

are now down to 5000 a year), and the hospital hierarchy is blocked: even of the elite teaching hospital internes, only half become *chefs de clinique* and an eventual one fifth find permanent hospital posts. The rest set up as specialists in *medicine liberale*. This sector too is overburdened—its 80 000 doctors, two thirds general practitioners, one third specialists, at a ratio of one per 700 inhabitants, and increasing by 3% a year, represent two thirds of all doctors and compete in private practice for patients. A patient has the right to go to any doctor he chooses, even if not in the same area, and to change doctors when he wishes, and the pressures to satisfy patients or lose business are reflected in the drugs bill (up by 16% last year, though prices went up by 6%), more expensive investigations, and over 300 million working days lost a year through medically certified sickness.

The government, which reimburses the patient, is faced with a health bill rising faster than inflation or economic growth, and this, coupled with an ideological wish to reform, has led to a flood of new legislation. For example, one bill has abolished private beds in public hospitals, while another attempted to make the selection of the head of a medical department democratic, with a poll of all personnel including non-medical staff. One teaching hospital unit promptly elected a cleaner to the post: a hasty amendment restricted the choice to doctors. A better received suggestion was that internes' duty rota should be ideally one in six, and that pregnant women should stop on call work after the first trimester: the latter has been implemented, so, paradoxically some non-pregnant internes have

found their rotas increased. The setting up of government sponsored health centres, staffed by salaried doctors, is looked at with suspicion as an attempt to replace *medicine liberale* by state functionaries. As bogey men, countries with national health services are cited: one Paris professor in a speech reported by the medical press described increased child mortality, decreased life expectancy, and black market medicine in Russia, and went on to suggest that in Britain a patient with a tooth abscess would have to wait 1½ months for treatment unless he was prepared to pay privately, and that only foreign doctors will consider doing general practice. Those who know the British system a little better think it strange to be on a single doctor's list: any limitation of choice seems to be regarded as attacking a basic right.

The confrontation does not arise simply from political animosity: while some parts of a conservative profession are not very keen on socialism—one group has stopped giving red roses, the symbol of the socialist party, to ladies at its dinners—others, such as many of the juniors, voted for the present government, hoping for reforms. But unfortunately these have been presented in what is seen as a hasty, high handed, and often ill thought out way without consultation of all the profession's representatives, and now all attempts are mistrusted.

The underlying questions are whether doctors, responsible for 70% of health expenditure, should themselves be controlled by the government, their distant paymaster; and whether a system of medicine respected throughout the world for its quality would suffer in the process.

Aviation Medicine

Is the crew fit to fly?

I: Licensing requirements for aircrew

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"Look to your health; and if you have it, praise God, and value it next to a good conscience, for health is the second blessing that we mortals are capable of; a blessing that money cannot buy." (Izaak Walton, 1593-1683)

For those who earn their livelihood by flying medical fitness is of prime importance since safety in flight and future financial security will both be adversely affected by ill health. Redundancy apart, medical disqualification is the most frequent reason for the premature involuntary termination of an airline pilot's career and, contrary to popular belief, few airlines are able to offer alternative ground employment to those so affected. In the United Kingdom alone between 20 and 30 professional pilots' licences are lost each year for medical reasons, usually because there is an unacceptable risk that the holder may become incapacitated while in control of an aircraft.

Inflight incapacitation

Incapacitation may be sudden or insidious. Sudden incapacitation may be obvious to other crew members but may result in complete loss of function and be extremely dangerous if it occurs during a critical phase of take off or landing. Insidious incapacitation may not be obvious to those afflicted or, more importantly, to other crew members. Both may jeopardise the safe operation of the aircraft, but incidence data—particularly for sudden incapacitation—are scarce.

The incidence of insidious incapacitation is clearly difficult to assess but is reported to be more common than sudden incapacitation.¹ Fortunately, the occurrence is usually transient and is statistically more likely to occur during a relatively safe phase of flight. Gastrointestinal disturbance is the most common cause of such incapacitation,² but the causes of subtle or partial loss of cerebral function are more dangerous and may include reactive hypoglycaemia and psychological factors.¹ The most effective way to reduce the potentially lethal risks of these events depends particularly on the ability of all aircrew to recognise problems in their colleagues and to take appropriate remedial action. Recognition of this need led to the introduction of incapacitation training, which has been mandatory for the past 10 years and has been demonstrably successful. The infrequency

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of such incidents must also be the result, at least in part, of the strict medical selection of aircrew and subsequent regular and rigorous medical evaluations.

