MOBBS TRAVELLING FELLOWSHIP AWARD TO ATTEND THE ADVANCED AVIATION MEDICINE COURSE AT KING'S COLLEGE, LONDON.

Dr Jenny Dodman
Academic Clinical Fellow in Occupational Medicine

Introduction

The Advanced Aviation Medicine course is held annually at King's College, London. It is a 2 week full time course, designed to enable the student to build on knowledge from the Basic Aviation Medicine Course and develop a more advanced understanding of key areas of clinical Aviation Medicine as well as a more detailed consideration of human factors and altitude physiology.

The course includes medical assessment of fitness to fly according to the Joint Aviation Regulations (JAR). The JAR will soon be replaced by the European Aviation Safety Agency (EASA) and the course also covered some material with a view to this however, the formal medical regulations that will be enforced by EASA are not yet published.

The course is recognised by the Civil Aviation Authority (CAA) as a training requirement for appointment as a Class 1 authorised Aviation Medical Examiner.

Aims/Objectives

My aims for attending this Advanced Course in Aviation Medicine were –

1. To further my knowledge and understanding of identifying risk of medical cause of incapacitation in aviation. I can apply this to my on-going research work into assessment of fitness to work safety critical occupations, within the Centre for Occupational and Environmental Health at the University of Manchester.
2. To build on my existing knowledge of Aviation Medicine following attendance at the Basic Aviation Medicine Course at King's College in 2008 and to learn about recent developments and changes in medical regulation in aviation, in particular as the European Aviation Safety Agency regulations come into force in 2012. These developments may also be relevant to my on-going research interests.
3. In completing the course I will gain a Civil Aviation Authority recognised qualification, which would be invaluable to future practice as an Aviation Medical Examiner.

The Course

Physics of the atmosphere and altitude physiology – revision

The first lectures of the course covered physical composition of the atmosphere and its' potential effects on the cardio respiratory system. This was largely revision of the Basic Aviation Medicine Course, on which the rest of the course material was based. This recapped the basic theory of altitude physiology, which it is essential to have fresh in the mind at the beginning of the course. I was pleasantly surprised how much I remembered but found recapping some of the applications of this theory very useful, before moving on.

Cardiology

The cardiology lectures spanned a good proportion of the course and were taken by Professor Batchelor, who presented the material in interactive sessions that encouraged me to think not only about the theory but the practical implications of cardiovascular disease on fitness to fly. I thought this was very appropriate because it is a major cause of morbidity and mortality in the western world and even taking into account the possibility of a 'Health Worker' effect, Pilots are still subject to these risks.

The lectures covered coronary arterial disease, arrhythmias, valvular disease, hypertension and ECG reporting. In particular I found the information regarding screening, assessment and management of pilots with asymptomatic disease very useful because it highlighted the usefulness of screening at medical assessment but also the problems associated with this in considering risk when assessing fitness to fly.

Overview of class 1 and 2 medical standards plus ATCO standards

This session provided an overview of the medical standards applicable to Air Traffic Control Officers (ATCO's). It highlighted the assessment of medical fitness to work, considering risk of incapacitation and functional ability. It was useful to see how assessment methods can apply to workers in other safety critical roles and understand why fitness criteria may differ as a result of this approach.

The session also covered new changes with the introduction of EASA regulations.

Decision panels for complex cases

We were shown, during an interactive and practical session, how the Civil Aviation Authority approach complex cases such as pilots with multiple co-morbidities or those with rare conditions, who are applying for medical certification.

It was extremely useful to understand how rare cases were approached as it showed the progress of the case form beginning to end. The decision panel apply fundamental evidence based principles in considering fitness to work. We formed mock 'Fitness Panels' based on real, but anonymised, cases where we were required to consider evidence and form a risk assessment. We were given the

real outcome and were able to compare our approach to that of the real panel. This session allowed me to develop a systematic, evidence based approach to problems. It highlighted cases of rare diseases/scenarios and showed they did not necessarily mean that certification cannot be considered but showed the problem in such cases is often lack of evidence.

