

2.5.1 Introduction

This section on neurological disorders outlines some of the major categories of neurological diseases that are commonly encountered and indicates their aviation medical significance.

2.5.2 Nervous System Standard – CASR Part 67

[CASR 67](#) The nervous system standards are found in the following paragraphs of [CASR Part 67](#):

CASR 67.150	For medical standard 1	CASR 67.150 Table 67.150 1.7 – 1.8
CASR 67.155	For medical standard 2	CASR 67.155 Table 67.155 2.7 – 2.8
CASR 67.160	For medical standard 3	CASR 67.160 Table 67.160 3.7 – 3.8

2.5.3 Headache

Nearly all applicants have experienced headache. The diagnosis of primary headaches are not discrete and the different types should be considered to be part of a continuous spectrum ranging from Muscular Tension Headache at one end to Classical Migraine at the other. Secondary headaches from other conditions eg, Cranial Neuralgia, Temporal Arteritis should be considered separately.

When considering primary headaches it is important to assess the history according to:

- **Speed of onset:** Is there warning eg, aura or no warning?
- **Period of prodrome:** seconds, minutes or hours?
- **Frequency:** isolated or recurrent, if recurrent how often. Time off work is a useful guide.
- **Neurological symptoms:** aura (crippling or just perceived), photophobia, visual changes, paraesthesia, paralysis, dysphasia etc.
- **Severity:** need for acute and intensive intervention such as parenteral opiate analgesics, degree of incapacitation such as need for bed rest vs ability to continue complex tasks.
- **Treatments and their effectiveness:** How effective prophylaxis if used. Type of acute treatment used eg, Tryptins and speed of response and any significant side effects.
- **Precipitating factors:** such as diet, oral contraceptive etc and effect of avoidance or withdrawal of such factors.

Since objective investigations will most usually be negative, a detailed history is essential. The best history is obtained at first presentation.

Migraine

For strict diagnostic purposes, migraine is an acute but reversible transient cerebral vascular insufficiency phenomenon and headache is not necessarily the most important component. When the vascular insufficiency effect predominates it should be distinguished from transient ischaemic attacks. In the worst case migrainous stroke can occur where the implication for flight duties is similar to that for stroke.

Beware of Atypical Migraine without headaches.

In common usage, the term migraine may refer to any headache, but there are two main types — common migraine and classical migraine.



Common Migraine (Migraine without Aura)

More than 80% of migraine sufferers experience "common" or "non-classical" migraine, which is not associated with sharply defined neurological disturbances.

It is often a label used for Tension Headache perceived to be of significant severity by the patient. Careful history will avoid the diagnosis of migraine with its implication vs. Tension Headaches

Diagnosis of "nonclassical" migraine depends on:

- Detailed history of headaches
- Usually an absence of significant neurological symptoms.

Treatment usually does not include parenteral opiates or specific migraine drugs such as vascular active agents.

Classical Migraine

Classical migraine is accompanied by any transient focal neurological and/or vascular phenomena that may include:

- Unilateral headache
- Hemiparesthesia, Hemiplegia
- Retinal/Occipital phenomena, such as visual disturbance of various degree and scotomata
- Basilar artery phenomena
- Autonomic symptoms of nausea, vomiting etc.

Such migraines have variable periods of remission and rate of onset, and may completely incapacitate the sufferer. There is no universal exclusion of medication. Significant side effect should be explored and their presence or absence documented.

Adverse factors for aeromedical certification include:

- Sudden significant neurological symptom such as loss of vision, weakness and incoordination with no warning
- Failure or of prophylactic treatment with frequent attacks
- Requirement for intensive treatment
- Short prodrome that does not allow effective use of acute treatment before symptom onset.

The Aviation Medicine Section considers all cases individually.



Cluster Headache

Cluster headache is a subgroup of vascular headaches where the frequency of occurrence has a characteristic "cluster" nature. Aeromedical certification assessment considerations are similar to those for migraine. The details of history required are the same.

Other Types of Headache

Tension (Muscle Contraction) Headache

This category of headache can assume the nature of a vascular headache with a pulsating quality when it is severe and is often confused with migraine.

It includes headaches occurring secondary to other conditions that gave rise to muscular tension, e.g. eyestrain, cervical pathologies, psychiatric conditions in which management of the underlying cause is of prime importance.

Chronic tension headaches that require treatment such as anxiolytics or other drugs likely to cause a decreased state of alertness or diminished performance require specialised assessment.

