

Incapacitation is a reduction in your ability to do things (*functional capacity*). Numerous medical conditions have the potential to cause incapacitation. Medical incapacitation can take many forms, including:

- Gradual onset (e.g. slowly evolving severe headache) to sudden onset (e.g. a fit or convulsion) incapacitation;
- Partial (e.g. weakness in one arm) to complete (e.g. loss of consciousness) incapacitation; Temporary (e.g. a faint) or permanent (e.g. severe spinal injury with lower limb paralysis) incapacitation;
- Subtle (e.g. disordered thinking) to obvious (e.g. loss of consciousness and collapse) incapacitation;

Changes of physical capabilities (e.g. paralysis), the senses (e.g. loss of vision), behaviour (e.g. impulse control and risk-taking behaviour), or mental function (e.g. disordered thinking).

A simple faint (or syncope), for example, might result in an obvious, temporary, sudden onset, and complete incapacitation while a small stroke or TIA (mini-stroke) might result in a subtle and partial incapacitation that only effects complex calculations. Although these two examples describe very different types of medical incapacitation they are both likely to result in a reduction in aviation safety.

The risk of medical incapacitation is therefore an important matter that must be considered for CAA medical certification.

Why is medical incapacitation an aviation safety problem?

Incapacitation is an aviation safety concern because:

- The reduced functional capacity can impair performance to a significant extent;
- The incapacitating medical condition may result in unsafe behaviour; and
- Many medical conditions that cause incapacitation also result in an increased risk of other future incapacitating events.

Reductions in functional capacity cover a very wide spectrum of impairment. Some examples of reduced functional capacity (e.g. minor weakness in one hand) have only a relatively small impact on aviation safety and, after appropriate investigation, may not result in any loss or reduction in medical certification status. Others (e.g. widespread paralysis or loss of consciousness), however, are clearly incompatible with safe aviation.

Some medical conditions (e.g. a stroke) can result in incapacitation and can also lead to changes in behaviour. Sometimes the altered behaviour (e.g. reduced impulse control or increased risk-taking behaviour) will not be compatible with aviation safety.

Someone who has suffered an incapacitating stroke or TIA (see MIS 11 'Strokes and Transient Ischaemic Attacks'¹ for further information on these) usually has an ongoing increased risk of future strokes, TIAs, or heart attacks. Similarly someone who has suffered recurrent faints may be at risk of further faints in the future, and the level of that risk may be unacceptable. Conversely most isolated faints, while they are usually very incapacitating (loss of consciousness), are simply a normal response to an abnormal situation (e.g. pain) and do not, in themselves, signify an increased future risk of incapacitation.

¹ <https://www.aviation.govt.nz/assets/publications/medical-information-sheets/mis011-strokes-and-transient-ischaemic-attacks.pdf>

Surely aviation safety demands a zero risk of medical incapacitation?

While zero risk of medical incapacitation would seem to be desirable it is an entirely unattainable goal. It is simply not possible, based on the medical tools and information available, to determine that someone has a zero chance of suffering a medical incapacitation event.

Zero risk of medical incapacitation is not possible, but a high risk would not be acceptable from an aviation safety perspective. To provide consistent safety outcomes, and consistent medical certification decisions, the CAA endeavours to apply risk criteria or thresholds to conditions that cause, or predispose to, medical incapacitation.

A risk threshold is a level, usually numerical, above which the risk is unacceptable and below which the risk may be acceptable.

How are people with “excessive” incapacitation risk identified?

It is possible to identify some groups of people who have an increased risk of medical incapacitation and to test those people further to determine whether that risk is excessive or not. For example, a person with a lifelong history of epilepsy will probably have an excessive risk of medical incapacitation, usually in the form of another fit or convulsion. Conversely a person who has suffered a single faint associated with a painful or disturbing event, and is otherwise perfectly healthy, is unlikely to be viewed as having an excessive incapacitation risk.

An in-between example would be a person who has had a small heart attack but is perfectly healthy with entirely normal heart tests six months afterwards (see MIS 8 ‘After a Heart Attack or Coronary Artery Stents’²). They may be assessed as representing an acceptable risk for class 2 medical certification, but not an acceptable risk for single-pilot professional air operations carrying passengers.

What risk thresholds does the CAA use for medical incapacitation?

The aviation medical safety legislation uses word-pictures to describe the medical risk thresholds. An example of such a word-picture can be found in the phrase ‘likely to interfere with’ that is used in the definition of ‘aeromedical significance’ in Rule 67.3(a) (See ‘Looking at the law section of this MIS).

