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ABOUT ASAM

Australasian Society of Aerospace Medicine (ASAM) is the authoritative professional body whose role is to cultivate and promote aerospace medicine and related disciplines in Australasia. Comprising more than 800 members from many fields of medical practice, the Society has been in existence for nearly 60 years and has provided professional development for its members by hosting successful scientific meetings each year.

For more information, please visit the ASAM website at www.asam.org.au
# CONFERENCE PROGRAM

## THURSDAY 10 SEPTEMBER 2015

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## FRIDAY 11 SEPTEMBER 2015

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<td>0905 - 1000</td>
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<td>1000 - 1015</td>
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<tr>
<td>1015 - 1030</td>
<td><strong>A/Prof Steven T Moore</strong> Effects of long duration spaceflight on piloting and driving performance on day of landing</td>
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<td>1030 - 1045</td>
<td><strong>A/Prof Steven T Moore</strong> Galvanic vestibular stimulation as an analog of spatial disorientation: Pre-adapting pilots to enhance performance in perturbed vestibular environments</td>
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<td><strong>Dr Gordon Cable</strong> Subarachnoid haemorrhage from a posterior inferior cerebellar artery aneurysm in a military aviator: Factors determining aeromedical disposition</td>
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<td><strong>Dr Simon May</strong> Crypoteginc stroke in an Airline Transport Pilot</td>
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<td>1145 - 1200</td>
<td><strong>Dr Priti Bhatt</strong> Challenges with aeromedical certification after a ‘funny turn’</td>
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<td>1330 - 1350</td>
<td><strong>Dr Muntaser Husein</strong> Cervical spine MRI analysis in asymptomatic fighter pilots flying F-16 and MIRAGE-2000</td>
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<td>1540 - 1600</td>
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**1600 - 1620**  
**Dr Claude Preitner**  
Aeromedical concerns in certification with implanted multifocal intraocular lenses – an international perspective

**1620 - 1640**  
**Dr Wolfgang Seckler**  
Transient visual disturbance in an aircrewman (loadmaster) - Investigation and differential diagnosis

**1845**  
Coach departs from Hilton Adelaide for ACAsM Fellows Dinner

**1900 - 2300**  
**ACAsM Fellows Dinner**  
State Library of South Australia  
Dress: Black tie

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**SATURDAY 12 SEPTEMBER 2015**

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<td><strong>A/Prof Gordon Davies</strong> Murder by aircraft: Is it preventable?</td>
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<td><strong>Dr Ian Hosegood</strong> Monitoring and managing pilot psychological fitness for duty in commercial airline operations</td>
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<td><strong>WGCDR (Dr) Collette Richards</strong> Cerebral aneurysm in a fast jet aircrew</td>
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<td><strong>Dr Andrew Marsden</strong> Assessment of cognitive decline in ageing pilots</td>
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<td><strong>Dr Adrian Zentner</strong> Migraine, stress and responsibility in a corporate environment</td>
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<td><strong>LTCOL (Dr) Robert Kennedy</strong> Spinocerebellar ataxia: When, where and how is it a problem?</td>
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| 1030 - 1230 | **CASA Update**  
*Dr Peter Clem:* Diabetes and Hypoglycaemia  
*Dr Sara Souter:* Stenting and the aviator | Ballroom BC |
| 1230 - 1240 | Closing Remarks                               | Ballroom BC |
| 1240 - 1400 | Lunch                                         | Ballroom A, Level 1 |
| 1400       | Conference concludes                          |                |
| 1300 - 1700 | **CASA MRS2 Training Session**                | Suite 3, Level 1 |


This meeting is approved by the RACGP as a Category 1 Active Learning Module.

The organisers reserve the right to change the topics and presenters if necessary.
ABSTRACTS
- ORAL PRESENTATIONS

FRIDAY 11 SEPTEMBER 2015
0905 - 1045 (SESSION 1)
SPACE MEDICINE

John Lane Oration – Dr Gilles Clément

Neuroscience in space
The functioning of the brain and the exploration of space are both fascinating mysteries that keep defying our scientific curiosity. The reduced gravity environment during space flight provides an opportunity to challenge the nervous system in a unique way, which allows investigating new aspects of brain functioning. Experiments performed in weightlessness help to better understand how the brain utilizes gravity in normal conditions on Earth. Knowledge gained from this research also helps understand the consequences of an alteration of the gravitational information because of disease, accident, or malformation at birth. Finally, a better understanding of the anatomical, physiological, and cognitive changes that occur during exposure to altered gravity will eventually contribute to the success of human exploration missions beyond low Earth orbit. The objective of this talk is to review the changes in brain functions in orbit and the neuroscience experiments that are designed to investigate them.