The techniques learned during this session are relevant to my on-going research work.

Drugs and alcohol misuse in aviation

Drugs and alcohol is a potential problem in any occupation and a particular problem in any safety critical occupation where it causes a risk to safety. Pilots and flight safety are no exception and this session recapped the limits and legislation surrounding aviation and alcohol and substance misuse. It covered the referral, management and follow up of pilots who are recovering from such problems, including assessment of fitness to fly following treatment programmes.

A reference from session directed me to a very candid report by a pilot, who was recovering from a long period of alcohol misuse. It was startling to learn about how long alcohol excess had been a problem and the thought processes that antagonised his acceptance of the problem.

Cosmic radiation

The detail built on areas already covered in the basic course but moved further into calculating exposure doses and how these comply with legislation from the European Commission (Euratom Directive). I gained a greater understanding of how exposure to radiation from air travel is a function of latitude, altitude, time and of the solar cycle.

It was useful to review the theory behind the possible sources of radiation and how exposure from air travel adds and compares to the natural exposure from everyday life and other common sources such as medical investigation.

Acceleration

This session covered the effect of extreme positive and negative gravity on human physiology and the potential symptoms of this. Included was explanation of manoeuvres and equipment that are used to counteract these effects and the mechanisms behind this. The focus was in Military fast-jet pilots but the material was also applicable to civilian pilots who have experience in aerobatic flight.

I have personal experience of the effect of positive and negative gravity through my on-going training in aerobatics and I have used the information gained learned from this lecture to increase G tolerance during this training. It seems that many aerobatic pilots have experienced adverse effects of G during flight at some point during their training, however the extent and incidence of symptoms in civilian aerobatics is not known. This highlighted an area where further research is needed and I have given thought to this.

Neurology

The Neurology sessions recapped some common Neurological problems and highlighted the approach and barriers to certification with diseases such as migraine, epilepsy, TIA and CVA, loss of consciousness and movement disorders. It was helpful to have case based discussions, which required application of the theory we had covered.

Ear, nose and throat and Ophthalmology

This session recapped material from the basic course. The sessions were interactive and we practiced examination of the ear and eye, which was very useful for those of us who don't practice ENT or Ophthalmology on a regular basis. The material covered included current and proposed changes to regulations for certification of fitness to fly.

We had a fascinating discussion about the introduction of the Colour Assessment and Diagnosis (CAD) testing and how useful this is in detecting pilots with deficiencies in colour vision, which other tests such as the Ishihara plates or lantern tests may not detect. CAD testing will hopefully overcome some of the common problems encountered during the testing process for colour vision deficiencies.

Flight time limitations and sleep disturbance

This session was very relevant and applicable to all safety critical industries, particularly those with out of hours practice, such as Health Professionals, Heavy Goods and Rail Transport and ATCO's. It included the potential effect of rostered shifts and shift patterns on performance and alertness, and the safety implications of this. The material covered an overview of sleep structure and factors affecting this, including positive behavioural factors that workers can apply to their regimes to improve sleep and alertness when awake.

The legislation behind the working time directive and working time limitations was also covered, which is applicable to other safety critical occupations and to my research work.

I was particularly interested to learn about how pilots may fit a long commute into their working pattern and how important it is to consider the effect of this on flight safety even when they have a roster that is compliant with legislation.

Diabetes Mellitus

This was an excellent session taken by Dr Raymond Johnston, which reviewed up to date evidence concerning the prevalence and management of Diabetes Mellitus. The concern surrounding Pilots who suffer from diabetes is the effect of the disease and its complications and treatment on performance. At the moment pilots who need insulin for the treatment of Diabetes Mellitus (type 1 or 2) are classed as unfit for commercial flight. However, it was interesting to hear about recent steps towards certifying pilots with insulin treated Type 2 DM, as fit for commercial flight with a multi crew limitation. They would need to demonstrate good control of blood glucose levels using a memory chip glucose meter and have regular on-going monitoring.

