

AEROSPACE MEDICAL SOCIETY OF
AOTEAROA NEW ZEALAND AND
AUSTRALASIAN SOCIETY OF
AEROSPACE MEDICINE
CONFERENCE 2024

28 MARCH - 1 APRIL 2024
★ QUEENSTOWN, NZ ★

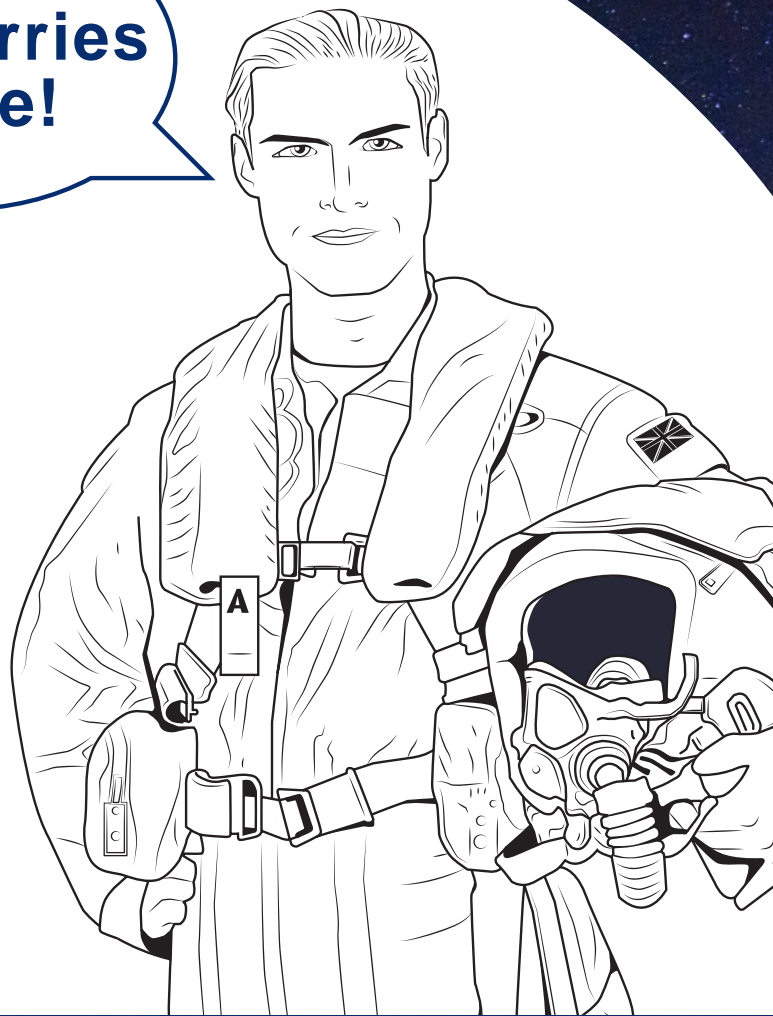
ABSTRACTS BOOK



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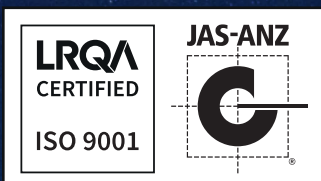
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CONTENTS

FRIDAY 29 MARCH 2024.....	4
JOHN LANE ORATION	4
SESSION 1 ABSTRACTS	5
PATTERSON TRUST LECTURE	8
SESSION 2 ABSTRACTS	9
SESSION 3 ABSTRACTS	14
SATURDAY 30 MARCH 2024	18
REGULATORS DAY – PANEL DISCUSSIONS	18
MONDAY 1 APRIL 2024.....	20
SESSION 4 ABSTRACTS	20
SESSION 5 ABSTRACTS	23

FRIDAY 29 MARCH 2024

0850 – 0950

JOHN LANE ORATION

Aerospace Medicine: Challenges for the Future

Dr Susan Northrup

Dr. Susan E. Northrup is the Federal Air Surgeon for the U.S. Federal Aviation Administration. In this capacity, she leads the Office of Aerospace Medicine in Washington, D.C. She leads strategic management of the FAA's aviation medical programs, which oversee all pilots. Together with the Deputy Federal Air Surgeon, she shares responsibility for the direction and management of all FAA medical programs.

This includes the development and establishment of airman medical certification, the air traffic control specialist medical qualification policy, the application of that policy in medical decision making, the medical appeals process, and the oversight of aviation industry drug and alcohol testing programs. Dr. Northrup oversees the FAA's aeromedical education programs, the planning and conduct of aerospace medical and human factors research, and the investigation of aircraft accident medical factors.

Aerospace medicine as we know it is changing. How do we move from where we are to the art of the possible? The journey has been from the human element as an afterthought in aviation to being part of an integrated safety system. The medical standards system will need to keep up and evolve for all individuals in the aviation arena. Safety management systems and risk hazard analysis offer a new vision of aeromedical decision making. Discussions on acceptable level of risk and risk tolerance are critical. Successful integration internationally will become ever more important. The developments in medical science and knowledge must be integrated into current policies and practices. Major challenges will include mental health, future responses to novel pathogens, and inclusion. Opportunities to leverage education, transparency, and international collaboration will continue to make the field of aerospace medicine a vibrant and exciting place to be.

1010 - 1250 (SESSION 1)

WHY DID THE HEART APPLY FOR A JOB? IT WANTED TO MAKE A LIVING

Cardiac Conundrums - PFOs, PDAs and Stroke Risk in Pilots | Prof Christian Gericke

Prof Gericke is a Consultant Neurologist and Epileptologist, Director of Research at Calvary Mater Newcastle, and Professor of Medicine and Clinical Dean at the University of Newcastle. He serves as Squadron Leader and Aviation Neurologist in the RAAF and as Aviation Consultant in Neurology for CASA.

Previously, he worked as an Epileptologist at King's College Hospital London and Sheffield Teaching Hospitals and as Professor and Director of Neurology at the University of Queensland and the Prince Charles Hospital in Brisbane.

He studied medicine at the Free University of Berlin and Tufts and Harvard Medical Schools and trained in neurology at the Charité University Hospital in Berlin and the University Hospitals of Strasbourg and Geneva.

He holds an MD (research) in cognitive neurology from the Free University of Berlin, a Cambridge MPH, a London MSc, a Deakin MBA, and a PhD in health systems research from Berlin University of Technology.

Stroke in young patients is frequently associated with a PFO. Controversy exists over whether the PFO is a cause, a risk factor, or an incidental finding in these cases. Estimating the individualised risk of stroke recurrence is difficult to ascertain. This has implications for medical certification for pilots following recovery. This session will present two case studies - one of PFO associated with stroke, the second an asymptomatic patent ductus arteriosus closed before any adverse outcomes. The session will discuss congenital heart defects and their risk stratification in the context of aviation.