Ex Astris, Medicina: Medicine, space and astrobiology – Dr Eamon Raith

Astrobiology is the study of the origin, distribution, evolution and future of life on Earth and in the Universe; a field apparently distant from the world of medicine and the application of biomedical science, genetics and medical technology to prevent diagnose and treat disease, illness and injury. Yet these multi-disciplinary specialties both approach the study of life, particularly in extremis, from opposite ends of the same spectrum. From fields such as physical cosmology and extremophile biology to critical care and aerospace medicine, astrobiology and medicine share the study of life-processes and adaptation and response to extreme physiological stressors (e.g. microbial development and antibiotic resistance).

This presentation discusses the historical precedent and future potential for a convergent approach to the study of astrobiology and medicine, particularly the specialties concerned with extreme physiological derangement and complex physiology; critical care medicine, aerospace medicine, neuroscience and pathology.

This paper proposes a novel, trans-disciplinary and translational approach to the study of life, physiology and molecular biology under extreme conditions and discusses the potential for paradigm-forming discoveries that may improve our understanding of life, its function and dysfunction, on Earth, and ultimately throughout the universe.
Effects of long duration spaceflight on piloting and driving performance on day of landing
– A/Prof Steven Moore
Steven T Moore1, Valentina Dilda1, Tiffany Morris1, Hamish MacDougall2, Scott Wood3.
1 Human Aerospace laboratory, Icahn School of Medicine at Mount Sinai, New York NY USA
2 University of Sydney, Australia
3 Azusa Pacific Universality, USA

Although critical for the planning of future exploration class missions, the effects of spaceflight on operator proficiency when returning to a gravitational environment are not well known. This study compared astronaut performance on a range of sensorimotor tests and full-motion flying and driving simulations pre-flight and on the day of return from six months aboard the International Space Station (ISS). The test battery had 8 tasks: simple reaction time, sleepiness scale, match to sample, perspective taking, manual tracking, dual tasking (tracking plus entering 4-digit alarm codes), manual dexterity (Purdue pegboard) and motion perception. The simulations were performed in a cabin mounted on a 6 degree-of-freedom Stewart platform; landing an aircraft (T-38) with an overhead approach and driving a car (lane control and obstacle avoidance). Astronaut subjects were tested four times before launch and post-flight within 24 h of landing and 4 and 8 days after return. Of the six subjects tested to date on landing day, three experienced significant decrements in piloting ability during the T-38 landing, and all subjects exhibited dramatically reduced lane control on the driving task. Operator proficiency had recovered by four days post-landing. Significant changes were noted on landing day in fatigue, tracking performance during dual tasking and perception of low-frequency roll (<0.3 Hz) tilt. These results demonstrate a significant impact of long duration spaceflight on operator proficiency, likely induced by a lack of cognitive reserve and impaired roll tilt perception after six months without a gravitational reference. Support NASA NNX12AM25G.

Galvanic vestibular stimulation as an analog of spatial disorientation: Pre-adapting pilots to enhance performance in perturbed vestibular environments – A/Prof Steven Moore
Steven T Moore1, Valentina Dilda1, Tiffany Morris1, Hamish MacDougall2
1 Human Aerospace Laboratory, Icahn School of Medicine at Mount Sinai, New York NY USA
2 University of Sydney, Australia

Astronauts returning from microgravity are particularly prone to spatial disorientation (SD), as evidenced by a marked deterioration in pilot performance during shuttle landings. We developed an analog of SD based on Galvanic vestibular stimulation (GVS). GVS passes a small (<5mA peak) low-frequency pseudorandom current between surface mastoidal electrodes, which is superposed on veridical vestibular afferent information and interpreted by the CNS as external movement. Thus, there is a conflict between vestibular, and visual and somatosensory, inputs. The GVS SD analog was validated in a study of 12 astronaut and military pilots familiar with shuttle landing operations in the Vertical Motion Simulator at NASA Ames Research Center. Decrements in landing performance during GVS closely matched observed data from the shuttle program. We further assessed whether adaptation to GVS provided a protective effect when exposed to a novel perturbed vestibular environment. We exposed 10 healthy subjects to a cumulative 120min of GVS over 12 weeks (10min per week) and found that subjects adapted to GVS, with performance on a balance task during GVS returning to baseline after ~70min exposure. Moreover, GVS trained subjects performed significantly better on a visuomotor nulling task during random roll motion in a flight simulator than GVS-naive controls. Repeated exposure to GVS facilitates the use of other sensory modalities when vestibular input is compromised to maintain performance. GVS may prove a valuable adjunct to conventional training to better prepare pilots for operations in perturbed vestibular environments and for recognizing and safely responding to SD. Support NASA NNX12AM25G; NSBRI SA01603.
Subarachnoid haemorrhage from a posterior inferior cerebellar artery aneurysm in a military aviator: Factors determining aeromedical disposition – Dr Gordon Cable

