

Human Performance & Limitations • Module D — Poisons & The Cabin

Smoking & Alcohol

Chapter 9 — Two self-inflicted hazards the exam loves: the smoker's altitude penalty and oxygen-capacity loss, and alcohol — the 24-hour bottle-to-throttle rule, the fixed metabolic rate, and why altitude doubles every drink.

BOOK

Human Performance & Limitations

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EXAM

DGCA CPL / ATPL — HPL

CHAPTER

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Plate 9.0 — Two habits, one cost: both quietly steal the oxygen and judgment a pilot cannot spare.

§ 13

Smoking

13.1 The 3,000-ft Penalty — 10,000 ft becomes 7,000 ft

THE SINGLE MOST-ASKED DGCA FACT ABOUT SMOKING

A pilot who is also a smoker **may experience the symptoms of oxygen deprivation, or hypoxia, at a lower altitude (7,000 ft)** than a non-smoker (10,000 ft).

That is a **3,000-ft penalty**. The smoker walks into the cockpit already partway up the hypoxia ladder. Combine that with an unpressurised climb to FL080 and the smoker can be hypoxic *at cruise altitude* when the non-smoker beside him is still asleep.

7,000_{ft} Smoker's effective hypoxia threshold

5–8% O₂-carrying capacity reduction — 1 pack/day

↑ Increased susceptibility to CO poisoning

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13.2 The 5–8 % O₂-Capacity Hit

WHY SMOKING HANDICAPS YOU — DIRECT QUOTE

A person who smokes **one packet of cigarettes per day** will **reduce his capacity to carry oxygen by 5–8 %**. A smoker also has **increased susceptibility to Carbon Monoxide poisoning**.

THE MECHANISM — ANEMIC HYPOXIA, SELF-INFLICTED

Cigarette smoke contains **carbon monoxide**. Recall from §11.1 that CO binds to haemoglobin **over 200 times more readily** than oxygen. Every cigarette saturates a portion of your haemoglobin with CO — and that Hb is then **unavailable to carry oxygen** until the body slowly clears it (hours). A heavy smoker effectively walks around with **permanent low-grade anemic hypoxia (Type b)**. This is why the smoker's hypoxia threshold drops 3,000 ft.