HCM – Is Commercial Single Pilot Medical Certification Possible? | Dr Tim Sprott

Dr. Tim Sprott is an Aerospace Medicine Specialist and Chief Medical Officer with CAA New Zealand.

INTRODUCTION: This case report describes a commercial civilian helicopter pilot who had incidental findings that lead to a diagnosis of hypertrophic cardiomyopathy (HCM).

BACKGROUND: HCM is a common disorder, generally agreed to be present at a rate of at least 1:500 in the general population. The clinical course of HCM is variable and there is a spectrum of low to high risk for adverse cardiac outcomes. The potential risks of aeromedical significance associated with this condition include sudden cardiac death (SCD) and ventricular arrhythmias, as well as non-sudden cardiac events such as atrial fibrillation with associated stroke risk, and syncope. For these reasons Regulators apply restrictions especially on single pilot commercial operations.

CASE PRESENTATION: The subject pilot was a 50-yr old New Zealand asymptomatic AS 350 pilot with 5310 flying hours involved in single pilot scenic and commercial flying. A

diagnosis of HCM was made in 2021 following cardiac investigations, including cardiac MRI. He was recertified with a restriction from single Class 1 (commercial) flying. In 2023 he applied for this restriction to be lifted to allow for single pilot Class 1 operations.

DISCUSSION: The assessment of his aeromedical risk was undertaken taking his risk of SCD, as well as non-sudden cardiac events including atrial fibrillation. In this pilot's case the estimated risk of cardiac related acute medical incapacitation was about 1% or less. This presentation outlines this risk assessment process that led to the decision to lift the restriction on single pilot operations.

'Going for a Spin' – Using a Centrifuge to Inform Aeromedical Decision Making | Dr Danielle Polgar

Dr. Danielle Polgar is an Aerospace Medicine Registrar with the Royal Australian Air Force, currently working at the RAAF Institute of Aviation Medicine. Danielle studied medicine at the University of Melbourne, is a Fellow of the Royal Australian College of General Practitioners, and recently completed a Diploma in Aviation Medicine.

Historically, Royal Australian Air Force (RAAF) aircrew with hypertension have been prohibited from flying high-performance aircraft when treated with calcium channel blockers, thiazide diuretics, or beta blockers, due to concerns that these agents may impair tolerance to +Gz acceleration. However, there is limited evidence within the scientific literature to support this assumption.

A 30-year-old male fixed-wing pilot taking a triple combination antihypertensive (olmesartan, amlodipine, and hydrochlorothiazide) requested the RAAF Institute of Aviation Medicine to consider his suitability to fly the Pilatus PC-21 in an instructional role. PC-21 instructors typically encounter up to +6Gz in routine sorties.

Functional assessments of the pilot's +Gz tolerance were conducted at a centrifuge facility on two separate days. The pilot successfully completed two 30 second +6Gz runs, as well as a single 15 second +8Gz centrifuge run, all while wearing a 5-bladder anti-G suit.

Based on the centrifuge assessment, it was determined that the pilot's medication is not significantly impairing his tolerance to +Gz acceleration. He has been deemed medically fit to fly all military high-performance aircraft, including the PC-21.

This case highlights how individualised objective functional assessments can be a valuable tool to inform aeromedical decision making, and challenge previously held assumptions. Functional assessment in a centrifuge resulted in the removal of a career-limiting restriction for this pilot and allowed the Institute of Aviation Medicine to maintain Defence capability without compromising flight safety.

Cardiovascular Risk-Factor Management in a Pilot Population by In-House Occupational and Aviation Medicine Unit | Dr Alejandro Fandino

Medical Doctor and Otolaryngologists from Colombia. Advanced Fellowship in endoscopic sinus surgery and skull base surgery with Te Whatu Ora. Candidate for Master in Aviation

Medicine with the University of Otago. Volunteer Research Fellow with the Air New Zealand Aviation Medicine Unit.

The aeromedical incapacitation risk for pilots with known high cardiovascular risk can be considered from three standpoints: first, the risk of an incapacitating event; second, cardiac function and third, the management of modifiable risk factors. The presenters summarise current evidence for the benefits of optimal risk factor management. Then results of an audit of commercial pilots with identified high cardiovascular risk are presented. Data relating to modifiable risk factors is compared with current treatment paradigms and best-practice guidance. Conclusions are drawn about where improvements may be made, including recommendations on improving the preventative care of pilots.

Taking the 1% Rule to Heart: Cardiovascular Risk Assessment in 2024 | Dr Calum Young

Calum Young graduated from University of Otago in 1994. He is a Cardiologist in public and private practice in the Bay of Plenty, New Zealand- after having returned from a Clinical Fellowship at the Western Infirmary in Glasgow, Scotland in 2004. He has Fellowships with the Royal Australasian College of Physicians, and with the Cardiac Society of Australia and New Zealand. He has a sub-specialty interest in cardiac CT scanning and is a Member of the Society of Cardiovascular Computed Tomography, and a Member of the European Society of Cardiology. Calum has a particular interest in cardiac risk assessment, which has prompted his interest in Aviation Medicine. Calum graduated with a Master of Aviation Medicine with Distinction in 2018, and a Post-Graduate Diploma in Occupational Medicine. He is a current Committee Member of the Aerospace Medical Society of Aotearoa New Zealand. In his spare time, he enjoys the gym and the awesome mountain biking trails of the region.

Accurate cardiovascular risk prediction remains a challenge, especially when reliant on traditional population-based risk estimates, such as the Framingham Risk Score. There have been recent advances in risk score systems, as well as development of advanced risk prediction techniques. These newer approaches include CT Coronary Calcium Scoring, and use of novel risk markers- including Lipoprotein(a) and Polygenic Risk Scores. The aim of this presentation is to discuss the shortcomings of traditional risk estimation in Aviation Medicine, and to look at how modern techniques can assist in maximising our ability to predict cardiovascular events in the pilot population.