A Royal Australian Navy aviator is diagnosed with a subarachnoid haemorrhage after sudden onset of occipital headache, the result of a small aneurysm of the left posterior inferior cerebellar artery. The aneurysm was surgically wrapped and clipped through a posterior fossa craniotomy, and the patient made a full and uncomplicated recovery. Except in rare cases, subarachnoid haemorrhage and intracranial aneurysms are generally considered to be disqualifying for military aviation. Even with good recovery of neurological functioning, complications such as seizures, risk of rebleeding, and de novo occurrence of other aneurysms are all significant concerns due to the risk of sudden incapacitation. This paper will examine the aeromedical factors particular to this case that influenced a favorable aeromedical decision-making outcome.

Cryptogenic stroke in an Airline Transport Pilot – Dr Simon May

This case presentation discusses a 47 year old Boeing 777 airline captain who suffered a cerebrovascular event. Despite extensive investigation, no underlying cause or contributing factors could be identified. He went on to make a full recovery from his stroke, and after two years applied for renewal of his medical certificate. This presentation discusses the aeromedical certification process, including the restrictions and health surveillance measures put in place once he was recertified.

Challenges with aeromedical certification after a ‘funny turn’ – Dr Priti Bhatt

Temporary loss of consciousness is unnerving for anyone, however the consequences in some professions can be devastating. This paper will discuss the case of an Airline Transport Pilot License pilot who experienced a ‘funny turn’ resulting in loss of consciousness, with reference to the aeromedical decision-making process and a literature review.

Aerospace medicine and the neurosciences – Parkinson’s disease – Dr V. John Affleck

Parkinson’s disease is a common, progressively debilitating neurological disorder that affects 1/30 people (not in nursing homes) over the age of 55. As it develops it disables the sufferer in many ways - motor disorder, cognition and executive function, sleep and sleepiness, bladder function, etc. Medications are used to control symptoms however it will, in due course, become a condition that is not compatible with safe performance of duties as a pilot or air traffic controller.

This paper briefly reviews current knowledge about the disease and its treatment and examines the ways in which subtle changes in impairment can be monitored. A determination must be made about the level of impairment, the effects of drugs used in treatment, whether restriction in certification can mitigate risk, and ultimately at what stage the condition becomes disqualifying for an aviation medical certificate.
FRIDAY 11 SEPTEMBER 2015
1330 - 1555 SPECIAL SENSES WORKSHOP 1

EARS AND ORIENTATION – Dr Gilles Clément, Dr Michael Schultz

This hands-on workshop will provide a practical insight into ENT assessments relevant to the aviation environment, in particular the normal physiology of the vestibular system and its relevance to spatial orientation in flight, and the clinical assessment of ears, nose, throat and vestibular function.

FRIDAY 11 SEPTEMBER 2015
1330 - 1450 (SESSION 3)

EXTREME AND HIGH PERFORMANCE ENVIRONMENTS

Cervical spine MRI analysis in asymptomatic fighter pilots flying F-16 and MIRAGE-2000
– Dr Muntaser Husein

Reclined seat-back angle has been identified as a risk factor for neck in +Gz flying environment. The additional neck flexion required to maintain normal gaze relative to horizon increases the risk of extreme cervical spine (CS) position and reduces mechanical efficiency of neck muscles in CS protection. In this MRI study, CS images of 9 F-16 fighter pilots (FP) and 9 Mirage-2000 FP have been evaluated by two blinded radiologists to assess the prevalence and pattern of degenerative changes among these FP subgroups for the hypothesis that F-16 FP are more prone for CS degeneration than other FP flying other aircrafts of similar performance. There were no significant differences between study groups in relation to numbers, grades, disc levels involvement and nature of degenerative lesions. 24 (57.1%) lesions affected 13 discs of 7 F-16 FP compared to 18 (42.9%) lesions in 9 discs of 5 Mirage-2000 FP. Degenerative changes of both subgroups concentrated around C3-4 (38.1%) and C5-6 (38.1%) levels and they were frequently in the form of posterior disc protrusion/bulging (42.9%), signal intensity reduction (28.6%) and posterior osteophytes formation (19%). It was concluded that F-16 FP are not at higher risk of developing CS injuries because of the reclined seat-back angle. Further studies with more criteria and definite grading together with larger study samples and non-flying controls might be of greater statistical significance and help in understanding links between +Gz exposure and CS loading.