Cranial Nerve Headache

The commonest of these conditions is trigeminal neuralgia. This may be idiopathic or secondary to underlying disease. Irritation of the nerve may be relieved by surgical intervention, which requires specialised neurosurgical assessment. Consideration must be given to the risk and implication for certification associated with any neurosurgery. The side effects of medications commonly used in its treatment include diminished judgement and diminished depth perception. Relevant history should be elicited and documented.

The Aviation Medicine Section assesses all cases individually.

Local Cranial Disease

Temporal arteritis

This condition need not be disqualifying if controlled, particularly when steroid therapy has been ceased. Full specialist reports are required for assessment.

Adverse factors associated with it include loss of vision and intracerebral involvement with significant functional sequelae.

The Aviation Medicine Section assesses all cases individually.

2.5.4 Blackouts, Loss of Consciousness and Syncope

These words are often used interchangeably by both laymen and medical professionals. A detailed description is more informative than the label. It does not necessarily describe loss of consciousness (LOC) but can be used to mean an altered state of consciousness, vertigo or even psychiatric disturbance such as fugue-like states. Causes can be primarily neurological, secondary to cardiovascular pathology, gastrointestinal upset, physiological or even be specific to aviation causes such as G induced loss of consciousness.

History of the event is paramount in differentiation of the causes. The applicant should be directed to relive the experience in his/her own words, without prompting. Only when that is established should more direct questions about the circumstances before, during and after the event be asked. The patient's account of sensations should be elicited. Observer history should be obtained if available. If uncertainty exists, record the uncertainty rather than introduce attempts at explanation. Such factual records allow further independent evaluation where necessary. The value and accuracy of the history deteriorates with time and repetition of recounting.

Specific features that will help in differentiating the physiological system involved are:

- **Prodrome:** absence or present.
- Posture at the time of the episode.
- **Period:** ie, duration of attack.
- Postictal orientation.
- Activity before, immediately and within 24 hr preceding.
- Head trauma.
- Frequency.
- Urinary incontinence.
- Tongue biting.
- **Observer report:** confirmation of patient's account, particularly concerning convulsive movements. Time course to any convulsive movement is important ie, did it occur at the same time as LOC, or seconds later?
- **Bystanders' action:** eg, promptly placing patient in prone or coma position, or keeping patient sitting/upright.
- Family and/or past history.
- Known cardiovascular history or risks.
- History of infection such as recent viral infection that may support labyrinthitis.



Depending on the historical features elicited, the need for referral to relevant specialist/s can be determined. If the cause is primarily neurological, refer to neurologist or neurosurgeon for clarification. For possible cardiovascular causes, cardiologist opinion should be sought. Where the history suggests vestibular problem, ENT opinion will be appropriate.

The Aviation Medicine Section assesses all cases individually.

Concussion

The term should be restricted to brief LOC in the setting of blunt head injury with no demonstrable intracranial injury. The emphasis is on the brief duration, which should be in the order of 5 minutes or less. If the event accords with these criteria and no sequelae are reported, it is generally of no significance for aeromedical certification. An exception is made for repeated concussions such as occur in boxers.

Transient Global Amnesia (TGA)

The cause of TGA is uncertain. It may be first warning of TIA. Current theory considers it to be a transient, migraine- type of vascular phenomenon. The condition should be distinguished from epilepsy, particularly complex partial epilepsy and symptomatic intracranial tumours.

Relapse can occur and may be precipitated by exercise, coitus, or exposure to water. A period of observation is necessary to monitor relapses. Risk of relapse is 30% and can recur once or twice. Where frequent attacks are present, other diagnoses should be considered.

The condition is benign and affected applicants can be aeromedically certificated following a suitable period of observation. Neurological reports are required in all cases and follow up reviews may be necessary.

2.5.5 Disorders of Equilibrium

Benign Positional Vertigo

This is a true rotational sensation accompanied by nystagmus, occurring only on change of head position. It is usually idiopathic or secondary to head trauma. Its course is variable. Assessment is based on the frequency of occurrences, their duration and severity.

Acute Peripheral Vestibulopathy (Vestibular Neuronitis and Acute Labyrinthitis)

Diagnosis implies temporary unfitness to fly. If the condition settles without recurrence, a return to unrestricted flying may be permitted after three months.

Menière's Disease and Acute Recurrent Positional Vestibulopathy (ARPV)

In these conditions, vertigo usually lasts for hours and often causes chronic disequilibrium. Menière's disease and ARPV have high recurrence rates. Applicants with these conditions are usually unable to meet the standard for certification, but require individual assessment.