FRIDAY 29 MARCH 2024

1150 – 1250

PATTERSON TRUST LECTURE

Neuroergonomics: Understanding and Monitoring Pilots' Brain in the Wild

Prof Frédéric Dehais

Frédéric Dehais received a PhD in Cognitive Science at Onera - Toulouse (France) in 2004 and obtained his HDR (Habilitation à Diriger les Recherches) in 2012. He is a full professor at ISAE-SUPAERO since 2012 and holder of the 20-year AXA-chair "Neuroergonomics", a rare credit attributed to less than 30 researchers in the world and holder of the 3AI Chair "AI for Neuroscience" (ANITI, Toulouse). His research deals with the understanding of the neural correlates of human error, the implementation of neuro-adaptive technologies to enhance human performance. He is leading the Human Factors and Neuroergonomics team (DCAS research Department), composed of 25 permanent and non-permanent members with an interdisciplinary expertise in Neuroscience, Signal Processing, Computer Science, and Human Factors. His team has developed a unique methodology from basic research using fMRI in well controlled environments to experiments conducted in real flight condition using cutting edge portable brain imaging techniques to investigate cognition in complex real-life situations. His team has become a key player in human factors for flight safety and his laboratory won the 2019 Commercial Aviation Safety Laureate awarded by Aviation Week (<http://aviationweek.com/laureates>). He has authored 150 publications and 5 international patents. He is the co-chair of the International Neuroergonomics conference and co-chief editor of the Journal of Neuroergonomics. He also co-founded Hinfact, a spin-off dedicated to implement monitoring technology for safer operations.

The emerging field of research, known as Neuroergonomics, posits that to investigate complex real-world behavior effectively, it is crucial to comprehend the processes within the context of underlying interacting brain networks, rather than solely under reduced and isolated laboratory conditions. Coined by its founder, Prof. Raja Parasuraman, as the "scientific study of the brain at work," this discipline harnesses recent technological advancements in mobile brain imaging and artificial intelligence to measure brain activity outside the laboratory. It aims to determine the neural correlates of perceptual, motor, and cognitive processing in highly ecological environments. Aviation operations serve as an exemplary platform for implementing this approach. This presentation aims to underscore the relevance of Neuroergonomics in understanding attention failure, decision making, social interactions, and assessing human performance within aviation operations. Additionally, we will delve into the challenges of integrating neuroadaptive technology in the cockpit to enhance safety and operational efficiency.

1330 - 1550 (SESSION 2)

GLORIOUS GALLIMAUFRY

Drug and Alcohol Management in the Airline Industry | Dr Michelle Williams

Dr Michelle Williams, an expert in toxicology and pathology, is a dynamic keynote speaker known for her development of cutting-edge rapid drug detection methods and investigations into new technologies for the increased efficiency of drug and alcohol testing and management.

With extensive experience training pathology collectors and delivering informative sessions to executives, union representatives, and workers across industries and government sectors, Dr Williams shares her knowledge on the effects of drugs and alcohol testing procedures, Australian standards for drug testing, and policy development. Dr Williams is well-versed in navigating the complex regulatory frameworks of the pathology and toxicology industries, with expertise in legislation, national accreditation requirements, and Medicare guidelines.

Equipped with a Ph.D. in Toxicology and legal qualifications, Dr Williams offers expert interpretation of oral fluid, urine, and hair drug tests, and guidance on medication use in safety-sensitive environments. Reflecting on her experience working with private companies, sporting organisations and government agencies including in child protection and juvenile justice, corrections and parole, defence, and health, Dr Williams delivers impactful, tailored keynote presentations that help guide you in the best ways to manage drug and alcohol testing regimes in your company or organisation.

Drugs and alcohol risks in the airline industry extend beyond the personal choices of individuals. They have the potential to compromise the safety of air travel, jeopardize the lives of passengers and crew, and damage the reputation of airlines. Fully understanding and then mitigating those risks in a rapidly changing landscape is a complex task. The purpose of our presentation is to enhance the understanding of the broader landscape in which a drug and alcohol testing programs operate. The presentation will proceed in two parts:

First is a discussion on societal trends supported by data from over 30,000 hair drug tests within Australia in the past three years. We discuss current use, novel drugs, adulteration techniques and the recent challenges relating to medicinal cannabis.

The second part focuses on the safety risks in in the airline industry with a discussion about recreational, acute and chronic use, detection timeframes and the testing options available for effective drug and alcohol management. This includes the role of Hair Drug and Alcohol testing in a medico legal context, for detection, return to work management and clinical assessment.

The presentation concludes with some tips on result interpretation and outlines where practitioners can go for support, advice and keep up to date with industry drug and alcohol management best practice.

Conceptual Issues with Calculating Annualised Incapacitation Risks in Pilots With Epilepsy | Prof Christian Gericke

Prof Gericke is a Consultant Neurologist and Epileptologist, Director of Research at Calvary Mater Newcastle, and Professor of Medicine and Clinical Dean at the University of Newcastle. He serves as Squadron Leader and Aviation Neurologist in the RAAF and as Aviation Consultant in Neurology for CASA.

Previously, he worked as Epileptologist at King's College Hospital London and Sheffield Teaching Hospitals and as Professor and Director of Neurology at the University of Queensland and the Prince Charles Hospital in Brisbane.

He studied medicine at the Free University of Berlin and Tufts and Harvard Medical Schools and trained in neurology at the Charité University Hospital in Berlin and the University Hospitals of Strasbourg and Geneva.

He holds an MD (research) in cognitive neurology from the Free University of Berlin, a Cambridge MPH, a London MSc, a Deakin MBA, and a PhD in health systems research from Berlin University of Technology.

The adaptation of annualised risk of incapacitation estimates for aeromedical certification by CASA has allowed pilots affected by various medical conditions to obtain aeromedical certification where this was previously anathema. Common examples are the risks of recurrent cardiovascular events after a myocardial infarction or the risk of hypo- or hyperglycaemic events with loss of consciousness in patients with diabetes.

Estimating annualised incapacitation risks for seizure recurrence in patients with epilepsy is more challenging. In my opinion, the current CASA methodology of annualised incapacitation risk estimation should not be applied to the aeromedical certification of pilots with epilepsy.

In this presentation, I will present the 2024 update of the ICAO Manual of Civil Aviation Neurology Seizures and Epilepsy Section and outline why calculating annualised incapacitation risks for seizure recurrence is not conceptually sound.

From Inconspicuous to Incapacitating: Assessing and Managing Asthma in the Private Pilot | Dr Vienna Tran

Growing up in suburban Adelaide, Vienna became fascinated with the light-polluted night sky visible from her backyard. When she discovered that she could combine her passion for space with her medical degree, she went on to research the effect of artificial gravity on the hip muscles during prolonged bedrest, for which she earned a First Class Honours as part of an international team. Vienna is currently a registrar with the Australian College of Rural and Remote Medicine (ACRRM), undertaking her Diploma of Rural Generalist Anaesthetics. She has worked for the Australian Space Agency to help develop the first Applied Space Medicine and Life Sciences roadmap. She was the winner of SQLDR Lana Davies Memorial Award in 2023 for her early-career contribution to aerospace medicine. Outside her day job, you will find her giving a school talk about space, conducting medicals as the local DAME or running on the trails.

Profile: Mr B is an 80-year-old man who lives in regional South Australia. He is a private pilot who has had asthma since childhood.