A clinical case of thoracic fracture during standard centrifuge training
– SQNLDR (Dr) Elicia McGinniss

E McGinniss, L. Maus

INTRODUCTION: A fit and well 34 year old male FA18 pilot who had previously undertaken centrifuge training with no ill effects presented with mid thoracic back pain after a standard run. There were no neurological defects present on examination and he was treated conservatively with analgesia and restricted duties. As pain was persisting an x-ray of his thoracic spine was organised by his local medical centre which demonstrated mild scoliosis, depression of end plates in the upper thoracic region and a mild wedging of T7. MRI spine confirmed an old wedging of T7 and superior endplate fractures of T3, T4 and T5 with recent changes consistent with compression fractures. A full medical work-up was inconclusive as to underlying medical cause for the compression fractures.

DISCUSSION: This presentation will discuss a case of what appears to be vertebral crush fractures induced by centrifuge training.
The role of physical conditioning in (+Gz) tolerance – Dr Muntaser Husein

The question about the role of physical conditioning (PC) in improving +Gz tolerance (GT) has always been raised. The introduction of new generations of agile aircrafts capable of sustaining high G-levels for prolonged time with high G-onset rates has made this question even more necessary for both aircrew and operational communities.

Many experiments were conducted to investigate the effects of different PC programs on GT. The data from these studies so far, did not provide clear evidence suggesting that PC improves GT. This presentation will begin with some relevant physiological and pathological aspects of +Gz exposure followed by introducing GT concepts and anti-G straining manoeuvres (AGSM). The presentation will then pass through the relevant literature to determine the effects of PC, if any, on GT.

Conclusion: Although it looks logical to consider muscle-strength and endurance for GT, still there is need to re-evaluate the generalized-acceptance of strength-training as measures to enhance GT. Some “but not all” experiments done were in favor, the validity of which have been challenged on several grounds; experimental design, some studies were without appropriate control, results were inconclusive with difficulty in eliminating possible learning-effects, statistic data-analysis lacks independency with greater-probability of establishing significance. Evidence about the relationship between aerobic-fitness and GT is “scant so much about it remains to be learned”. Future studies should focus on the components of (VO2max) such as cardiac-output, blood-volume, local-metabolites and bio-histochemical muscle-profile. Evidence about role of neck-muscles PC in preventing neck-injuries is lacking, further studies are required to investigate the etiology of such injuries and efficacy of neck-muscle conditioning as preventive measures.

More comprehensive studies encompassing endocrinology, environmental, somatotype, tissue-histochemistry, cardiovascular and other physiological and physical variables and include effects of training on in-flight GT and long-term effects of PC are required for better understanding.

You are the DAME: “Altitude makes me dizzy, Doc...” – Dr Gordon Cable AM

This interactive presentation will discuss the case of a civilian 34 year old commercial pilot flying single pilot operations in pressurized turboprop aircraft, who is referred to you for assessment of persistent symptoms over a period of 3 years. Aviation is his only source of income. He has been grounded because of recurrent right orbital pressure, right temporoparietal headache and disequilibrium with cabin altitude exposures above 3000 feet, occurring with every flight. Last week he executed a missed approach due to sudden exacerbation of symptoms, this time on descent on finals. The history, investigation results, and specialist opinions will be progressively revealed and your opinion sought interactively regarding differential diagnosis, information required, and further actions that you would take to return this pilot safely to the cockpit.
The Colour Assessment and Diagnosis (CAD) Test: An Ishihara by another name?
– Dr Arthur Marinus Pape

The Civil Aviation Safety Authority (CASA) is responsible for aviation safety, carrying out its responsibility using various methods. These include:
(i) Mandating regular medical tests (minimising risks of, say, cardio-vascular events that could render aircrew incapable of safe piloting); and
(ii) Mandating regular flight-simulator tests (ensuring pilots can cope safely with unexpected events while flying).

