	REPUBLIC OF SOUTH AFRICA CIVIL AVIATION AUTHORITY	CAA Private Bag x08 Waterkloof 0145
Tel: (012) 346-5566 Fax: (012) 346-6059 E-Mail: mail@caa.co.za	**AERONAUTICAL INFORMATION CIRCULAR**	**AIC** 21·34 02-09-15

OPERATION OF AIRCRAFT

SAFETY

USE OF OXYGEN AT 10 000 FEET

Λ *Indicates changes.*

Λ *This AIC replaces AIC 21·34 dated 99-09-15.*

Purpose

1. ***Introduction***

1.1 Hypoxia in aviation is a syndrome that results from inadequate oxygenation of tissues secondary to a decreased partial pressure of oxygen in the inspired air, which is frequently encountered at low barometric pressures.

1.2 Without the proper use of oxygen equipment and cabin pressurisation, hypoxia can quickly lead to incapacitation or death, depending on the altitude.

1.3 Humans are adapted physiologically to altitudes that extend from sea level to 10 000 feet. The oxygen level within this zone is sufficient to keep a normal, healthy person physiologically fit without the aid of special protective equipment.

1.4 From 10 000 feet to about 50 000 ft oxygen deficiency becomes a problem due to reduced atmospheric pressure.

1.5 The symptoms of hypoxia can be divided into stages related to the approximate pressure and the altitudes as follows:

1. Indifferent stage where the only adverse effect is on dark adaptation, which manifests at altitudes as low as 5 000 feet.

2. Compensatory stage where physiological compensations may provide some defence against hypoxia so that effects are latent unless the exposure is prolonged, or unless exercise is undertaken. Respiration may increase in depth or slightly in rate.

3. Disturbance stage with insufficient compensations to provide adequate oxygen for the tissues and latent oxygen want becomes manifested.

Subjective symptoms may include fatigue, sleepiness, dizziness, headache, breathlessness, and a feeling of well-being. Occasionally there are no subjective sensations up to the time of unconsciousness.

Other important symptoms include impaired vision, intellectual impairment which makes it impossible for individuals to comprehend their own disability, slow thinking with resulting unreliable calculations, faulty memory, poor judgement and delayed reaction time.

In addition, muscular co-ordination is decreased, and delicate or fine muscular movements may be impossible resulting in stammering, illegible handwriting and poor co-ordination.

4. The critical stage is reached with the loss of consciousness. There may be convulsions and eventual failure of the respiratory centre.

1.6 The crew members last line of defence against incapacitation from altitude hypoxia, is to recognise their own symptoms of exposure to hypoxia.

The warning signals most important to the aircrew member are air hunger or oxygen want, a feeling of apprehension, headache, dizziness, fatigue, nausea, hot and cold flashes, blurred vision, tunnel vision, tingling, and numbness.

2. ***Present regulations***

2.1 *These following rules were subsequently implemented during the Regulations review to minimise safety implications due to the effects of hypoxia experienced at altitude.*

CAR: Rules of the air / General operating rules

Part 91, Regulation 91.04.19 (1)

Λ No owner or operator of a non-pressurised aircraft shall operate the aircraft at altitudes above 10 000 feet and up to 12 000 feet for longer than 120 minutes, or above 12 000 feet, unless such aircraft is equipped with the supplemental oxygen as prescribed in Document SA-CATS-OPS 91.

91.04.19 (2)

The amount of supplemental oxygen for sustenance required for a particular operation must be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures established for each operation in the operations manual and with the routes to be flown, and with the emergency procedures specified in the operations manual, if applicable.

3. ***General comments***

3.1 *It is impossible to give strict times regarding length of stay at a certain altitude without any impairment. This is because of the variation from individual to individual and even in the same individual from day to day.*

3.2 *However, the individual is able to recover from the symptoms of hypoxia within minutes, provided that descent is undertaken immediately to an altitude of 10 000 feet (preferably 8 000 feet) on recognition of the symptoms.*

3.3 *The majority of destinations in South Africa can be reached within a space of two hours flying time, with varying altitudes due to terrain.*

3.4 *Operating an aircraft for 2 hours at an altitude above 10 000 feet and not exceeding 12 000 feet, should not pose a severe safety risk, provided that operators are trained to recognize and act on the symptoms of hypoxia.*

COMMISSIONER FOR CIVIL AVIATION