Alternobaric Vertigo

In this condition, vertigo occurs on change of air pressure, often after a forceful Valsava manoeuvre to clear the ears. Oscillopsia and nystagmus may accompany it.

Occasionally this condition is due to chronic eustachian tube compression (e.g. by hypertrophied adenoids) and may thus be surgically correctable. Recurrent cases are assessed individually.

Momentary Vertigo

This is generally considered to be benign unless there is evidence that it significantly affects the applicant.

Non-Functioning/Hypo-Functioning Labyrinths

This condition is characterised by unsteadiness of gait, by loss of orientation (particularly in the dark) and by inability to maintain accurate visual fixation while in motion. It is often secondary to aminoglycoside administration. The degree of functional impairment should be fully investigated for decision by the Aviation Medicine Section.



Vestibular Imbalance

Applicants with this condition may experience feelings of unsteadiness on rapid change of position. It is generally benign and a "pass" assessment may be issued.

Multisensory Dizziness

This is a chronic condition of loss of balance or feeling of light-headedness in persons with multiple sensory disorders, such as a combination of two or more of:

- Peripheral neuropathy
- Vestibular imbalance
- Visual impairment
- Cervical spondylosis, and
- Hearing loss.

Multi-sensory dizziness is assessed according to the degree of disability present.

Note: Drugs used to control dizziness and vertigo often produce drowsiness. Control of these symptoms by drugs with such side effects is not acceptable for pilot or ATC medical certification. See also [Section 2.13 Medication – Drugs and Flying/Controlling](#)

2.5.6 Seizure Disorders

General

The tendency towards epileptic seizures is not an “all or nothing” phenomenon. Most people, under certain conditions, may have a seizure if sleep deprived or withdrawing from alcohol or benzodiazepines, especially if in addition they are taking medications that decrease the seizure threshold (e.g. tricyclic antidepressants). Approximately 2% of the population have a seizure during their lifetimes.

Following a single seizure, an adult has a 30-40% chance of recurrence. Those with a distinct epileptiform abnormality on the EEG, in the setting of a history of seizure, as opposed to non-specific abnormalities, have an increased risk of further seizures.

Diagnosis

It is imperative that there be an accurate diagnosis of the type of seizure. The importance of a description of the event cannot be overemphasised. While a useful diagnostic tool, any EEG must be reviewed by an experienced reader and must be evaluated in the context of the clinical history. It is not a useful sole diagnostic or screening tool.

The important components to the diagnosis are:

- More than one event, except Post Traumatic Epilepsy (PTE) for which one event will establish the diagnosis
- Must be unprovoked.

Video-EEG confirms the diagnosis but is not easily available as it is time consuming and difficult to organise except in academic research facilities.

Aeromedical certification considerations

A detailed history and specialist neurologist opinion is essential. Provoking factors must be considered. Their absence suggests a poor prognosis.

Significant adverse factors are:

- Unavoidable concomitants of aviation eg, strobe lights, propeller flicker, fatigue
- Difficult to avoid eg, menstruation.

Provoking factors that are avoidable or insignificant in context of aviation are:

- Alcohol excess and/or withdrawal
- sleep.



These should be considered with regards to risk of occurrence in the absence of such factors.

Individuals with established epilepsy, ie, more than one unprovoked attacks, are unfit for aviation medical certification. Persons who have experienced seizures but who are not diagnosed as epileptic may be deemed to meet the medical standard.

Partial (Simple or Complex) Seizures without progression to Generalise Seizures

The term Partial Seizure often misleads patients to consider the condition is not as significant as the classical Grand Mal Seizure. Careful counselling of patients should include the explanation that such terms are anatomical and electro-physiological distinctions. The functional effect of impaired conscious state and/or brain activity is equally as significant as in other epilepsy.

Sleep (Nocturnal) Epilepsy

Epilepsy that occurs only when asleep is distinguished from sleep disorders such as Sleep Behaviour Disorder, Sleep Apnoea etc. Such disorders must be excluded. Sleep EEG recordings—best with video recording (if possible), will confirm the diagnosis.

The condition is associated with increased risk of seizure when awake ie, progression to the more “classical” type of epilepsy. This risk is increased when the condition is untreated.

Since aircrew and air traffic controllers are not performing flight-related duties when asleep, sleep as a provoking factor is not relevant in the aviation context. When the condition responds to anticonvulsants, the risk of such a seizure during flight related duties is further reduced.