CASA also implements the Aviation Colour Perception Standard (ACPS) which since June 2014 has included the CAD Test. In February 2015 the Administrative Appeals Tribunal (AAT) granted a colour-vision-defective pilot who had failed the CAD Test all privileges of the Airline Transport Pilot Licence (ATPL), concluding, in essence, that CAD Test performance was irrelevant in determining whether the pilot could fly aircraft safely. I elaborate on this AAT decision. I do this by showing a video of the CAD Test in action, and using this to highlight crucial aspects of the Test that provide compelling evidence for the proposition that while the CAD may be an excellent test of defective colour vision, it is not a test of potentially defective and unsafe control of aircraft. That is, the CAD Test is not an operational test, a point acknowledged by Professor J. Barbur, a co-developer of the Test, in his AAT evidence. I conclude by asking why CASA has not considered using a version of an operational test already in its armoury (see Point (ii) above) in its implementation of the ACPS.

Colour vision testing: Science or just bad habits? – Dr David Collis

Colour vision testing has been and remains a controversial subject in aviation but colour testing methods have remained essentially unchanged in many years. This presentation will review the relevance of colour testing methodologies to modern aviation and present a review of recent literature relating to colour vision and how it is affected by various physiological states and changes occurring with various pathological conditions and the relevance of these discoveries to current and future aeromedical certification processes.

Aeromedical concerns in certification with implanted multifocal intraocular lenses – an international perspective – Dr Claude Preitner

Use of multifocal intraocular lens (IOL) may result in compromised visual acuity for near, intermediate and distance vision, visual distortion, reduced contrast sensitivity, halos, glare at night and requires time for neuroadaptation. In addition, pupillary size, pre-/post-operative astigmatism, type of lens implanted and surgical precision could influence development of dysphotopsia. The aetiology of cataract, post-operative complications and need for YAG-laser contribute to the outcome of surgery. All these factors influence aeromedical decision making to determine fitness for aviation duties. This case study aimed at analysing aeromedical concerns in evaluation for fitness for aviation duties after implantation of multifocal IOL in commercial pilots.

METHODS: In this study, a young airline pilot was diagnosed with unilateral cataract following keratitis. He underwent phacoemulsification with imported foldable multifocal IOL implant a year back and YAG laser capsulotomy 10 months later. The protocol followed for evaluation and certification to arrive at evidence based decision is elaborated.
RESULTS: The pilot was awarded a restricted certificate.

DISCUSSION: FAA allows pilots with FDA approved multifocal IOLs implants to fly since 2005. Multifocal lenses, compared to monofocal IOLs, offer patients with cataract a unique opportunity for independence from spectacles. Most regulators, however, including DGCA India, are wary of allowing commercial pilots to fly after implantation of multifocal IOL. Despite neuroadaptation, these lenses are often considered to cause unacceptable impairment in vision, especially in mesopic light; which is not satisfactory for aviation safety. Objective evaluation criterion like adequate contrast sensitivity, acceptable standards of unaided visual acuity without complaints of glare and halos, could allow pilots with multifocal IOL to fly with or without restrictions. A protocol for evaluation is proposed. Adequate workup and grounding time for neuroadaptation prior to certification with restricted/unrestricted flying is discussed.

Transient visual disturbance in an aircrewman (loadmaster) - Investigation and differential diagnosis – Dr Wolfgang Seckler

This case report about an Australian Army aircrewman who developed a sudden incapacitating visual disturbance explores the investigation pathway, differential diagnoses and the aeromedical implications. Although not all cases of visual disturbance have an underlying ophthalmological or neurological cause, and in fact might be quite benign, there is a possibility of a serious pathology of vascular or ischaemic aetiology affecting fitness to fly and recertification. History, signs and symptoms and investigation results are discussed in the context of the aeromedical handling of the case and eventual return to flying duties after a restriction period. Unusual facets and possible contributors in this case study are the exposure to noxious fumes and vaporised nicotine (e-cigarettes), the implications of the latter are still unexplored in the aviation environment.

SATURDAY 12 SEPTEMBER 2015
0905 - 1045 (SESSION 5)
CLINICAL POTPOURRI

Patterson Trust Lecture - Dr John Roberts

Changes in air traffic control - will air traffic controllers have to change the way they think?

The rapid changes in technology as well as commercial and environmental pressures in Air Traffic Management will be discussed to explore how these may impact on the human element of Air Traffic Control and the implications this may have for flight safety.