It was useful to review different regimes of oral hypoglycaemics and their suitability or barriers to certification. With recent advances in medications, treatment regimes need to be constantly reviewed with respect to their potential risk to flight safety. It is important the Pilots do not decline treatment that is beneficial to their health for the sake of medical certification, but equally important that risk assessment of fitness while on treatment is evidence based.

Respiratory disease

The topic of Respiratory Disease is very large and I was glad that this session was interactive and covered common cases. The focus was on assessing fitness to fly in Pilots with asthma, sarcoidosis, obstructive sleep apnoea and following pneumothorax.

I was particularly interested in reviewing the evidence behind why certain drugs were and weren't allowed for certification. In particular oral steroid treatment is not conducive to certification due to the risk of steroid related psychosis, which is considered to be a greater risk to flight safety due to incapacitation than the disease requiring steroid treatment in the first instance.

Space medicine

This was the final lecture of the course. It brought to light some obvious, and some not so obvious issues that can and do present themselves during and after space travel, such as the effect of prolonged zero gravity on the human body for periods up to 6 months. We reviewed the effect on the musculoskeletal system, sleep, psychological health and well being as well as the provision and limitation of medical care available in space. Included in this was discussion about the process that astronauts have to endure on return to earth to re-adapt to the 1 G environment.

The issue of fitness for space travel is becoming more prominent as Virgin Galactic is making it more assessable to the general public, albeit for a large fee! Nevertheless it has highlighted the importance for the development of a system whereby individuals can be assessed.

The hypobaric environment, hypoxia and hyperventilation

I thoroughly enjoyed these sessions, which were given by Professor Mike Bagshaw. I have been fortunate enough to hear Professor Bagshaw lecture previously and as always, his sessions were interactive and used real cases to highlight important points, making them very memorable.

We learned about hypoxia and hyperventilation during the basic course and I have since attended lectures covering the topic. However, it is always useful to recap the theory surrounding the hypobaric environment and symptoms and effects of hypoxia and hyperventilation. I have found that every time I do, I gain greater appreciation of the detail within the subject. There was an emphasis on the similarity in the symptoms of hypoxia and hyperventilation and the importance of early recognition of subtle signs of insidious onset.

Of course there are instances such as sudden decompression, which are more obvious but even in instances such as this the time window of useful consciousness above 45000 feet is only 12 seconds

when there is decompression to atmospheric pressure thus showing the importance of flight and cabin crew simulation training for such events.

Air travel and infectious disease, including malaria.

The material included explanation of possible modes of transmission of disease and included legislation (International Health regulations 2005) on the control of disease and international preparedness procedures, which are to be actioned in the event of an outbreak. It explained the importance of pre-embarkation, en-route and on arrival action measures in controlling spread of disease. I thought the general principles could be applied in many instances.

The incidence of Malaria infection in flight crew and cabin crew was also covered along with an explanation of factors that commonly increase risk. Consideration of side effects of prophylaxis must be balanced against this risk when considering medical fitness. I was particularly surprised at just how common malaria is in these groups of workers. It highlighted how important it is to educate flight and cabin crew about the spread of malaria and the importance of compliance with prophylaxis.

Depression

There have been recent international changes in the medical standards related to depression. In particular the Civil Aviation Safety Authority (CASA) of Australia has started to allow Pilots who are taking certain anti depressant medications, to fly commercially with multi-crew limitations. CASA were the first aviation regulatory authority in the world to do this, which naturally prompted debate regarding the assessment of risk. The session addressed this risk and explained why other aviation authorities are also considering allowing pilots to fly while taking SSRI's for depression.

I will be interested to follow how medical regulation continues to change in relation to this as it is not just pilots who suffer from depression and this will be applicable to other safety critical occupations and to my on-going research.