Prior to certification, the effect of anticonvulsant control failure or “breakthrough” must be considered. Expert neurological opinion should be sought to determine if such a control failure occurs. The first presentation may be recurrence of sleep epilepsy or epileptic seizure whilst awake. Recurrence that first presents as fits whilst awake poses a flight safety hazard.

Aviation Medicine Section assesses all cases individually.

Important indicators of less risk are:

- No further occurrence of sleep epilepsy
- Absence of significant side effects of anticonvulsant.



Childhood Seizures

Childhood febrile seizures that are brief, not associated with neurological deficits and have ceased before the age of five are not generally disqualifying. The applicant must have been off all anti-epileptic medications for at least five years and the off-medication EEG, should be normal.

The seizures of Benign Rolandic Epilepsy of Childhood usually involve the face, tongue or hand and are often precipitated by drowsiness or sleep. The EEG shows significant abnormalities from the Rolandic area. Individuals with this condition may be considered for certification if they have been seizure free and off medication for ten years. They must have a normal neurological examination and EEG. A sleep deprived EEG should also be obtained and must be normal prior to issue of any aviation medical certificate.

Petit Mal or Juvenile Myoclonic Epilepsy is seizure disorders that occur in childhood. Because such conditions may persist into or present during adulthood, they are considered as subtypes of epilepsy. These conditions are associated with a risk of progression to generalised convulsions.

The Single Epileptiform Seizure

Extreme care must be taken to diagnose epileptic seizure in the presence of a single event. Clonic movements from transient brain hypoxia or from other causes are often reported as seizures. The condition should be considered as Loss of Consciousness (see above section on Blackouts, Loss of Consciousness and Syncope). Non-epileptic causes should be sought and excluded.

An individual with a single epileptiform seizure is initially unfit for medical certification. A case may be reconsidered five years from a seizure if the following conditions are met:

- Specialist neurological examination is normal
- Repeated EEGs, including sleep-deprived EEGs, do not reveal any significant abnormalities
- Studies incorporating additional nasopharyngeal or minisphenoidal electrodes, if relevant, do not reveal any significant abnormalities
- Neuro imaging, preferably by MRI, has demonstrated normal brain structure.

For continued medical certification five years after initial certification or recertification, all of the above investigations must be repeated and reported as normal. Applicants for Class 1 certification may be restricted to "as or with co-pilot" for a further two years. Individuals who have a second seizure are considered to have epilepsy.



When a single seizure was related to alcohol withdrawal, applicants may be considered for medical certification earlier if they have a normal EEG and Neuro imaging, and psychosocial and biochemical evidence is presented that their alcohol abuse is in a continuing "recovery" phase. The alcohol abuse should be dealt with as a separate medical problem.

Those who have had a seizure while on tricyclic antidepressant drugs or other seizure enhancing medications should be considered more prone to seizures than the average population. Both neurological and psychiatric opinions should be sought to manage their interrelated problems. Psychiatric report should indicate the optimum treatment required and if alternative treatment is suitable and/or available. The neurological report should indicate the applicant's risk of further seizures, particularly if using other psychotropic medication for psychiatric treatment.

2.5.7 Head Injuries

There are two major concerns over fitness for aviation-related duties following head trauma. One is the neuropsychological consequence of the trauma in applicants who have not had any clear focal deficits and the other is the possibility of Post Traumatic Epilepsy (PTE).

The neuropsychological consequences are secondary to the effects of acceleration/deceleration forces on the skull and brain. Because of the anatomy involved, these forces cause their greatest focal damage to the orbital, frontal and anterior temporal areas of the brain. Diffuse white matter damage may be associated with the cortical damage.

The result of such injury is dysfunction in a number of functional executive activities of the brain. Frequent effects include:

- Slowing of reaction time, impaired memory and decreased ability to maintain a high level of performance over time, particularly in settings of complex activities and choices,
- A high propensity for further mental decline with fatigue, and
- Other problems include maintaining attention, initiation and proper sequencing of tasks, difficulty in planning and anticipating, and difficulty in establishing automatic responses to a trigger.

The affected individual may not notice or care that the task is being poorly performed. Stress, fatigue and pain may exacerbate all these effects, and the handling of simultaneous emergency tasks is particularly affected.