An interesting case of altitude sickness – Dr David Collis
A 29 year old pilot develops altitude sickness while on holiday in the Andes of Peru, requiring hospitalisation while on holiday. This presentation details this case and the complications which have arisen in the management, both medically and from certification perspectives.

Challenges with recertification – who has the time? – Dr Ian Cheng

A 49 year old male ATPL pilot had been on a CASA audit requirement (CAR) for Non-Hodgkin’s lymphoma since 2010. As part of his ongoing haematological medical surveillance a neck, chest, abdomen and pelvis CT scan in 2014 reported an “incidental” abnormality in his neck. Perusal of the first several articles raised from a “Google” search of the abnormality linked it with possible stroke, carotid dissection and death. Would CASA now cancel or suspend this pilot’s medical? Could this pilot become a casualty of V.O.M.I.T. (victim of modern/medical imaging technology)? If DAMEs were
delegated the responsibility to be able to issue Class 1 certificates, how many would spend the time (and charge commensurately) to perform a more detailed literature search and critical appraisal to support an aero-medical decision one way or the other?

SATURDAY 12 SEPTEMBER 2015
1110 - 1230 (SESSION 6)
AVIATION MENTAL HEALTH

Pilot incapacitation of the non-physical kind – Dr Robert Liddell

Aircraft accidents are generally classified according to cause. This causal classification usually includes the following categories; airframe and engines, avionics and navigational aids, weather, operational factors (ATC and corporate factors) and the human factor. The human factor was traditionally subdivided into decision making and physical inflight incapacitation. Recent airline accidents give cause for adding another category to the human factor and that is psychological incapacitation.

Those of us who work in aviation medicine must assume responsibility for testing for the fitness or otherwise of the human part of the aviation system. There is virtually no accident statistic relating to physical inflight incapacitation in the two pilot airline operation, yet this is where hundreds of thousands of dollars are spent each year ensuring the pilot’s physical fitness. It could be argued that we as an international community of aviation medicine examiners have failed in our responsibility to ensure the human element in the man machine complex is not subject to unacceptable risk of mental incapacitation.

Murder by aircraft: Is it preventable? – A/Prof Gordon Davies

Murder by aircraft is very rare - the data suggesting a figure of about one in two and a half thousand crashes. However one study has noted a threefold increase in multiple fatality aircraft accidents following publicity regarding murder suicide, at a time the single fatality rate remained unchanged. This study suggested that many murder/suicides in aviation are undetected. When the antecedents to suicide are examined, the most common factors are recent or impending criminal proceedings or relationship conflict. When murder/suicides are involved, the majority occurred in the context of relationship breakdown and conflict. Incidents involving regular public transport aircraft are rarer, but involve many more casualties. The antecedent factors are likely to involve different resentments as the majority of victims are strangers to the pilot. The likely motivation involved in airline incidents reflects either a pseudo-political belief, or anger at some action taken by the company in concert with a very self-focused personality characteristic.

Some narcissism is a common personality attribute of the pilot group, but it is normally counterbalanced by a strong feeling of social responsibility. It is the detection of erosion in this characteristic that represents the best chance of early intervention.

Therefore, the pilots to be aware of are those that are disgruntled with someone (particularly their employer), who are inclined to have unusual belief systems, are unusually self-focused, and who have poor social supports. DAMEs should also consider the need to provide a lot of support when a pilot is advised that he is likely to be medically disqualified because this means a loss of self-image, self-worth and his usual structure of activity.
Monitoring and managing pilot psychological fitness for duty in commercial airline operations
– Dr Ian Hosegood

Recent fatal commercial airline events have highlighted the importance of monitoring and managing the risks that pilot mental health issues may pose to aviation safety. This is a complex issue with risk falling into the two main areas of

(i) potential impairment from common psychological and psychiatric conditions and
(ii) the very rare but high risk possibility of intentional sabotage due to the interaction of pilot psychiatric ill health with their social context.

Addressing these risks requires a multilayered approach to risk management that considers the various risk controls that are available both at initial entry and throughout a pilot’s career. A focus solely on psychological screening tools or on mandatory reporting is likely to be counterproductive and efforts must be made to create a culture of disclosure with robust support mechanisms for those pilots identified at risk. The author also challenges the notion that the aviation medical examination is an ineffective control measure and emphasises the importance of DAME training in this domain.

Acute and long-term consequences of ICU acquired weakness – A/Prof Arthas Flabouris

Intensive care has evolved from treating patients with poliomyelitis associated respiratory failure to treating patients with complex multi organ dysfunction. Despite an ageing population, and pre-intensive care unit (ICU) chronic illness complexities, ICU survival continues to improve.