Oncology

I found this session very interesting. It covered the process by which pilots are assessed for fitness to fly following treatment for cancer. This is a very big topic and covers all types of cancer and respective management options. However, the focus was to highlight the evidence based approach taken to assess pilots following treatment for cancer, based on the classification of disease and risk of complications as well as risk of metastasis. It also covered how complications and effects of treatment and recurrence were assessed.

Certification criteria have evolved as medical science has developed and new screening and treatment methods have become available. Survival for certain cancers has improved and I thought it contained a very positive outlook for pilots who had suffered from certain cancers.

Simulator session

During the second week of the course we were fortunate enough to be able to experience simulated flight in the cockpit of a Boeing 747-400 by having a session in the simulator at the British Airways Cranebank (which I am told is affectionately known as Braincrank by some flight crew!) training facility at Heathrow Airport. This session demonstrated how it is possible to become and fixated on a particular aspect of flight, thereby inadvertently blocking out any other sensory inputs. The concept of sensory overload became evident and despite being in the safe environment of the simulator, this can still happen. Experienced simulator instructors are very able at creating realistic airborne operation scenarios to test fully the crew reactions to emergency situations.

Clearly, the flight deck of the 747 is much more complex than that of light aircraft I am used to flying; nevertheless the basic principles of flight remain. Sat in the left hand seat and the trainer in the right, we took off from San Francisco International Airport and turned north towards the Golden Gate National Park area, flying out over the Golden Gate Bridge. However, rather than admiring the scenery (albeit simulated), I was then instructed to reduce the engine thrust and pitch the nose of the aircraft up to simulate a stall. This is when the speed of the aircraft through the air is so low that there is insufficient lift generated from the wings. The main result is a rapid loss of height. I have done this many times in light aircraft to practice stall recoveries and during aerobatic training as part of the entry into certain manoeuvres, such as the spin.

There are certain features of an imminent stall that are present to some degree in any aircraft such as 'buffeting' (felt almost as though flying through bumpy air and caused by broken air flow over the wings). I was aware that the 747 is fitted with a 'stick shaker', which is a mechanism that causes the control column to vibrate in order to get the pilots' attention, as a safety device to warm of the approaching stall. I had not experienced this before. As the aircraft approached the stall I felt the stick shaker activate and was surprised because it was a lot more violent than I expected. I noticed that the nose had not dropped significantly, which can be very pronounced in light aircraft. Even though I knew that we would be entering the stall, I could feel the buffet and the stick shaker had activated, it still took a moment to initiate the stall recovery by lowering the nose and increasing thrust from the engines to regain flying speed.

When we spoke after the session, someone mentioned the stall warning alarm. I knew that the Boeing aircraft were fitted with this and I knew it would sound if the aircraft stalled. However, I do not recall hearing it but I am assured it was there. It was interesting to see that if a relatively familiar situation presents itself atypically (or when not expected) that the sensory inputs can be perceived differently, or in some cases not at all! This was a good example of sensory overload and was demonstrated, even in the safe environment of the simulator. I thought this highlighted the importance of regular emergency procedures training and Standard Operating Procedure (SOP) checklists for pilots.

Conclusion

I thoroughly enjoyed the course. It gave me the chance to build on my existing knowledge in Aviation Medicine and to focus on areas that are applicable to my on-going research work as well as to discuss relevant areas that were highlighted during the course. I was very interested in how the development of changes in regulation has evolved, particularly over recent years and the basis behind these changes.

In addition, across all of the topics there was great emphasis on evidence based assessment of risk to flight safety and this being the main focus and driver towards certifying Pilots as fit to fly. This is extremely relevant to my current research work within the Centre for Occupational and Environmental Health at the University of Manchester, looking at fitness to work in safety critical occupations. I learned how to approach cases when considering assessment of fitness versus risk and how to go about making evidence based decisions in relation to medical certification. This will not only be relevant to my current practice and research but also to my future aspirations. I was pleased that I had fulfilled my aims for attending the course.

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