Although the effects of head trauma may be severe, routine IQ and mental status testing may be within normal limits. Fortunately there is a natural tendency for neurological deficits to improve with the passage of time. There are a number of ways to predict the outcome of a head injury. The most commonly used is the duration of post-traumatic amnesia (PTA). Serial sequential neuropsychological tests separated by months or years can document changes associated with improvement of neurological deficit. A pre-trauma baseline test of such nature will provide the ideal reference but is not usually available. The limitations of neuropsychological testing should be recognised eg, learning; subjective interpretations by the tester, interface issues (particularly if computer-based) and its results should be interpreted with these limitations in mind.



Mild Brain Injury

This is characterised by:

- Transient loss or alteration of consciousness without any focal neurological deficit and with rapid return to alertness and orientation
- Post-traumatic amnesia (PTA), which occurs when a person is conscious but ongoing events are not recorded in the memory. The duration of this lapse must be less than one hour; and
- Post-traumatic syndrome (PTS) which comprises a symptom complex involving:
 - Dizziness
 - Emotional impairment
 - Intellectual impairment, and
 - Headache.

Applicants with mild brain injury are generally considered to be fit to fly unless there is a history of PTS, which takes more than six months to resolve.

Any alteration of consciousness associated with head trauma is a sufficient indicator of likely brain injury that flying should not be undertaken for at least two weeks — the period during which "early" post traumatic epilepsy is most likely to occur.

Even in the absence of other risk markers or of a neurological deficit, a more prolonged loss of consciousness and its associated post-traumatic amnesia should be followed by longer periods of suspension from aviation related duties, as follows:

PTA < 1 HR	1 month
PTA 1 HR - 24 HRS	3 months
PTA > 24 HRS	At least 1 year

In all cases, formal confirmation of neurological fitness should precede a return to flying and referral to the Aviation Medicine Section for a final decision is required.

Moderate and Severe Brain Injury

The significant factors in the assessment of head injuries, which produce moderate or severe brain injury, are:

- Extent and nature of any neurological deficit
- Risk of post-traumatic epilepsy (PTE).

2.5.8 Post-Traumatic Epilepsy Markers

A past history of febrile convulsions in childhood and/or a family history of epilepsy doubles the risk associated with any other markers.

Early post-traumatic epilepsy that occurs within the first week following injury carries a 25% risk of later epilepsy. Convulsive movements that accompany an impact head injury do not increase this risk. However, any convulsive activity following the immediate effects of impact, however shortly thereafter these occur, should be considered as "early post-traumatic epilepsy".

Demonstrated haemorrhage within the brain substance, particularly the cortical part, is associated with 25-45% risk of PTE. Depressed fractures or presence of blood in the subarachnoid space are not reliable guides to risk of PTE. However, the presence of such findings should alert investigators to search for bleeding within the brain substance.

Both CT scan and MRI are desirable in assessment of such bleeding. Availability dictates which test is performed. MRI has the advantage of being able to grade breakdown products from blood and can be very sensitive for late imaging where no initial CT or MRI was performed. Where possible an initial CT and/or MRI should be performed. If the history suggests a severe head injury and no initial imaging available a MRI should be performed to detect residual changes associated with bleeding within the brain substance.

A normal MRI should be reassuring.

Other markers are the presence or absence of a post-traumatic amnesic interval of more than twenty-four hours, focal signs, and early post-traumatic epilepsy.

Once the first post-traumatic week (the period of early PTE) has passed, the risk of subsequent PTE decays exponentially. By two years, the residual risk is less than 20% of that immediately post-injury and at four years it is less than 10% of that initially present.

When considering recertification, a residual risk of PTE of 1% or less is acceptable, given that the prevalence of epilepsy in the community is 0.33%.

Conditions that require careful assessment and which most commonly result in a "fail" assessment are: epilepsy, intracerebral haematoma, , persisting CSF fistula, primary open cerebral laceration, and the presence of any significant permanent neurological deficit.



Recertification Guidelines

The Aviation Medicine Section applies the following guidelines:

1. Applicants with PTA lasting 30 minutes or less, who after the event have a normal neurological examination and no sequelae, may return to full duties in three to four months if the CT scan is normal.
2. Applicants with PTA from 30 minutes to 24 hours, with a normal MRI and EEG, are acceptable after 12 months. If a seizure occurred in the first week after trauma in an adult, a longer interval before re-licensing is required. Such cases are assessed individually.
3. If there is PTA greater than 24 hours, but Neuro imaging and neuropsychological testing are normal, applicants can be declared fit after two years. Flight simulator testing may provide additional valuable information in these cases.
4. Applicants with head injuries associated with intracerebral haemorrhage or focal deficit, whose neuropsychological testing does not show significant sequelae at 5-7 years post trauma, may return to duties after 7 years. Those who demonstrate abnormal neuropsychological sequelae have been more seriously injured and are considered individually. MRI is essential to determine presence or absence of bleeding.
5. . Use of an anticonvulsant may mask the presentation of any PTE. The duration of the seizure free period should be considered as beginning only when applicant is off anticonvulsant medication. Where the risk of further seizures is considered to be too high to cease medication, the applicant is not medically fit for certification.