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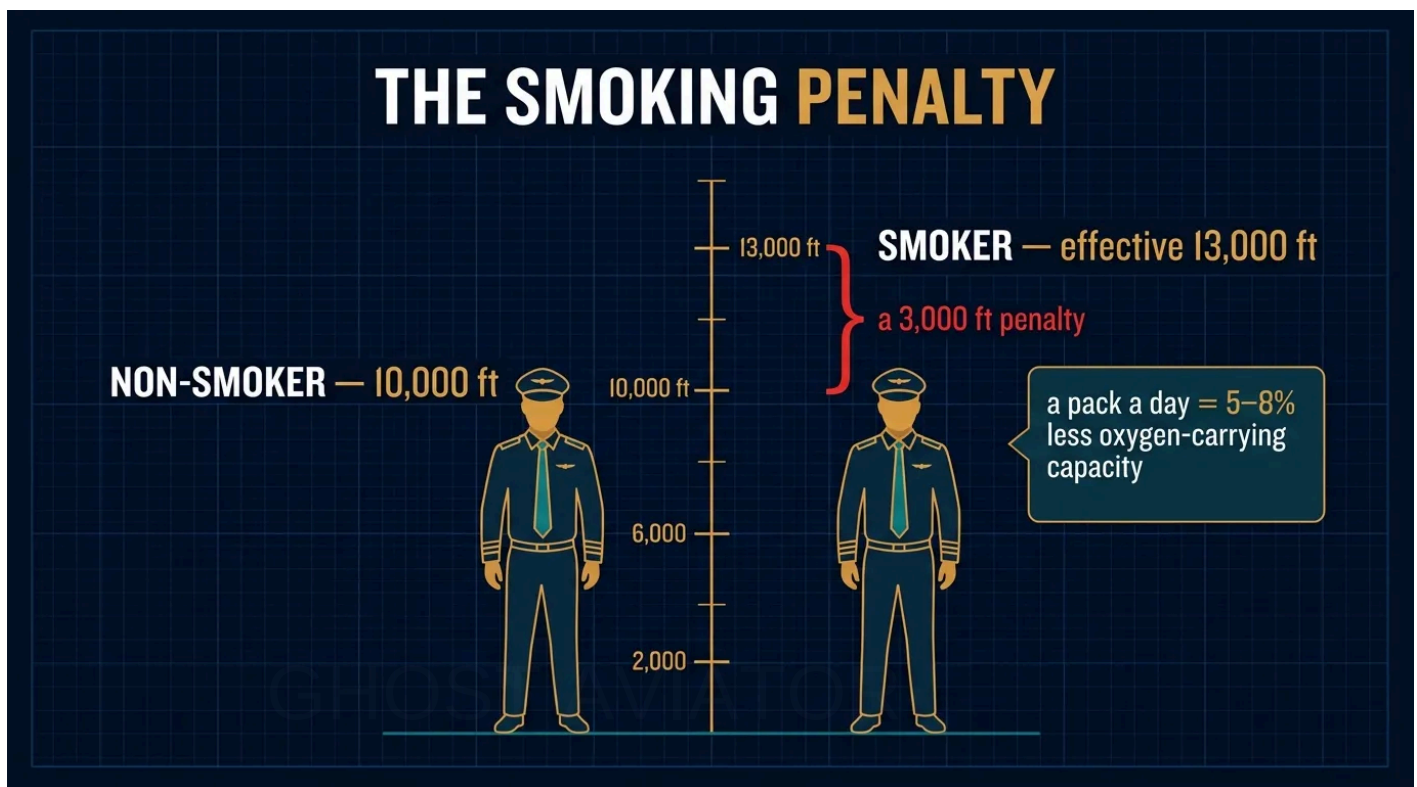


Figure 9.1 — The smoking penalty: a pack a day permanently shaves 5–8% off effective oxygen-carrying capacity, so 10,000 ft feels like 7,000 ft worse.

13.3 The Full Medical-Impact List

DGCA-QUOTED HEALTH EFFECTS ON A SMOKING PILOT

The smoker pilot is exposed to **all six** of the following — every one with direct flight-safety implications:

- **Lung cancer**
- **Breathing problems**
- **Circulatory problems**
- **Reduced tolerance to G forces**
- **Increased risk of heart attack**
- **Degradation of night vision**

Smoking — what it breaks and why it matters in the cockpit

Health Effect	Flight-Safety Implication
Lung cancer	Eventual respiratory failure — medical disqualification.
Breathing problems (COPD, chronic bronchitis)	Reduced ventilation → reduced O ₂ uptake → lowered hypoxia threshold (the 7,000-ft figure above).
Circulatory problems	Plaque, atherosclerosis, peripheral vascular disease → narrower arteries → ischemic hypoxia risk (§10.3c).
Reduced tolerance to G forces	Critical in aerobatics, fighter pilots, upset recovery. Less G-tolerance → earlier G-LOC.
Increased risk of heart attack	Direct link to angina/MI risk-factor list in §9.5 (smoking was one of the 12 listed).
Degradation of night vision	Recall night vision is impaired at 5,000 ft for non-smokers (§10.5). Smokers see degradation at <i>even lower altitudes</i> — devastating for night IFR and night VFR ops.