ICU survival is however associated with ongoing functional limitations, in particular persistent ICU acquired weakness and a spectrum of physical and neuropsychological disabilities. This is despite a full recovery from the primary organ failure that precipitated the ICU admission. These disabilities may persist for years. Functional outcomes may range from complete recovery to persistent quadriplegia.

ICU acquired weakness is a complex condition that includes a myopathy and a neuropathy. It occurs in up to 50% of patients with a prolonged ICU stay. The pathophysiological mechanisms are multifactorial and include microcirculatory dysfunction, inflammatory mediator induced injury, illness associated metabolic effects, certain drug treatments and immobility. There is muscle wasting, loss of thick filament myosin and Type II fibre atrophy, decreased muscle excitability and axonal degeneration of both the motor and sensory nerve fibres. The cranial and autonomic nerves are often spared.

Evidence for prevention and treatment interventions for ICU acquired weakness is limited. Strategies such as sedation management, glycaemic control, early mobilization, nutrition and electrical muscle stimulation have been advocated. There have been fewer studies on post-ICU discharge interventions, in particular for exercise-based interventions and with respect to longer term functional outcomes.

In summary, ICU acquired weakness is common, associated with long-term morbidity and challenges for survivors those who manage them following ICU discharge.

SATURDAY 12 SEPTEMBER 2015
1315 – 1515 SPECIAL SENSES WORKSHOP 2

ASSESSMENT OF VISION – Dr Kim Frumar, Dr Neil Murray

This hands-on workshop will provide practical insights and a refresher on the assessment of visual function relevant to the aviation environment, in particular methods of colour vision testing.
Cerebral aneurysm in a fast jet aircrew – WGCDR (Dr) Collette Richards

33 year old male Air Combat Officer was recommended to have a CT cerebral angiogram, based on a family history of a vascular anomaly.

A 1-2mm aneurysm located in the cavernous portion of the internal carotid artery was discovered.

Neurosurgical advice was obtained which indicated that the risk of haemorrhage from this aneurysm in this location is ‘practically zero’, and that there is no indication for any intervention.

The fast jet environment does impose significant stress on the individual however, and aeromedical decision making is often more difficult when, despite the depth of evidence available, the risks remain unquantifiable.

This presentation will discuss the literature review conducted, the risk factors for rupture and risks of rupture, precipitating events, treatment, monitoring, and advice for the affected individual.

The aeromedical disposition of the affected individual will be outlined, to include the follow on discussion held with the member regarding the risks of fast jet flying with a cerebral aneurysm.

Assessment of cognitive decline in ageing pilots - Dr Andrew Marsden

This presentation discusses two cases of cognitive decline and visual dysfunction. The first is a case of dementia presenting in a commercial helicopter pilot, where he had a visual-spatial form presenting before the cognitive decline, as one type of “Benson’s Syndrome”. The second case presented with another type of visual difficulty as an early type of dementia, in which the patient is not able to connect what can be seen with the correct function of the object. That is, being a “blind man who can see...but not be able to interpret what he is seeing...” He too eventually started the cognitive decline to an Alzheimer’s type dementia, but again the visual difficulties preceded this cognitive decline by several years. The significance for a pilot developing this type of syndrome is obvious, and both types would probably be identified quite quickly, early, with the simple Mini-mental test, especially copying simple shapes, such as the clock face, squares and cube drawings. In the latter case, presented here, the question of whether this was early dementia or not, when presented to two separate consultant neurologists was interesting, with both vehemently denying that dementia may start in the visual system. The issues of assessing pilots over 60 years of age for early dementia are discussed.

Migraine, stress and responsibility in a corporate environment – Dr Adrian Zentner

A case is presented of a 46 year old 737 captain who developed a visual field distortion whilst on a training flight overseas. Prior history included two similar episodes around 15 years of age. More recently there is a history of self-initiated grounding during a period of stress associated with marital breakdown and custody issues. This paper will explore the effect of personal stressors on flight safety with reference to the corporate environment, the criteria for flight crew licensing with a diagnosis of classical migraine. The potential for both positive and negative impacts of a corporate environment (CE) will be examined with reference to a revised SHELL, the CE-SHELL model of human factor analysis.
Spinocerebellar ataxia: When, where and how is it a problem? – LTCOL (Dr) Robert Kennedy

Background: Family histories of illnesses are always concerning and imply a level of risk that a subsequent family member will develop that illness. But what is the risk when the individual undergoes genetic testing for that illness, and it comes back “positive”, and this illness is progressive neurodegenerative in an aircrewman?