2.5.9 Neurosurgery

Opening the skull is not necessarily a permanently disqualifying factor for flight crew or ATC certification.

Assessment is based on:

- The underlying disease and its prognosis
- Any neurological deficit
- Surgical approach and any associated induced injury to the brain substance along the approach path
- Any risk of post operative epilepsy secondary to destruction or removal of cerebral tissue
- Location of the supratentorial/infratentorial lesion.

Full reports are required in all cases. DAMEs should issue a "doubtful" assessment and provide explanatory notes.

2.5.10 Cerebrovascular Diseases

These pathologies are usually secondary to or associated with other medical conditions and these should be sought and controlled besides dealing with the presenting cerebrovascular events. Investigations are more informative regarding the causes than the history alone. Imaging by CT scan, MRI or Angiography will differentiate the various types. Other investigations such as lipid profile, stress test for coronary ischaemia, ultrasound of carotid and heart, digital subtraction angiography etc should be considered to address non-cerebral conditions. The treatment of these non-cerebral pathologies may introduce factors affecting aeromedical certification, eg, use of an anticoagulant.

Specialist neurologist assessment is mandatory. Opinion should specifically include the risk of:

- recurrence
- epilepsy
- subtle or acute incapacitation.

Such assessment should be supported by reference to current literature with reasoned opinions.

Where subtle functional changes are suspected, neuropsychological testing to quantify the changes should be undertaken. These tests can be expensive and are open to varying interpretations.

Ischaemia

Assessment of transient ischaemic attacks (TIAs) and reversible ischaemic neurological deficits (RINDs) depend upon their causes.

- **Stenosis.** Although stenotic lesions may be bypassed or treated by endarterectomy, the risk of continuing TIAs and cerebral infarction remains high.
- **Embolism.** The risk of recurrent embolism or of haemorrhage secondary to anticoagulation is high.
- **Postural.** Individual assessment is required, but most instances are related to head movements necessary for flying.
- **Vascular headache.** See earlier section on Headache.
- **Blood hyperviscosity.** This condition may be due to polycythaemia, myelomatosis, Waldenstrom's macroglobulinaemia, etc. These cases are assessed individually and usually result in "fail" assessments if the hyperviscosity cannot be controlled.
- **Hypertension.** If adequate control is established with the use of suitable drugs, these applicants may be considered fit.



All precipitating or associated pathologies should be addressed and separate reports relevant to them included.

Aviation Medicine Section assesses all cases individually.

Haemorrhage

There are two major types of cerebral bleeding:

- Intracerebral haemorrhage, producing cerebral infarction
- Subarachnoid haemorrhage.

Most cases are secondary to leakage or rupture of an aneurysm; some are secondary to arterio-venous malformation. Surgery to treat them may cause injury to brain matter with associated post-operative epileptic risk. Details of the surgery should be included in reports.

20% have no identifiable cause but may be related to sustained hypertension or to transient elevation of blood pressure.

All affected patients are at risk of later developing normal pressure hydrocephalus with visual field loss and corresponding subtle incapacitation. This possible complication should be looked for and excluded as part of the follow up of all affected applicants.

Aviation Medicine Section assesses all cases individually.

Cerebral Infarction

Applicants who have suffered a cerebral infarct are generally considered unfit for at least one year. Recertification depends on:

- Underlying pathology leading to the stroke
- Absence of neurological deficit
- Risk of recurrence
- Assessed risk of future seizures.

2.5.11 Infections of Central Nervous System

Meningitis

All applicants diagnosed with meningitis should not engage in flight duties for six months. Return to flight duties depends on the nature of the infecting agent or cause of meningitis, eg, viral, bacterial or fungal, and the degree of recovery of resultant deficit and risk of development of epilepsy or hydrocephalus.

Encephalitis

This is dealt with as for meningitis.

Brain Abscess

Assessment is based on the underlying cause and whether the lesion is:

- Supratentorial, in which case the risk of epilepsy and the degree of deficit must be considered, or
- Infratentorial, where the nature and degree of deficit must be considered.