HOW SMOKING HARMS THE PILOT

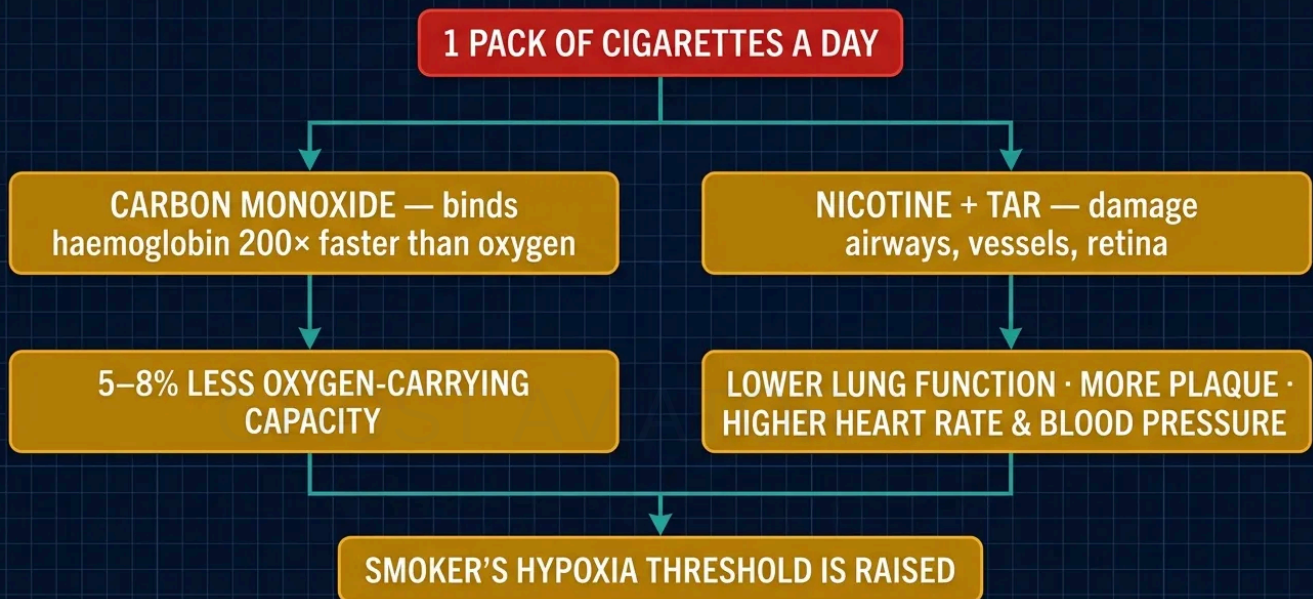


Figure 9.2 — What smoking breaks: carbon monoxide load, reduced oxygen capacity, and the cardiovascular toll.

PRACTICAL CRM NOTE

DGCA Class-1 / Class-2 medicals do *not* automatically disqualify a smoker, but the lifestyle is flagged. **If you smoke and you are reading this, you are accepting a permanent flight-performance handicap.** Even one cigarette before takeoff materially lowers your hypoxia threshold for that sortie. Best practice for examined fitness: **do not smoke at all, especially in the 24 hours before flight.**

§ 14

Alcohol

THE HEADLINE — ALCOHOL IS A DEPRESSANT

Alcohol acts primarily as a depressant. Do not fly while under the influence of alcohol. **Even small amounts of alcohol in the system can adversely affect judgment and decision-making abilities.**

14.1 The 24-Hour Bottle-to-Throttle Rule

THE HARD RULE — MEMORISE VERBATIM

An excellent rule is to allow TWENTY-FOUR HOURS between the last drink and takeoff time.

This is the "*24-hour bottle-to-throttle*" rule. It is more conservative than the statutory minimum in some jurisdictions (often 8 hours), and is the answer DGCA expects in the HPL paper. Some operators enforce 12 hours; some, 24. The / DGCA text recommends **24 hours**.

14.2 Alcohol Metabolism — The Fixed Rate

DGCA-QUOTED METABOLISM RATE

Remember that your body metabolises alcohol at a **fixed rate**, and **no amount of coffee or medication will alter this rate**. Alcohol leaves the body at an average rate of **0.015 g/100 mL/hour**, which is the same as reducing your **Blood Alcohol Content (BAC) level by 0.015 per hour**.

For men, this is usually a rate of about ONE STANDARD DRINK PER HOUR.