Initial examination

In the United Kingdom the Civil Aviation Authority is responsible, through its medical department, for the maintenance of aircrew medical standards. Aircrew are examined by doctors, usually general practitioners who are often private pilots and have undergone postgraduate training in aviation medicine. Courses for the certificate and diploma in aviation medicine—qualifying the holder to examine private pilots and professional aircrew respectively—are conducted at the Royal Air Force Institute of Aviation Medicine. A register of authorised medical examiners is maintained by the Civil Aviation Authority. Basic minimum medical standards are laid down by the International Civil Aviation Organisation, a United Nations agency, but each member country is free to impose higher standards for its own national licences.

Authorised medical examiners issue two classes of medical certificate (table I) that are valid for periods of six to 24 months (table II) depending on the type of licence held and the applicant's age.

TABLE I—Classes of medical certificate issued by the Civil Aviation Authority

Class*	Licence
1	Airline transport pilot Senior commercial pilot Commercial pilot Air traffic control officer Flight engineer Flight navigator
3	Student pilot Private pilot

*The terminology of classes 1 and 3 is used for international comparability.

The initial examination of professional aircrew and air traffic control officers is carried out at the Civil Aviation Authority's own medical centre. At other examinations the applicant has to meet certain medical criteria that are defined by the authority's medical department in a handbook provided for use by its authorised medical examiners. The standards for class 1 certificates are higher overall than for class 3. When the fitness of a private pilot is in doubt, authorised medical examiners may seek local consultant opinion to help decide whether a medical certificate can be issued. Professional aircrew and air traffic control officers who fail to meet the standards at subsequent

periodic examination must be referred to the authority for further assessment.

VISUAL FUNCTION

The need for high visual standards is obvious and ophthalmic problems are a common cause of rejection in applicants for ab initio commercial pilot training. Safe colour vision is essential and must be verified at the initial examination for all medical classes by Ishihara plates. Candidates who fail this test should be referred to a specialist for a lantern test since they may still possess sufficient colour discrimination to operate an aircraft safely. Standards of visual acuity are laid down according to the type of licence to be issued and these permit spectacles to be worn provided that the vision is correctable to the level of acuity defined in the visual standard. Contact lenses are accepted provided that tolerance is established, but spare spectacles must be carried by all those who have corrections whether wearing contact lenses or ordinary spectacles. Evidence is also required that other visual variables are within normal limits.

CARDIOVASCULAR FUNCTION

A common cause of rejection at initial examination of middle aged private pilots is cardiovascular abnormality. A resting electrocardiogram is required at initial examination for class 1 licences but only for a class 3 licence if the applicant is aged 40 or over. (The subsequent periodicity of electrocardiographic examinations depends on age and class of licence: see table II.) The electrocardiograms must then be reported on by a cardiologist or physician experienced in their interpretation. The electrocardiograms of professional aircrew are read centrally by Civil Aviation Authority cardiologists with access to previous records. A normal tracing does not of course exclude ischaemic heart disease, which should also be actively sought by history taking and examination. Routine exercise electrocardiographic testing of all applicants with normal as well as abnormal resting tracings is unlikely to be worth while since it has been shown to yield a high proportion of false positive results with poor specificity and reproducibility. In a recent study 771 asymptomatic men aged 35-54 with normal resting tracings were exposed to either maximal treadmill or Double Master's tests. As a result 19 men underwent cardiac catheterisation but only four showed coronary artery disease.³ On the other hand, Bruce has stated that the sensitivity and specificity of exercise electrocardiograms are appreciably improved by repeated testing at yearly intervals.⁴ If the initial resting tracing is abnormal then further cardiovascular evaluation by a specialist is indicated (see next week's article). Such investigations should be carried out in consultation with the Civil Aviation

TABLE II—Current requirements for medical recertification

Licence (age)	Validity of medical certificate (months)	Recertification requirements						Physical, visual, auditory standards
		Electrocardiogram*		Chest x ray*		Audiogram*		
		Age (years)	Renewal (years)	Age (years)	Renewal (years)	Age (years)	Renewal (years)	
Airline transport pilot	6	< 30	5	< 40	5	< 40	5	As on initial examination
Senior commercial pilot	6	30-40	2	< 40	At 40	< 40	5	
Commercial pilot (> 40)	6	40-50	1	> 40	3	> 40	3	
Commercial pilot (< 40)	12	> 50	6 m	> 40	3	> 40	3	
Air traffic control officer	12	< 30	5	< 40	5	< 40	5	
Flight engineer	12	30-40	2	< 40	At 40	< 40	5	
Flight navigator	12	> 40	1	> 40	3	> 40	3	
Student/private pilot (> 40)	12	At first PME after 40, then		> 40	At 40 then	Only if needed		
Student/private pilot (< 40)	24	40-50	5	> 40	3			
Student/private pilot (> 70)	6	50-60	2	> 40	3			
		60-70	1					
		> 70	6 m					

PME = Periodic medical examination.
*All required at initial examination for class 1 licences.