2.5.12 Degenerative Disease

Dementia

Dementia is defined as deterioration in cognitive abilities that impair the previously successful performance of activities of daily living. The examining doctor is in a better position to assess an applicant with possible dementia if there has been contact over some years and changes over time can be more readily appreciated.

Memory loss, particularly short term, is most common and tends to affect executive function. (Planning, initiation and regulating behaviour for systematic, goal-directed activity. It is highly involved in novel situations where long term memory "experience" is not adequate).

In the aviation medical examination, presentation of dementia tends to occur at early stage in the process, with consequently difficult diagnosis. Pathologies that cause secondary dementia should be sought and excluded before a diagnosis of primary dementia is made. Age of onset is not a reliable guide. With aging, frequency of all pathology increases. Dementia, primary or secondary, is one of the many manifestations of increasing age. In the absence of pathology, even advanced age is not a reason for refusal of medical certification.

In early dementia, diagnosis usually is made by exclusion. Where a positive finding is present eg, brain atrophy on CT scan, the diagnosis is more likely. However, the absence of such findings does not preclude the diagnosis. Investigations should be guided by pathologies that produce secondary dementia.

Clinical examination can be formal or informal. Abnormal performance of tasks such as form completion, or following simple instruction such as undressing should be recorded. Mini-Mental State Examination has limitations because of its dependence on the applicant's linguistic ability, educational level and cultural background, particular in the early and late stages of the condition. Other reasons for poor test performance should be carefully considered before the result deemed positive. If test performance is normal, the presence of dementia is unlikely.

The greatest diagnostic challenge occurs where formal tests appear normal yet a family member or the examiner's prior knowledge of the applicant indicates the presence of changes in mentation sufficient to cause concern. A flight performance report from instructors should be sought. Formal flight test may be necessary. Assessment of flight performance must take account of the pilot's experience and currency. Highly experienced pilots may perform adequately even when mildly impaired. Comparison with previous performance or with that of other pilots' with similar experience should be sought.

Many dementias are progressive but some may be static. Where dementia has been demonstrated to be progressive, an immediate "fail" assessment is likely.



Note: If dementia is secondary to metabolic disease or correctable organ failure, there may be significant recovery of mental function following effective treatment. Aviation Medicine Section assesses all cases individually.

Normal Pressure Hydrocephalus

Treatment is not effective in preventing progression and subtle incapacitation may develop even in the presence of a working shunt. Assessment will be "fail".

2.5.13 Extrapyrarnidal Disease

Parkinsonism

This is characterised by:

- Rigidity
- Bradykinesia
- Tremor—although a "resting" tremor eases with movement, stress may produce a "reversal" with worsening of tremor on movement.

Parkinsonism can be a manifestation of other diseases and such causes should be sought and dealt with. Parkinson's disease is a chronic, progressive disorder of primary Parkinsonism with no evidence of more widespread neurological involvement

The functional effects of Parkinsonism can be variable. A careful record of neurological deficits, including effect on common activities, should be made. This will serve both as a quantitative appraisal tool and for comparison in evaluating subsequent progression of the condition.

A flight test is an essential component of evaluation. It should be the last of the tests performed and does not replace clinical assessment.

Applicants may be assessed as fit for certification if there is no adverse effect of treatment such as postural hypotension or "on-off" phenomena, and if the following features are adequately controlled:

- Bradykinesia
- Rigidity
- Tremor
- Adjustment of centre of gravity
- Voice quality
- Rapid scan eye movement.



Significant sequelae relevant to aviation safety include:

- Altered colour vision
- Dementia (late phenomenon)
- Depression (early as reaction to diagnosis, or later as a primary phenomenon)
- "On-off" phenomenon: abrupt but transient fluctuation in clinical state within the day, often as complication of levodopa therapy.

Progression to incapacitating symptoms or signs is generally slow. Shortened validity of certification is required to facilitate monitoring of changes. Class 1 certificate holders may require 6-monthly review and restriction to duties 'as or with co-pilot'. All classes of medical certificate holders will require neurological review at least annually.

Applicants receiving treatment who display "on-off" phenomena will not be certificated to continue flight duties due to the likelihood of rapid onset of incapacitation within the time period of a typical flight.

2.5.14 Demyelinating Disease

Multiple Sclerosis (MS)

MS is characterised by multiple episodes of demyelinating attacks within the central nervous system. Diagnosis cannot be made following a single attack unless confirmed by MRI changes. A single attack with a single lesion on MRI does not confirm the diagnosis. Multiple lesions in the clinical setting of single attack may be consistent with the diagnosis.