24_{hr} Bottle-to-throttle separation

0.015 g/100 mL/hr metabolism rate ($\approx$ 1 drink/hr in men)

40_{mg%} BAC at which pilot errors spike significantly

14.3 Altitude Amplifies the Effect — "1 = 2" Rule

THE "ONE DRINK AT ALTITUDE EQUALS TWO AT SEA LEVEL" RULE

Relatively small amounts of alcohol **significantly decrease a pilot's tolerance to hypoxia (oxygen lack)**. At **6,000 ft (1,800 m)**, the effect of **ONE** drink is that of **TWO** drinks at sea level. Even at sea level alcohol impairs judgment and reaction time. **Therefore, alcohol and flying do not mix.**

WHY? — HISTOTOXIC + HYPOXIC STACKING

Recall **Histotoxic Hypoxia (§10.3d)**: high blood alcohol levels prevent cells from *using* the oxygen they receive. Layer that on top of **Hypoxic Hypoxia (§10.3a)** from altitude, and you have two oxygen-starvation mechanisms operating *at the same time*. They are **additive** — exactly the same principle that makes a smoker's hypoxia worse at altitude.

ALCOHOL AT ALTITUDE — THE 1 = 2 RULE



Figure 9.3 — The 1=2 rule: one drink at 6,000 ft hits the pilot like two at sea level (hypoxic + histotoxic effects combine).

14.4 Recommended Maximum Alcohol Intake — Units & Rules

DEFINITION OF "ONE UNIT"

ONE UNIT of alcohol = half a pint of beer = a standard glass of wine = one measure of spirits.

MEN

5 units / day · 21 units / week

Maximum recommended consumption.

WOMEN

3 units / day · 14 units / week

Maximum recommended consumption.

1 UNIT EQUALS
½ pint beer

1 UNIT EQUALS
1 glass wine

1 UNIT EQUALS
1 measure spirits

MEN – DAILY/WEEKLY
5 / 21

WOMEN – DAILY/WEEKLY
3 / 14

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14.5 BAC 40 mg/100 ml — The Pilot Error-Spike Threshold

DGCA-QUOTED: THE BAC LEVEL AT WHICH ERRORS BALLOON

Blood alcohol concentrations of **40 mgs per 100 ml** results in significant increases in errors committed by pilots due to the following effects:

- Impaired judgment and impaired ability to reason
- Degraded muscular coordination and degraded vision
- Lack of inhibitions and self-control
- Increased susceptibility to Hypoxia
- Damages to the liver, heart, brain and blood cells
- Affects short and long-term memory
- Slows reaction time
- Sufferer may feel that performance is improved (*the alcohol-euphoria trap*)
- Balance and sensory illusions
- Irregular sleep patterns

THE EUPHORIA TRAP — ANALOGOUS TO HYPOXIA

"Sufferer may feel that performance is improved" is the alcohol equivalent of *hypoxia's euphoria* (§10.2). The pilot is the *least* qualified person in the cockpit to judge whether he's safe to fly. This is precisely why **fixed bottle-to-throttle rules exist** — they take the judgement out of the impaired pilot's hands.

14.6 Hangover & the "Masked Hangover" Warning

DGCA-QUOTED HANGOVER RULE — VERBATIM

Do not fly with a hangover, or a "masked hangover" (symptoms suppressed by aspirin, caffeine or other medication). High altitude, where oxygen is deficient, aggravates these effects.

WHY A "MASKED" HANGOVER IS WORSE THAN AN OBVIOUS ONE

A normal hangover at least gives you a warning sign — you feel awful, you don't fly. A **masked hangover**, where caffeine, paracetamol, ibuprofen or other OTC medication has suppressed the headache and nausea, leaves you **still impaired** in judgement, coordination, vision and reaction time — but **without the warning**. Several aviation accidents have been traced to a pilot who took an aspirin, "felt fine," and flew with substantial residual BAC.

[illegible]

Figure 9.4 — Alcohol and the pilot: the 24-hour bottle-to-throttle rule, the fixed metabolic rate, and the BAC error-spike threshold.

✦ E N D O F C H A P T E R 9 ✦

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