Case Study: We present an individual with a family history of the autosomal dominant spinocerebellar ataxia who underwent genetic testing as an aircrewman of the Australian Defence Force (ADF), with subsequent “positive” results for the presence of the gene mutation for spinocerebellar ataxia.

Discussion: As with most genetic illnesses, little literature exists regarding the risk of the development of the illness if someone is a carrier of a gene mutation. When it is likely to manifest, where will its symptoms first show and how is it likely impact an individual, i.e. what are the aeromedical implications for us in aviation? Should we encourage genetic testing for genetic illnesses if it only gives a probability of developing an illness? Once we have that probability what do we do with it as aviation safety regulators? Should an employer, i.e. the ADF, know of the results? Should it be declared to the regulator if it is only a probability of being aeromedically significant?

Unwitnessed syncope with abnormal EEG in a commercial pilot: A challenging case
– Dr John C Chalkley

INTRODUCTION: A clear diagnosis and prognosis is imperative when determining the aeromedical disposition following an episode of syncope. This paper presents a case of unwitnessed syncope in an aircraft bathroom. The assessment of the case was complicated due to the fact that the episode was not directly witnessed and subsequent investigation showed abnormal electroencephalogram (EEG) recordings.

DISCUSSION: A 35 year old commercial pilot suffered a syncopal episode in the bathroom on a repositioning flight. This was a first syncopal episode and was unwitnessed. The differential diagnosis includes vasovagal syncope, arrhythmia, cerebrovascular disease, and seizure disorders. This paper will discuss the assessment process. This case highlighted the difficulties in making a firm diagnosis following an unwitnessed event as well as the difficulty in interpreting the significance of an abnormal EEG without a clear history of seizure. A small proportion of the population can demonstrate potential epileptiform abnormalities on EEG with no seizures during a lifetime. The clinical picture and extensive investigation in this case supported a diagnosis of micturition vasovagal syncope resulting in relicensing with limitation several months after the event. However, after one year of uneventful flying, further events, which this time were witnessed, led to a revised diagnosis of generalised epilepsy with petit mal seizures and permanent revocation of medical. This case explores the predictive value of EEG and more importantly the fact that witness accounts are critical in the aeromedical assessment of syncope.
ABSTRACTS

- POSTER PRESENTATIONS

An Overview of Neurological Complaints in Space - Dr David Phillips

Spaceflight exposes astronauts to a specific set of flight stressors including the unique environmental stressors of microgravity, high-dose radiation and an altered day-night cycle. While these stressors are associated with a wide range of medical conditions, Astronauts’ most common complaints are of neurological conditions. Given the Neuroscience and Rocket Science-based themes of the 2015 Australasian Society of Aerospace Medicine Conference, and the increasing promise for commercialization of spaceflight, this poster seeks to investigate these specific neurological conditions, the space-related stressors that cause them and how they may be managed or prevented. In order to achieve this, a literature review was conducted using the Scopus search engine with keywords of “Neurology” “Space Medicine” “NASA” “ESA” and “Space-flight”. This revealed five common neurological-based complaints of Astronauts; Space Motion Sickness, headache, sleepiness, and micro-gravity related back pain and constipation. These complaints are therefore examined and form the focus of this poster.

A Computational Simulation of the effects of altered gravity on human cardiovascular system
– Prof Han-qing Wang
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Altered gravity, such as weightlessness, can cause a series of adaptive changes in human body, especially in the cardiovascular system, which is closely related to the health of the astronauts during spaceflight. In order to study the effects of altered gravity on human cardiovascular system, a Matlab/Simulink model based on the theory of elastic reservoir model was established by integrating the gravity factor into the existed mathematical model of the human cardiovascular system. The computational simulation was carried out to figure out the changes of the key parameters of the cardiovascular system. Results showed that the wave shape of the systemic arterial pressure, left and right ventricular pressure, volume and blood flow turned out to be the same with that under 1G when the gravity altered. Further, the diastolic pressure and systolic pressure decreased, while the left and right ventricular pressure increased, as well as an increase in the volume and blood flow. Finally, by comparing the simulation results of the heart rate and mean artery pressure with the existing experimental date, an accordance was observed. The simulation results indicated that the model was a reliable one for the study of gravitational physiology, which was able to predict the changes of the cardiovascular system quickly and accurately when the gravity changed.