The course of the disease can be relapsing-remitting or progressive. In the relapsing-remitting type some patients may remain static for many years while some will relapse at variable frequency. Favourable prognostic features are: isolated optic neuritis or other sensory change, complete recovery, age of onset younger than 40 years, female, fewer than two relapses in the first year of illness and minimal impairment five years after the first presentation.

Progressive type of MS has a 50% probability of functional deficit in daily life activities requiring assistance at 10-15 years from initial diagnosis.

Typical attacks in mild cases have onset over days rather than minutes. However in severe cases, attacks can present as an acute neurological event. Seizure is uncommon.

In all cases, assessment depends upon:

- Nature of symptoms
- Time between exacerbations
- Residual deficit
- Likelihood of sudden incapacitation
- Activity of the disease.

A flight test may be necessary to determine the effect of any residual deficit.

All cases of MS require formal neurological opinion. Aviation Medicine Section assesses all cases individually.

Any subsequent certification will require regular specialist reviews.



2.5.15 Intracranial Tumours

(See also [Section 2.14](#) – Malignancy.)

Three factors affect the aeromedical disposition of applicants with intracranial tumours:

- Malignant or benign
- Treatment modality: chemotherapy, radiotherapy, surgery
- Degree of brain involvement.

Certification of applicants with secondary malignant brain tumours is principally a function of the characteristics of the primary tumour.

Certification of applicants with primary malignant brain tumours depends on prognosis in terms of malignancy and sequelae of any treatment received.

Certification of applicants with benign brain tumours depends on tumour size and location and the effect of any treatment.

Radiotherapy

Whole brain irradiation may be associated with late radiation injury effects. Focal irradiation may cause residual changes demonstrated on MRI. Such complications should be monitored for and excluded.

Chemotherapy

Systemic effects have to be considered in any aeromedical assessment.

Surgery

Effects occur regardless of the tumour's malignancy. For tumours within the brain, aeromedical concerns are for brain substance loss, with associated neurological deficit, and surgically induced bleeding into brain substance, with associated post-“traumatic” epilepsy.

Essential factors for consideration are:

- **Site of tumour:** supra or infratentorial
- Surgical approach
- Details Of The Surgery: amount of intraoperative bleeding, retraction and compression of brain, and any intraoperative difficulties or complications.



The treating neurosurgeon's report and opinion on the risk of epilepsy is a mandatory requirement for aeromedical assessment and must include:

- Details of any neurological deficit from brain substance loss or as result of surgical approach
- Risk of epilepsy
- Risk of recurrence of tumour.

Benign tumours not involving brain substance such as meningioma or acoustic neuroma should be considered in terms of:

- Treatment used: radiation and/or surgery
- Severity of compression effect on underlying neural structure: brain or nerve. In respect to brain compression, the potential for epilepsy should be considered.

A report from the specialist involved is required in all cases.

The effect of different treatment combinations and their likely sequelae requires expert neurological opinion on the particular therapy.

If there is no significant neurological deficit, these applicants may be assessed as fit for pilot and ATC duties. Applicants with small tumours, with no significant deficit after treatment by cryotherapy, after which there has been no evidence of epilepsy, may be assessed as meeting the required medical standard or as posing no significant risk to the safety of air navigation following appropriate specialist neurological review.

Applicants with history of childhood cerebellar astrocytoma who have been cured and who have no deficit or history of epilepsy may be assessed as meeting the required medical standard or as posing no significant risk to the safety of air navigation.

For adult subtentorial tumours, Aviation Medicine Section assesses all cases individually.

Nasal approach to pituitary tumours has a low risk of sequelae; the primary aeromedical consideration is endocrine effect and any residual compression effect on the optic nerves.

Malignant tumours fully excised, with or without associated radiotherapy, are considered according to their potential for recurrence, effect of the treatment, and their associated seizure risk. Those treated by radiotherapy alone will require long period of observation, usually in order of years, before the condition can be considered cured. Early certification is unlikely.

Applicant with benign tumours treated by radiation alone will be considered individually, dependent on the siting and any residual pressure effects on surrounding structures.

Benign intraventricular tumours will be considered individually, with any neurological deficit resulting from the surgical approach the main consideration.

2.5.16 Extracranial Neurological Disease

Peripheral Nerve Diseases

These disorders are assessed on the basis of the nature and degree of deficit. Autonomic involvement may produce syncope and is generally regarded as incapacitating. Full reports are required.