Context: Mr B has had asthma exacerbations less than yearly and has never been hospitalised but had recently been using Ventolin daily. In August 2023, his respiratory physician commenced him on regular Symbicort and Spiriva with excellent symptomatic relief, and since then, he has not required any Ventolin. As requested by CASA, he underwent a full pulmonary function test (PFT) in September 2022, which indicated a severe obstructive ventilatory defect with a notable bronchodilator response. However, on the 8th December 2023 he undertook a Basic Class 2 medical in which he unconditionally met the AUSTRROADS Commercial Vehicle Standards for Medical Fitness to Drive.

Discussion: Other than sleep apnoea, the AUSTRROADS Commercial Vehicle Standards do not mention any respiratory conditions, including asthma. Therefore, a pilot with any degree of asthma seeking a Basic Class 2 would technically meet the standards. However, the CASA Clinical Practice Guidelines monitor asthma closely, specifying that a bronchodilator must be carried at all times. This discrepancy highlights the challenges in monitoring such a common condition. Asthma is highly individual, and the condition can range from unnoticeable to highly incapacitating. Medical practitioners and DAMEs must be aware of how the individual's asthma symptoms and treatments can cause impairment and distraction during aviation. It is crucial to encourage regular PFTs, specialist follow-up and medication adherence, particularly in rural areas where specialist care is limited.

Venous Thromboembolism and Air Travel – An Update for Pilots | Dr Jonathan Cohen

Dr Jonathan Cohen is the Medical Director of Travel Clinics Australia, the national association of over 30 travel clinics. He holds a Certificate of Travel Health (CTH) with the International Society of Travel Medicine, Fellow of the Australasian College of Tropical Medicine (FACTM), Fellow of the international Society of Travel Medicine, DAME, Honorary Senior Fellow, Dept of Paediatrics, University of Melbourne

Honorary Research Associate, Diagnosis and Development, VCGS/MCRI. Dr Cohen works in full time clinical practice in Melbourne and also as a consultant to a number of national and international organizations. He has authored over 80 articles and publications and presents regularly on travel health both nationally and overseas.

Venous thromboembolism (VTE) includes deep vein thrombosis (DVT) and pulmonary embolism (PE). The incidence of significant VTE associated with travel is 1 -2 per 1,000 travellers or 1 per 5,000 flights. It is important to be aware of currently known factors contributing to an increased risk of VTE. Recommendations for detection, management and prophylaxis will be presented based on known landmark studies and current local and international guideline statements.

Hereditary Angioedema a Global Disease With Challenges Unique to Aviation | Dr Karen Lindsay

Dr Karen Lindsay is a UK Trained Clinical Immunologist and Rheumatologist at Auckland City hospital who is enjoying studying at the University of Otago for a post-graduate

Certificate in Aviation Medicine. She has a special interest in HAE, and treating the whole person, and in exploring how her specialist knowledge can be utilized in Aviation Medicine.

Hereditary angioedema is a well described bradykinin mediated inherited condition with uniform incidence across the world. It results in unpredictable spontaneous abdominal, laryngeal or peripheral angioedema unresponsive to adrenaline or prednisone. There are well established clinical guidelines and available treatments which make attacks increasingly unlikely. Challenges are variable access to on demand and prophylactic medications and care in different countries and an unpredictable disease course. Some are affected mildly and have almost normal lives and work in the Aviation industry and increasingly travel with medication.

New Zealand has 68 patients with the condition with 3 having links to Aviation.

These clinical cases and suggested management plan will be presented to assist with any aviation jurisdiction.

There Is More to Vision Than Visual Acuity | Dr Claude Preitner

Claude Preitner first graduated in engineering before studying medicine in Switzerland, his country of origin. He eventually settled as a GP in his own practice at Rotorua in 1987. There he held a part time ENT Medical Officer position at Rotorua hospital for many years. Holder of a commercial pilot licence he became involved with Occupational, Diving and Aviation Medicine since 1990. In 2001 he accepted a position as Senior Medical Officer with the Civil Aviation Authority of New Zealand. He is FRNZCGP, Fellow of the Australasian College of Aerospace Medicine (FACASM) and member of n AsMA, ASAM and ICASM. He currently lives in Nelson NZ.

Contrast sensitivity impairment may affect visual acuity in low contrast situations and generally affects the quality of vision.

Yet no standards exist in the NZ Civil Aviation Rules other than an applicant must have "no condition that is of aeromedical significance". In NZ contrast sensitivity testing is required following refractive surgery, and as clinically indicated, for example in the presence of retinal disease or cataract.

The effect of impaired contrast sensitivity on visual function and the interpretation of test results are often poorly understood by nondomain experts. This presentation aims at bringing some clarity on the role of contrast sensitivity, inform on testing methods, and assist with the interpretation of contrast sensitivity tests results to support aeromedical decision making.

Learning goals:

- Learn about contrast sensitivity function.
- Learn about testing and interpretation of contrast sensitivity tests results.
- Assist Medical Examiners in making sound aeromedical decisions.

Long-COVID in ADF Aircrew and Controllers | Dr Richard Costelloe

Dr. Richard Costelloe is an Aerospace Medicine Registrar with the Royal Australian Air Force, at the Institute of Aviation Medicine. Richard has completed USAF Flight Surgeon training, and the Diploma of Aerospace Medicine at King's College London. He studied medicine at the University of Notre Dame Sydney and is a Fellow of the Royal Australian College of General Practitioners. Curious about flight, beginning as a toddler picnicking at Kingsford Smith, he is currently interested in the challenges that flight and diseases place on the aviator. His current research explores the cognitive impacts of COVID-19 in aviation related roles.

The proposed presentation would centre on the findings and implications of the 2023 IAM Study of Long-COVID in ADF Aircrew and ATC's, based on a survey of > 1000 individuals, with statistical and qualitative analysis of 314 respondent's reported impacts.

Implications and Importance:

In broad strokes, the study has demonstrated that ~ 10-20% (depending on symptom) aviators report returning to aviation duties in the first 4 weeks post infection, whilst still significantly impacted (physically and cognitively) by the effects of COVID.

A significant proportion continue to do so greater than 12 weeks post (~2-5%)

Some report long term, career altering impacts (failure to complete training/remuster/discharge).

Take Home Messages:

- Reaffirms that COVID-19 remains a serious multisystem disease with overt and subtle impacts to health and performance of Aviators, in a predominately healthy cohort.
- The reported impacts are aeromedically significant from a safety of flight perspective.
- Adequacy of controls and the potential reasons.
 - Inadequate screening processes (particularly occupational cognitive screening in highly competent/highly technical people/roles).
 - Non-disclosure (trust of medical system)
 - Cultural (e.g. ?persistence to achieve mission)
- The implications are significant for Military and Civilian DAME's AVMO's and Aviators in general.
 - The Survey offers a Novel Occupationally Relevant Cognitive Screening Questionnaire, Specific to Aircrew and Air Traffic Controllers. This was achieved by mapping common occupation task questions to Neurocognitive domains such as Executive Function. The which may offer an alternate consultation tool for clinicians to utilise in this cohort.