Authority not only to ensure that they are appropriate but also to avoid undue delay in providing a decision on an applicant's medical eligibility for flying.

The second area of cardiovascular controversy is in establishing a diagnosis of hypertension. Although the Civil Aviation Authority provides age related guidelines on acceptable maximum levels of blood pressure, these differ from other licensing authorities and this has resulted in a confusing variety of standards.⁵ Further error on examination is introduced by such factors as anxiety, posture (the authority requires supine blood pressure readings), and the use of phase 4 or 5 of the Korotkoff sounds to interpret diastolic pressure (the authority recommends phase 5—that is, cessation of arterial sounds). Controlled hypertension is usually acceptable in the absence of target organ disease provided that treatment is shown to be free from notable side effects in the individual. On the job performance testing is often required and other risk factors such as smoking must also be taken into account.

OTHER CONDITIONS

The remaining areas of importance that must be excluded at initial medical examination include acute or chronic ear disease, unacceptable hearing loss (an audiogram is required at initial class 1 examinations), and a history of psychiatric disease. These conditions and others that are incompatible with the issue of a certificate by an authorised medical examiner are summarised in table III, although the list is not exhaustive.

TABLE III—Diagnoses which are incompatible with the issue of a medical certificate by an authorised medical examiner

Cardiovascular disorders	Congenital heart disease Myocardial ischaemia or infarction* Hypertension* Arrhythmias Anaemia
Respiratory disorders	Asthma and hay fever (unless mild and controlled*) Pulmonary tuberculosis Spontaneous pneumothorax* Chronic obstructive airways disease Sarcoidosis*
Endocrine disorders	Diabetes mellitus* Other significant endocrine disturbances
Gastrointestinal disorders	Peptic ulcer* Crohn's disease Ulcerative colitis Gall bladder disease Recurrent calculi
Urogenital disorders	Proteinuria
Neurological disorders	Demyelinating disease Epilepsy Migraine (unless infrequent, not incapacitating, and not requiring treatment) Myasthenia gravis Cerebrovascular disease Tertiary syphilis Recent head injury* Unpredictable syncope*
Psychiatric disorders	Neurosis (particularly anxiety, hysteria, phobia, obsession, depression) Personality disorder Dementias Psychoses Alcoholism* and drug abuse
Ear, nose, and throat disorders	Acute or chronic otitis media Hearing loss (beyond Civil Aviation Authority defined limits) Vestibular disease (Menière's, neuritis, positional vertigo)
Ophthalmic disorders	Visual acuity or colour vision below standards,* uveitis, glaucoma
Other conditions	Most malignancies Hodgkin's disease Gross obesity Orthopaedic problems

*See text (including next week's article).

OTHER CONSIDERATIONS

It is important to appreciate that for commercial reasons the medical standards expected of ab initio recruits by the airlines will usually exceed those defined by the Civil Aviation Authority, which can only take into account the period of validity of the medical certificate issued. Since it may take up to 15 years for

a company to recover the cost of training a pilot, the long term physical and mental fitness of the applicant must be assured. Thus what seems to be a small blemish on an otherwise perfect medical record (which still meets the licensing standards of the authority) may result in rejection by the commercial operator. For example, an undescended testicle in childhood would be considered unacceptable, despite successful surgical treatment, because of the slightly increased risk of malignancy.⁶ As another example, future sick leave might have to be taken for a hip replacement because of a traumatic fracture sustained during adolescence. As a final example of the importance of commercial interests it is relevant that one United Kingdom airline has now decided that it should no longer recruit pilots who smoke.

Although the initial medical examination serves primarily as a selection process it should also be remembered that it has a most important role in providing baseline data against which subsequent information from periodic medical examinations may be compared.

Periodic medical examination

Renewal of a pilot's licence will depend, among other things, on satisfactory medical reassessment at regular statutory intervals. These intervals, in turn, are determined by the class of licence issued and the age of the applicant. Table II summarises the current intervals between periodic medical examinations and the standards required at each.

By increasing the likelihood of early detection of disease a routine medical examination is regarded as a valuable preventive tool. The yield from periodic medical examinations has, however, been said to be very low, especially in younger age groups: in one report less than 5% of the paired examinations studied showed any positive differences.⁷ On the other hand, these examinations probably do no harm,⁸ and the knowledge that "success" at such examinations is vital to a continued flying career may itself be of value in maintaining health. Furthermore, in the 28 months to December 1976, 58 of the 77 cardiovascular abnormalities that led to loss of licence in the United Kingdom were detected on routine examination.⁹ It should also be remembered that pilots are under regular intense scrutiny—probably more so than any other profession—during, for example, training and regular line flights and simulator checks. As a result some referrals for medical problems in aircrew may come from non-medical sources such as training captains.

Next week's article will cover several specific disorders which may affect a pilot's fitness to fly.

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