In an effort to provide safety, clarity, and consistency the CAA has, as a matter of policy, interpreted the legislated word-pictures in terms of numerical risk values, usually expressed in per year percentages. The incapacitation thresholds used by the CAA are generally such that, all other matters being acceptable:

1. Someone with an incapacitation risk in excess of 4 - 5% per annum is unlikely to be issued any class of CAA medical certificate;
2. Someone with an incapacitation risk of 2% per annum, or greater, but lower than 4% per annum is unlikely to be issued a class 1 or 3 medical certificate, but may be issued a class 2 medical certificate, with or without conditions;
3. Someone with an incapacitation risk of 1% per annum, or greater, but lower than 2% per annum is unlikely to be issued an unrestricted class 1 or 3 medical certificate, is likely to be eligible for a restricted class 1 or 3 medical certificate (e.g. precluding single-pilot air operations carrying passengers in the case of class 1), and is likely to be eligible for unrestricted class 2 medical certification;
4. Someone with an incapacitation risk of less than 1% per annum is likely to be eligible for the unrestricted issue of any class of CAA medical certificate.

² <https://www.aviation.govt.nz/assets/publications/medical-information-sheets/mis008-after-a-heart-attack-or-coronary-artery-stents.pdf>

But the risk of incapacitation can't be proven, so surely it's unfair to make medical certification decisions this way?

It is certainly not possible to determine, with absolute certainty, that any individual is going to suffer a medical incapacitation event.

It is possible, however, to identify features that show an individual to belong to a population (or group of people) that has an increased chance of suffering a medical incapacitation event. This is the approach that the CAA takes, and we endeavour to apply the best available medical evidence to assess the medical risk of pilots and air traffic controllers. In the absence of strong, high quality, medical evidence to suggest otherwise we treat an individual pilot as having a medical incapacitation risk similar to the population risk that best characterises that pilot.

An example of this approach can be found in the case of smokers. Some smokers do not suffer premature heart attacks but, on average, people who smoke are at higher risk of suffering a heart attack. For aviation safety purposes we view a smoker to be at an increased risk of a heart attack, even though it is possible that any particular individual will not suffer such an event. Accordingly, we may direct further investigation to showing that the heart is actually ok before issuing a medical certificate (See MIS 007 'Cardiovascular Risk'³).

While some people feel it is unfair that they have been singled-out (for example because their cardiovascular risk is considered excessive) this is entirely consistent with the principles of risk management and the needs for medical safety, and consistent medical certification decision-making, in aviation.

What about the '1% rule'?

The so-called '1% rule' is not actually a rule but was an early example of considering numerical risk thresholds in the context of aviation medical safety. The phrase's reference to 1% comes from a calculation that linked a medical incapacitation risk of <1% per annum, in a two-crew airline flight environment, with an airline hull-loss accident likelihood of less than 1 per 10 million flying hours.

Using this model, the CAA's current approach to medical incapacitation risk more closely resembles a '2% rule', although we do not limit our safety consideration of medical incapacitation risk to multicrew airline operations.

What about cardiovascular risk?

The CAA's handling of cardiovascular risk applies a similar approach but uses slightly different thresholds. Details of our approach to cardiovascular risk assessment can be found in MIS 007 'Cardiovascular Risk'.

What if I don't agree with a decision concerning my incapacitation risk?

You are always able to seek review of CAA medical certification decisions. Some people seeking review of decisions use the Convener process, some make an Appeal to the District Court, and some use other methods. For further information on review / appeal options you may wish to consult the Medical Information Sheet on the topic (MIS 005 'What Are My Review Options?'⁴).

³ <https://www.aviation.govt.nz/assets/publications/medical-information-sheets/mis007-cardiovascular-risk.pdf>

⁴ <https://www.aviation.govt.nz/assets/publications/medical-information-sheets/mis005-what-are-my-review-options.pdf>

Looking at the law

Civil Aviation Act 2023

Sch 2, cl 6(1) of the Act allows for a medical certificate to be issued to an applicant who meets the medical standards “unless the Director has reasonable ground to believe that the applicant has any characteristic that may interfere with the safe exercise of the privileges to which the medical certificate relates”.

Sch 2, cl 5(4) of the Act, describing the flexibility process that can be applied to applicants who do not meet the medical standards, includes a requirement for an applicant being ‘not likely to jeopardise aviation safety’.

These are both examples of word-pictures being used in the legislation to describe risk thresholds.

Civil Aviation Rule Part 67: Medical Standards

Rules 67.103(b)(1) (Class 1), 67.105(b)(1) (Class 2), and 67.107(b)(1) (Class 3) include provisions that require an applicant to have no medical condition that is of aeromedical significance.*

* Rule 67.3(a) defines ‘aeromedical significance’: A medical condition is of aeromedical significance if, having regard to any relevant general direction, it interferes or is likely to interfere with the safe exercise of the privileges or the safe performance of the duties to which the relevant medical certificate relates.

Rules 67.103(d)(4) (Class 1), 67.105(d)(4) (Class 2), and 67.107(d)(4) (Class 3) require an applicant to have no excessive cardiovascular risk factors unless normal myocardial perfusion can be demonstrated.

These are also examples of word-pictures being used in the legislation to describe risk thresholds.

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