1610 - 1730 (SESSION 3)

GRAVITY IS OVER-RATED

The Australian Antarctic Deep Field Traverse: A Unique Space Analogue for Planetary Body Exploration Missions | Dr John Cherry

Dr John Cherry is a Director of the Australasian Society of Aerospace Medicine (ASAM) and the Chair of ASAM's Space Life Science Committee. He is a member of the Australian Space Agency's Applied Space Medicine and Life Sciences Technical Advisory Group, and a delegate for the Agency's Australian Civil Space Delegation to the European Space Agency. He has previously worked for NASA and European Space Agency developing medical support and training for astronauts, and he holds a position as a Senior Lecturer in Space Medicine for the University of Tasmania. He remains actively engaged in Space Medicine research and works as a Rural Generalist with the Australian College of Rural and Remote Medicine. He also works as a Head Office doctor for the Australian Antarctic Division having completed an over-winter deployment with the Australian Antarctic Program in 2021 as an Antarctic Medical Practitioner. He has recently returned from a deep field deployment to Antarctica as a Field Leader and Antarctic Medical Practitioner to Little Dome C, one of the most isolated and challenging environments on Earth. Prior to medicine, he worked as an Astrophysicist, commercial helicopter pilot, high school science teacher, and expedition leader.

After nearly four decades, the Australian Antarctic Division is actively developing a new deep field traverse capability to support scientific research in isolated and remote Antarctic locations. The current focus of the traverse capability is the development and sustainment of the Million Year Ice Core Project at Little Dome C, an isolated region of Antarctica approximately 1,200km inland from Casey Research Station. The Million Year Ice Core Project is one of the most ambitious and challenging projects ever undertaken in Antarctica, with a plan to drill an ice core in the world's oldest ice to gain a continuous record of the earth's climate and atmospheric composition stretching back more than one million years.

This world-leading science requires a deep field traverse capability to deliver infrastructure, equipment and resources to the isolated drill site by undertaking a challenging inland traverse of remote Antarctica. A new route to Little Dome C was proved in the 2022-2023 Antarctic summer season, and the route was utilised again in the recent 2023-2024 summer season to deliver 36.4 tonnes of essential cargo and infrastructure to the site.

The Antarctic traverse setting represents a unique space analogue environment for planetary body exploration missions. The team face extreme isolation with real operational challenges and risks, the setting necessitates increased autonomy and self-reliance, and the team are dependent on specialised technology and infrastructure for their survival.

Antarctica is a well-known space analogue environment but it has traditionally been utilised to develop science and technology to support mission profiles associated with low earth orbit and long-duration spaceflight. As international space agencies begin a new era of lunar and Martian exploration, the deep field traverse provides a new space analogue environment

which could support these endeavours, as planetary body exploration and Antarctic traverse teams face many similar challenges.

Space Tourism: Developing Medical Standards for Spaceflight Participants | Dr Brooke Ah Shay

Brooke is a specialist GP who works in remote Aboriginal health, with a particular interest in medicine in remote and extreme environments. She is the RACGP Chair of Aerospace Medicine and a Designated Aviation Medical Examiner. Brooke has a Graduate Diploma in Healthcare in Remote and Extreme Environments and is currently finishing her Master of Public Health and Tropical Medicine, as well as working towards a Diploma in Aviation Medicine. Outside of work, Brooke is the holder of a fixed wing private pilot's license, writes about extreme medicine for The Medical Republic and is an expedition medic.

Below is the abstract from a paper (literature review) that I have submitted to the Australasian Journal of Aerospace Medicine, which is awaiting further review from the editor. The purpose of writing this paper was to synthesise the publicly available information on the medical standards for space tourism (both suborbital and orbital) and highlight the current knowledge gaps, as well as make recommendations on future directions in this field. To my knowledge, this is the only paper of its kind.

In the presentation, I plan to expound upon the key findings and recommendations of my review (summarised below) supported by slides.

“Suborbital and orbital space tourism is a burgeoning industry, with several private companies having launched passenger-containing spacecraft in recent times. With the development of the commercial space industry comes the consideration of medical clearance for spaceflight participants (SFPs). There are very little data available to guide aerospace physicians on providing medical clearance for SFPs and multiple factors to consider of the space and spacecraft environment that can affect human health. No medical standards exist for SFPs, but multiple guidelines have been written over the years to aid in physician decision-making. Preliminary studies suggest that many pathologies may be compatible with suborbital and orbital commercial spaceflight. There are many medico-ethical grey areas that are yet to be resolved. Companies must decide how to balance risk and safety, and SFPs need to be well-informed so that informed consent can be given. However, ongoing industry self-regulation is not appropriate and universal medical standards for SFPs should be established, in addition to an independent international regulatory body with oversight. The best way for medical standards to be developed is by research and the data obtained by ongoing commercial space travel.”

Beds, Butts and the Blue Danube: The Effect of Artificial Gravity on Gluteal Muscles During 60-Day Head-Down Tilt Bed Rest | Dr Vienna Tran

Growing up in suburban Adelaide, Vienna became fascinated with the light-polluted night sky visible from her backyard. When she discovered that she could combine her passion for space with her medical degree, she went on to research the effect of artificial gravity on the hip muscles during prolonged bedrest, for which she earned a First Class Honours as part of an international team. Vienna is currently a registrar with the Australian College of Rural and

Remote Medicine (ACRRM), undertaking her Diploma of Rural Generalist Anaesthetics. She has worked for the Australian Space Agency to help develop the first Applied Space Medicine and Life Sciences roadmap. She was the winner of SQLDR Lana Davies Memorial Award in 2023 for her early-career contribution to aerospace medicine. Outside her day job, you will find her giving a school talk about space, conducting medicals as the local DAME or running on the trails.

