Health assessment in aviation medicine: an overview

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Aviation medicine is perceived as one of the younger sub-specialities of occupational medicine. However, man was beginning to master flight with balloons in the late eighteenth century and the first application of sound scientific principles to the effects on man of the aviation environment was Paul Bert’s work on hypoxia in the early nineteenth century [1]. The early balloonists soon learned the requirements for environmental protection from cold and hypoxia, but generally did not consider their own medical fitness for the flight.

It was Wilbur Wright’s flight in a heavier than air machine in late 1903 that launched the modern era of air travel. However, the foundations of the need for consideration of the pilot’s physical and medical fitness to fly came from the development of the aeroplane as a machine of war. High losses sustained during the early air campaigns due to ‘physical defects’ of the pilots prompted the Royal Flying Corps and the Royal Naval Air Squadron to define standards for military aircrew, many of which are still extant [2].

The first international airline in the UK was set up in 1916 using converted World War I machines flown by ex-service pilots [3], and medical examinations were required of pilots under the Air Navigation Acts, which stemmed from practices developed by the Air Ministry [4]. However, the first airline medical department was not set up until Colonel Frederick Mackie was appointed by Imperial Airways in 1937. The rapid growth of international air travel before and during World War II prompted concerns regarding rights of airlines to fly between countries, through the airspace of others and the maintenance of navigation facilities. In 1944, representatives of 52 neutral and allied states met in Chicago to agree a set of international standards, including medical fitness of aircrew, which are now maintained and updated by the International Civil Aviation Organisation (ICAO), an agency of the United Nations [5].

In the UK, The Joint Aviation Authorities (JAA) of Europe now define standards for airworthiness, operations and licensing based on the ICAO standards and recommended practices, and the medical requirements for professional aircrew are currently applied by more than 12 states [6]. This approach has the advantage of a commonality of decision making between states, but in agreeing the standards, the result has been to increase the burden of medical examinations and surveillance for aircrew.

The role of the occupational physician working in aviation medicine is varied and includes the performance and protection of crew during routine and emergency operations, travel medicine, food hygiene, preventative medicine and public/environmental health. The bulk of the work, however, is in the health assessment of aircrew, cabin crew, ground workers and, increasingly, considering the health of passengers.

McGregor’s [7] review of fitness standards in airline staff shows how medical standards have been developed, particularly within one airline, along with models which can be used for setting the appropriate fitness standards and targeted health assessment. These techniques, especially the use of the ‘work ability’ questionnaire, can be applied more widely, making for better occupational health resource allocation. The need for continuous audit of such standards and methods is also highlighted.

The periodic medical examination (PME) has been the mainstay of many surveillance programmes, particularly in the military and regulatory domains. In their review, McLoughlin and Jenkins [8] highlight the fact that the routine clinical examination is not good at detecting abnormalities, particularly if the medical history has not been confirmed by their general practitioner. They conclude that changes should be made to the content and frequency of PMEs to better reflect the population- and age-specific risks of incapacitation and also take into account the ethical difficulties encountered by the screening process.

Routine screening tests as part of fitness assessments have developed from a belief that such tests contribute to flight safety by identifying people with a disease that might lead to incapacitation in the air. However, some of the tests used, especially at the initial medical assessment, have a rather weak evidence base. Mitchell and Schenck [9] review the value of the tests performed at the initial assessment which are invasive and/or associated with high cost. All occupational physicians should be reminded of the pitfalls of applying screening tests to low prevalence...
populations that are based on investigation performed in high prevalence populations. Also, although on prima facie evidence the possible ability of a test to prevent half the number of one type of acute incapacitation occurring in the cockpit would seem a good outcome, the estimated cost to the industry/society is high and might be better directed elsewhere in accident prevention.

Dowdall's review [10] should be of considerable interest for those occupational physicians who are, or might be, responsible for industries that have an impact on client health or have staff who are duty travellers. Although the aircraft cabin as a ‘workplace’ is not strictly covered by the usual health and safety legislation, airlines and the Civil Aviation Authority have a responsibility to make the flying environment safe. Traditionally their activities have been primarily directed towards operational safety and prevention of accidents. However, while there has always been an element of in-flight medical care by airlines for passengers with known and/or acute medical problems, it is only in the relatively recent past that the health of all passengers has come to the fore with public concern over ‘Economy Class Syndrome’, an unhelpful misnomer.

In summary, there are aspects of the way in which health assessments are approached in aviation medicine that are a good example of how an evidence base improves practice. Equally, however, some of the examinations and tests required by regulatory authorities are less proven and, in some cases, may have non-beneficial consequences.

References