and the most convenient way for people with medical problems to travel. It is just not the fastest way to reach the destination but the journey is smoother. However, it has some limitations. Passengers' state of health may deteriorate consequently on a long flight time, high altitude, cabin environment and jet lag of the flight. Not all passengers are therefore suitable for air travel.

Modern jet aircraft fly at an altitude of 9,000 -12,000 meters (30,000 - 40,000 feet) and at this high altitude, the barometric pressure is much lower than that on the ground. This makes the cabin environment essentially unnatural and a bit hostile to man. This can impose considerable demands especially on the passengers who are unwell to begin with.

Physiological Considerations

On earth, we live at the bottom of an ocean of air - the atmosphere that is necessary to support our life on earth. It not only provides us oxygen but also filters out harmful radiation from the sun. The blanket of atmosphere also prevents excessive heat loss.

The outer limit of earth's atmosphere is estimated to be about 430 miles above the surface of earth. The outer zone of atmosphere where it thins out into the vacuum of space is termed as exosphere. Two opposing forces determine the limit of atmosphere: Thermal Radiation from the sun and the gravitational forces exerted by the earth. The thermal solar radiation expands the gases in the atmosphere while earth's gravitational forces contract and attract the gases towards the surface of earth. Thus

the density and hence the pressure exerted by the gases in the atmosphere falls progressively with the ascent from the surface of earth towards the outer space. The density of atmosphere at the altitude of 22,000 feet is half that of sea level and 98% of the mass of atmosphere is below the altitude of 98,000 feet. Thus the atmospheric pressure -

At Sea Level the pressure on human body is 14.7 per sq. inch (psi) i.e. total of 20 tons.

At 18,000 feet the pressure is $\frac{1}{2}$ of sea level.

At 33,700 feet the pressure is $\frac{1}{4}$ of sea level.

At 100,000 feet it is $\frac{1}{100}$ of sea level.

This has immense physiological effect on human body when we ascend up to the higher altitudes. Our body is then exposed to less and less pressure from outside. The pressure inside the body, however, remains as it is i.e. as on the ground level. Due to this, strange things begin to happen. Gases trapped in the body cavities begin to expand. Expanding gases trapped in spaces like sinuses, inside the drums _in the middle ear, cavities in the teeth and in the intestines may cause headache, excruciating ear and toothache, and abdominal bloating.

All modern aircraft are therefore pressurized. Conventionally, modern aircraft draws air from outside the aircraft, compresses it and delivers to the cabin. The desired pressure is maintained by controlling the flow of compressed gases out of the cabin to the atmosphere. For technical reasons, the aircraft cannot be pressurized to simulate atmospheric pressure at sea level. In other words, at whatever level the aircraft is flying, the cabin pressure during the cruise is maintained at the equivalent of 1500 -2000meters of (5,000 - 7,000 feet) height. This is a compromise due to technical reasons and the cabin pressure is maintained at a level at which passengers can breathe cabin air through out the flight. The aircraft may be actually flying at 40,000 feet high but the cabin is pressurized in such a way that the 'cabin altitude' is around 7000 feet. It is therefore the symptoms

mentioned above cannot be totally eliminated and are especially noticeable in the event of cabin pressurization failure.

Because the air is less dense as we ascend, it offers less oxygen per breath of inhaled air. The amount of oxygen that can be carried in the blood depends to a large extent on the pressure exerted by the oxygen in the air as it passes through the lung capillaries. The same principle, you must have noticed is used in making carbonated drinks to dissolve large volume of carbon di-oxide. The lack of oxygen in the blood also leads to certain symptoms like dizzy feeling and tingling and numbness in the skin. The vision may also blur. Although, a normal healthy individual may not be very perturbed by these symptoms, invalid / sick passenger with low hemoglobin level and the patient with cardio-vascular and respiratory diseases may have adverse consequences of Hypoxia.

Keeping in view the possibility of pressurization failure, it is mandatory for every commercial aircraft to make ample provision of oxygen supply on board. Oxygen is usually carried in all passenger aircraft as gas filled in bottles/ cylinders at high pressure. For passengers, oxygen delivery masks are stowed over the passenger head and drop down automatically in the event of cabin pressurization failure. This event automatically takes place when the cabin altitude exceeds the pre-determined height of 13,000 - 14,000 feet. The oxygen flow to the mask doesn't start until the passenger pulls it towards him. The oxygen pressure in this system is controlled automatically although cockpit crew can control the main on/off valve and also its flow. Most modern aircraft are also equipped with pressure breathing oxygen system that can provide oxygen supply under some pressure. This is generally required when the cabin pressurization suddenly falls at altitude in excess of 30,000 feet when the oxygen pressure within the lungs cannot be maintained without an increase in the pressure of inhaled oxygen. This

pressure breathing installation one must know is a back up system reserved for sudden failure in cabin pressure.

Limitations of Cabin Environment

The Physiological considerations briefly mentioned earlier automatically impose limitations in the cabin environment on the safety and comfort of the passengers who are invalid/ sick. All commercial airlines therefore need to know the medical/ health background of such passengers who need some special attention on board. International Air Transport Association (IATA) of which we are a member airline, has devised a standard format applicable to all when making a reservation. The standardized information from Medical Information Form (MEDIF) enables the airline to assess the fitness of invalid passenger and to decide acceptance for travel.