Exposure to spaceflight and head-down tilt (HDT) bed rest leads to decreases in the mass of the gluteal muscle. Preliminary results have suggested that interventions, such as artificial gravity (AG), can partially mitigate some of the physiological adaptations induced by HDT bed rest. However, its effect on the gluteal muscles is currently unknown. This study investigated the effects of daily AG on the gluteal muscles during 60-day HDT bed rest. Twenty-four healthy individuals participated in the study: eight received 30 min of continuous AG; eight received 6 × 5 min of AG, interspersed with rest periods; eight belonged to a control group. T1-weighted Dixon magnetic resonance imaging of the hip region was conducted at baseline and day 59 of HDT bed rest to establish changes in volumes and intramuscular lipid concentration (ILC). Results showed that, across groups, muscle volumes decreased by 9.2% for gluteus maximus (GMAX), 8.0% for gluteus medius (GMED), and 10.5% for gluteus minimus after 59-day HDT bed rest (all $p < 0.005$). The ILC increased by 1.3% for GMAX and 0.5% for GMED (both $p < 0.05$). Neither of the AG protocols mitigated deconditioning of the gluteal muscles. Whereas all gluteal muscles atrophied, the ratio of lipids to intramuscular water increased only in GMAX and GMED muscles. These changes could impair the function of the hip joint and increased the risk of falls. The deconditioning of the gluteal muscles in space may negatively impact the hip joint stability of astronauts when reexpose to terrestrial gravity.

Skin Microbiome Considerations for Long Haul Space Flights | Dr Gabrielle Caswell

Dr Caswell holds fellowships with ACRRM, RACGP and ACAM. She provides services as a CASA DAME, skin cancer practitioner, laser and cosmetic medicine over a large geographical spread. Dr Caswell she is trained in disaster management, altitude medicine and media communications.

In addition to her medical career and medical post-graduate awards, she holds a Master of Arts (Cultural Astronomy and Astrology) from Trinity Saint David College, UK and a Master of History from UNE, Australia.

Dr Caswell is accomplished molecular biochemist with a special interest in Earth bound molecules and their molecular behaviour in altered gravity environments. Her theoretical interests extend to quantum biology and its affect on human space travel. She has stewardship of a Masters and PhD program in the EU focused on space health and human factors.

Dr Caswell owns Space Port Australia, an independent research hub focusing on space health and human factors.

Dysbiosis of the human skin microbiome has long been associated with changes to the pH of the skin, dermal immune function and chronic skin conditions. Dermatological issues have

been noted as the most prevalent medical presentation in the microgravity environment of space. The change in gravitational forces has been implicated in human immunosuppression, also impacted by changes in the gastrointestinal-skin axis and its impact on Vitamin D metabolism, altered microbial gene expression in resident flora (leading

changes in biofilm formation) and increased virulence factors in potential pathogens. There are also other stressors to the skin microbiome unique to space travel, including increased exposure to radiation, prolonged periods of dry washing technique, air quality and changes in microbe replication and growth parameters. Optimal microbiome health leads to enhanced skin barrier

manufacture and maintenance, along with improved skin immune function and healing. In a microgravity environment expected to be experienced during long space flights, disruptions to the skin microbiome, coupled with increased

virulence of pathological viruses and bacteria has implications for holistic skin health, astronaut cognitive function and mental health, and is coupled with slowed rates of wound healing. Scenario management for holistic skin health and restoration of microbiome homeostasis on long space flights require consideration.

SATURDAY 30 MARCH 2024

REGULATORS DAY – PANEL DISCUSSIONS

This panel brings together international experts from the airline industry and national aviation authorities to discuss current and evolving issues in aerospace medicine.

The panel will cover four key topics, each of which provides insights into the current approach, issues, and strategies. The panels will encourage respectful interactive discussions with questions from the audience invited as part of each session.

Neurodiversity – Focus on ADHD

ADHD is increasingly being diagnosed in young people who aspire to go on to a career in the aviation industry or as a private pilot. It is also becoming more prevalent as a later diagnosis in adulthood for people who have been living with symptoms for many years. Both these issues bring challenges for the aeromedical regulator and the industry. Problems around diagnostic accuracy and degrees of impairment, use of medications including stimulants, and the difficulty with risk assessment in the presence of non-impairing symptoms and medications. This panel will invite regulators to share their experience and expertise in how to respond to this evolving aeromedical challenge.

Healthcare Avoidance and Non-Disclosure

Ground-breaking research by Dr William Hoffman et al has provided a detailed insight into the way pilots with medical conditions approach the management of their conditions and their medical certification obligations. Knowing that a significant proportion of pilots delaying health care and withholding information from the regulators, it is now beholden on the industry to accept these findings as a safety-critical matter that must inform our approaches to medical certificate management. This panel will discuss how the risk of health care avoidance and non-disclosure adds to the aeromedical risk assessment picture, and how we can include this consideration in regulatory decision-making.

How Safe Is Unsafe? Acceptable Levels of Risk

Aviation is considered to be a global leader in the principles of risk assessment and safety management. Many other industries such as medicine and mining have adopted the principles that were first introduced in aerospace manufacturing, engineering and human performance. As a sub-set of the aviation industry, the aerospace medicine specialist group is being challenged to achieve a similar level of compliance with risk assessment and safety management processes and outcomes. This panel will discuss the reasons that aerospace medicine may be different from engineering; the barriers to achieving the same levels of compliance; and how the aerospace medicine speciality might approach the expectations that are now being demanded of them across the rest of the aviation industry.

Operational Assessments - An Industry View

The airline industry relies heavily on aviation regulators and on aviation medical examiners to maintain their workforce of pilots and controllers, both from a compliance perspective and

from a health prevention, surveillance and maintenance perspective. This panel provide an opportunity for senior aerospace medicine representatives from international airlines to discuss the challenges, opportunities, barriers and strategies that may support the cooperation between the airlines, regulators, medical examiners and medical certificate-holders.

MONDAY 1 APRIL 2024

0830 - 0950 (SESSION 4)

AUDACIOUS AVIATION MEDICINE

Helicopter Mustering – Stories from the Bush, Managing Aeromedical Risk for the Cattle Hands Who Became Pilots | A/Prof Michael Clements

A/Prof Michael Clements is a general practice owner who served with the RAAF before transiting to reserves and settling down in Townsville in 2013. Michael's special interests are veterans health and providing rural and remote outreach clinics to the Lower Gulf region of North West Queensland.

Michael undertook the UK Diploma in Aviation Medicine in 2010 and was one of the first trainees examined for the ACAsM Fellowship and was a previous award winner of the Eric Stephenson Award. In addition to running 3 private practices Michael flies his Cirrus SR-22 to conduct medical clinics and serves on the Board of RACGP as National Rural Chair.

Cattle stations in Australia can cover more land mass than an average European country and this means helicopter mustering has become a central part of our world class cattle industry. It has been said that it is easier to teach a cattle hand to become a pilot than it is to teach a pilot how to read and direct cattle behaviour so the ideal helicopter musterer is often happier in the dust and dirt and smell of a cattle yard than they are in the cockpit.

The operational risks of helicopter mustering have been well explored through CASA safety publications and this has led to a number of useful operational guidelines and protocols being available to increase the safety profile for operators. The human factor considerations have been less well described particularly in terms of the personality type of pilots who seek out this type of work.

The author conducts a large number of aviation medicals for helicopter musterers in North West QLD and has observed common personality traits and behaviours that are worth exploring (and they are not always related to alcohol). This presentation will discuss some of the protective and some of the high-risk human factor considerations in this pilot group which can serve to further support DAMEs and regulators in aeromedical decision making.

A Case Series Showing the Challenges of Delivering Medical Care in the Aerospace Setting and the Resulting Changes in Practice | Dr Mina Arsanious

Dr. Mina N. Arsanious is an Egyptian-born UK anaesthetic registrar with a background in Emergency Medicine and Intensive Care. He has worked in the pre-hospital setting throughout his career as an expedition doctor in various high altitude, desert and tropical environments such as Mt. Kilimanjaro and Mt. Kinabalu, the Costa Rican and Bornean jungles as well the Saharan desert. Of note he made it through the initial rounds of astronaut selection for the European Space Agency in 2022 and has served as a peer-reviewer for submissions to the 2024 Aerospace Medical Association convention in Chicago, USA. Last year he completed the diploma in Delivery of Medical care in Conflicts and Catastrophes

(DMCC) with the Royal Society of Apothecaries, during which period his interest in aeromedical retrieval was ignited. He is currently pursuing this particular passion in NSW Australia, working with the Royal Flying Doctors Service as a Retrieval Medical Officer.

Case-based learning from a UK anaesthetist working for RFDS, demonstrating how hospital medicine doesn't always translate neatly into the aeromedical setting - and ways to adapt:

A 64yoW with pneumopyelitis complaining of worsening pain on take-off illustrates the effects of vibration & the hypobaric environment on pathology.

A 47yoM with profound sepsis from infective endocarditis with mitral regurgitation demonstrates the haemodynamic changes with g-force of landing and take-off.

A 24yoM intubated and ventilated for airway burns, had a protracted retrieval time: all landing sites near the receiving hospital were closed due to weather – alternative out-of-state facilities were contacted whilst trying to keep the patient safely anaesthetised.

A 76yoM with myocardial infarction post-operatively, decompensated precipitously during a particularly turbulent descent while the cabin (including all medical equipment) was secure.

Whilst retrieving a 12yoF diabetic with labile blood sugars – inflight measurements weren't available as the blood sampling equipment had overheated whilst the plane was on the tarmac in 44°C ambient heat.

These cases personally managed, illustrate key learning points:

Gas expansion is a consideration in all relevant cases not just respiratory pathology. Pain on take-off with a ground-level cabin likely reflects vibration rather than hypobaric expansion, the effect of which shouldn't be underestimated.

Inflight echocardiography can be used for dynamic cardiac output monitoring to titrate vassopressors & inotropes against fluid resuscitation in the context of haemodynamic instability.

Preparing sufficient medications, restocking whenever possible and using adjuncts like magnesium to draw out paralysis can extend the period of safe anaesthesia.

Making 'deterioration plans' to reflect changes with g-force prior to landing and take-off allows the team to prioritise what equipment can be kept to hand opposed to in the aft-hold during a secure cabin.

Delicate equipment can be kept in a cool-box with reusable ice blocks to prevent overheating during retrievals.

Aerospace Medicine in Latin America- Current Situation, Challenges and Future Cooperation Opportunities | Dr Alejandro Fandino

Otolaryngologist, rhinologist. Candidate for the Masters in Aviation Medicine, University of Otago.

More than half of the people in the Western Hemisphere live in Latin America and the Caribbean. Based on United Nations estimates, the current population is currently over 600 million. This massive population, along with its varied and challenging topography, have made aviation an essential means of transporting passengers and cargo. This, in turn, has produced some important manufacturers and carriers such as Embraer, TAM, LATAM airlines, Aeromexico, Avianca, among others. Within the last decade, Latin America has seen substantial growth within the aerospace industry, with fleet expansion of major airlines and the birth of multiple low-cost carriers.

Latin America has also seen growth in the space sector, with organizations such as the Brazilian Space Agency, Mexican Space Agency, Chilean Agency of Space and the Argentinian National Commission for Space Activities at the forefront of space-related matters.

This growth has meant a simultaneous development of Aerospace Medicine in Latin America, with the creation of associations and meetings that bring together experts in the field of several Latin American countries, such as the Iberoamerican Association of Aerospace Medicine (AIMA) and the 2nd International Congress of Aerospace Medicine, which was held in the city of Bogota, Colombia in 2023.

Since Air New Zealand stopped operations in Argentina, LATAM and Qantas are the only carriers that operate direct flights from Australasia to Latin America. However, given the rapid expansion of the Latin American aerospace market, it is not unreasonable to consider that more routes may open in the near future. This expansion may increase the interest of aerospace medicine specialists from Australasia and Latin America in cooperating and learning from each other.

This poster or presentation will show an updated description of the current state, the challenges, and the possibilities of international cooperation with Australia and New Zealand in the Aerospace Medicine field.

The Hazards of Flying in the Southern Alps of NZ | Dr Dave Baldwin

Dr Dave Baldwin, author of men's health guide Healthy Bastards, is a GP based in Bulls who operates New Zealand's first and only Flying Doctor service, providing a medical aviation service to pilots in remote areas of New Zealand.

The Bulls Flying Doctor Service is a mobile aviation medical service for pilots working in remote areas around New Zealand's beautiful Southern Alps. Presentations about its initial development and subsequent success in creating a viable dream job for an avmedico, which combines an aviation medical practice with mountain flying, have been presented at ASAM conferences in 2001 and 2021.

However the BFDS is not without risk! The aircraft used for the BFDS "ward rounds" is done in a small, but powerful Cessna 172 XP. It has been upgraded to fly both high level IFR and low level VFR STOL to allow for work to be done using small bush airstrips. Both the IFR and VFR flying done by the BFDS in the Southern Alps have their own set of risks and in this presentation I will outline some of these scenarios (this will include awesome video footage

of the Southern Alps taken from my Cessna). I will then go on to reiterate, that if aircraft crashes eventuated from any of these scenarios, just how difficult it would be for Crash Investigations to determine the cause.

1010 - 1130 (SESSION 5)

BREAKING NEW GROUND TO STUCK IN THE MUD?

Genetics, Genomics and Travel Health | Dr Jonathan Cohen

Dr Jonathan Cohen is the Medical Director of Travel Clinics Australia, the national association of over 30 travel clinics. He holds a Certificate of Travel Health (CTH) with the International Society of Travel Medicine, Fellow of the Australasian College of Tropical Medicine (FACTM), Fellow of the international Society of Travel Medicine, DAME, Honorary Senior Fellow, Dept of Paediatrics, University of Melbourne

Honorary Research Associate, Diagnosis and Development, VCGS/MCRI. Dr Cohen works in full time clinical practice in Melbourne and also as a consultant to a number of national and international organizations. He has authored over 80 articles and publications and presents regularly on travel health both nationally and overseas.

The increasing availability of genetic testing is significantly altering our approach to medicine and travel health in particular. Some examples of how genetics impacts travellers and decision-making about prevention and management will be discussed including altitude sickness, pharmacogenomics, malaria and venous thromboembolism.

Clearance for Takeoff: Navigating Aeromedical Considerations for Aviators on Novel and Emerging Therapies | Dr Sarita Dara

Sarita Dara is a Senior Medical Officer with Civil Aviation Authority of New Zealand (CAA NZ). She has been practicing regulatory aviation medicine with CAA NZ for the past 6 years. Prior to this role, Sarita has been an aviation medical examiner for civil aviation authorities of New Zealand, Australia and Singapore. She was the Lead Designated Medical Examiner and Head of Aerospace Physiology and Human Factors at Singapore Aeromedical Centre and was involved with aerospace medicine education, simulations as well as clinical aerospace medicine and human factors in both civilian and military setting for over a decade. She is an Academician with the International Academy of Aviation and Space Medicine, a Fellow of the Aerospace Medical Association FAsMA(US), a Fellow of the Royal Aeronautical Society FRAeS (UK) and a Fellow of the Australasian College of Aerospace Medicine FACAsM.

Advancements in medical therapies presents promising opportunities for enhanced patient care, and their integration into the aeromedical landscape demands a comprehensive understanding of potential challenges and proactive consideration of the factors that are in the best interests for individuals without compromising flight safety. The introduction of novel pharmacological interventions, gene therapies, and immunotherapies has been a gamechanger in improving outcomes in many diseases.

Aeromedical certification considerations for aviators undergoing new treatments present a complex intersection of medical advancements and aviation safety. As medical science progresses, aviators may explore innovative treatments to optimally address their health issue. However, these endeavors introduce challenges that demand meticulous evaluation and adaptation within the aeromedical framework.

For any novel treatment, besides assessment of efficacy of a treatment, there are concerns about potential side effects. There is often limited knowledge base available for some of the emerging therapies. The aeromedical assessment must navigate the delicate balance between medical efficacy and the impact on an individual's ability to safely perform flight duties. Assessing the pharmacological profile of a new therapy needs to consider factors such as fatigue, cognitive and perceptual effects and the potential for adverse reactions at altitude.

This talk explores the aeromedical considerations associated with novel and emerging therapies, focusing on the intersection of medical innovation and air transportation. An adaptive principles based framework will be discussed, this could apply to consideration of any medical therapy. Some case examples of novel therapy will be presented, where certification has been carefully considered and made possible.

The integration of innovative therapeutic advancements into the realm of aviation demands a nuanced approach that prioritizes both individual health and flight safety. Navigating the challenges involves developing and establishing adaptive frameworks that prioritize thorough evaluation of novel therapy along with collaborative input from medical experts and ongoing monitoring.

The Role of the Airline Pilot-Physician | Dr Tony Schiemer

Tony is an Australian airline pilot, medical doctor and engineer. He is a clinical lecturer with the University of Adelaide and holds specialist medical qualifications in aerospace medicine and general practice. He is a fellow of the Aerospace Medical Association, and is currently a pilot-physician for Air New Zealand, which involves duties as a company doctor as well as flying the De Havilland Canada Dash 8 as a line pilot. Previous experience includes research with the RAAF Institute of Aviation Medicine as a civilian Senior Aviation Medical Officer, which followed 14 years in uniform in the Royal Australian Navy. His interests are primarily in medical education, flight training and aircrew medical certification, as well as space and extreme environment medicine.

Pilot healthcare avoidance and non-disclosure is a challenging issue. Primarily due to concerns regarding loss of medical certification and the career impact this may pose, this longstanding phenomenon is relevant to both aircrew and aviation medicine practitioners alike. Recent studies from the United States suggest that more than half of all US pilots (with a similar percentage of a Canadian cohort) surveyed reported a history of forgoing or delaying medical care due to fear of certificate loss, and that upwards of 5% of US aviation accidents with fatalities (in 2015) were attributed to an undisclosed medical issue.

Acting as a bridge and interpreter between the two professional spheres of medicine and flight operations, the pilot-physician is an individual performing the duties of both a line pilot and an aviation medical officer/examiner. The benefits and challenges presented by such a role are varied, however a primary goal is allowing a more open dialogue between both parties regarding pilot health. This ideally would lead to earlier disease detection, improved chances of maintaining medical fitness and certification to continue flying and subsequently, increased aviation safety.

An established role within the United States Air Force, the pilot-physician is less likely to be found in civilian aviation operations around the world. This preliminary review aims to assess the benefits of such a role in existing programs and discuss the aims of roles more recently established within the Australian and New Zealand airline industry.

Where Can We Improve Detection of Mental Unfitness in the Aviation Industry ? Obstacles and Challenges | Dr Trang Dao

Training Med School, Université Paris VII

Residency, Université de Montréal

Fellowship, Harvard University

Positions McGill, 1990-2004

Santa Cabrini Ospedale, 2000 - 2022

Expertise Liaison Consultation

Trans-cultural Psychiatry

Aviation

Background:

Powerless and frustration affect all systems faced with the abstract, intangible nature of mental issues, including the aviation industry.

These subtle conditions insidiously sabotage smooth operations, productivity, and quality of life of affected subjects' entire working and family environments.

However, at every level of aviation systems, many obstacles to detection are seeding threats to safety, namely:

- . The low awareness of mental dysfunction of the entire system, predisposing to the domino effect of human factors' weaknesses.
- The rarity of training programmes adapted to workers' responsibility who may have the theoretical knowledge but not the skills to detect and safely handle emotional crisis.
- The lack of a multi-disciplinary collaboration between Peer Support Programme, Employee Assistance Programme, Aviation Medical Examiners, employees and employers;

- The lack of treatment corridors resulting in delays to mental care.
- And an embarrassing absence of psychiatrists in aviation.

Objectives:

- 1) Identify weakness and strength of mental health detection and management programmes in aviation.
- 2) Recognize the magnitude of under-detection, and consequently, the need of training multiple levels of aviation professionals for a sharper vigilance and an early detection of mental unfitness subtle signs.
- 3) Analyse strategies to minimise negative effects of mental disorders.

Discussions and Conclusion:

Highly performant professionals in any industry are not immune to mental issues which affect 1 out of 5 persons in the general population. Once identified, management of such issues will be straightforward.

However, in spite of the global call for improvement of mental issues management and a genuine political will to take control, we are still faced with challenges to detection.

Fortunately, many strategies can minimize the impact of undetected mental disorders upon everyone involved.