free survival was not available for the larger international melanoma database cohort. One of the key aeromedical concerns of melanoma is its ability to metastasise to virtually any organ or tissue and melanoma has the highest risk of brain metastasis among common solid tumours. As the incidence of brain metastasis increased with the stage and the risk remained elevated in the early years after diagnosis, stage specific 5-year cumulative incidence of CNS metastasis was used to estimate the risk of brain metastases. Brain metastases was given a 100% incapacitation risk weighting in risk of incapacitation estimation. Stage- specific annualised percentage risk of incapacitation for melanoma was calculated as a product of risk of recurrence in each year, risk of brain metastases and weighting factor of 100. **DISCUSSION:** Using the Civil Aviation Safety Authority (CASA) of Australia's acceptable risk threshold for aviation medical certification, AJCC 8th edition stage specific certification assessment guidance chart was developed based on the updated prognostic data. This presentation will cover the aeromedical concerns of melanoma, CASA's approach to aeromedical decision making of melanoma and the risk assessment guidance chart.

Learning Objectives

1. The participant will learn about the principles of aeromedical risk assessment of melanoma.
2. The participant will learn about the estimated risk of incapacitation for each stage of melanoma and when does the risk drops below the acceptable level of certification for advanced melanoma.

[111] PRESSURE URTICARIA IN A CAREER ENLISTED AVIATOR FOLLOWING A HIGH-ALTITUDE RAPID DECOMPRESSION

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U.S. Air Force, Joint Base San Antonio-Lackland, TX, United States

(Education - Case Study)

INTRODUCTION: This case report described pressure urticaria presentation in a airborne mission systems operators following a high-altitude rapid decompression. **BACKGROUND:** The patient was a 35-year-old male with no previous history of pressure related disorders. He had an insignificant flying physical prior to technical school and no DNIFs outside of acute colds or soft tissue injuries. He had roughly 1,700 hours at the time of the event. The patient was a regular high-altitude research subject for 9 months prior to the event. He had participated in 9 rapid decompressions to altitudes up to FL300 prior to the event. **CASE PRESENTATION:** The patient participated in a rapid decompression to FL450 in preparation for a planned high-altitude research activity. The patient had no adverse presentations immediately post-exposure and returned home. The next day, the patient woke up and was notified by his spouse of "lumps" along his back. The patient contacted the research coordinator and was advised to go to BAMC for a suspected decompression sickness presentation. He was dove in the hyperbaric chamber for 1.5 hours and put on steroids for two weeks by the treating flight surgeon. After the course of steroids, the patient experienced a return and increase in severity of symptoms. The patient was prescribed three different types of antihistamines to be taken twice daily. The patient experienced relief from symptoms but severe degradation in quality of life. During this time, the patient was diagnosed with uncontrollable pressure urticaria. **DISCUSSION:** Under treatment by a flight surgeon, the patient was prescribed cyclosporine which was unsuccessful, but also started a waiver process prematurely. The patient was disqualified by the MAJCOM SGP and ultimately prescribed Xolair (300mg) to control his symptoms.

Learning Objectives

1. The audience will learn about development of pressure urticaria following a rapid decompression.
2. The audience will learn about treatment following pressure urticaria in a career enlisted aviator.

[112] UK CAA'S UPDATED HIV POLICY AND REVIEW OF UK LICENSED PILOTS LIVING WITH HIV

Ewan Hutchison
UK Civil Aviation Authority, Crawley, United Kingdom

(Education - Program/Process Review)

BACKGROUND: The UK CAA initially published guidance for the assessment of pilots living with HIV in 2008. There have been significant advancements in the management of HIV since, with improved life expectancy and quality of life. From 2015, all people with newly diagnosed HIV infection in the UK are offered anti-retroviral therapy (ART). As a result, most applicants applying for certification now have short periods between seroconversion and commencing therapy, normal CD4 counts and undetectable viral loads. **OVERVIEW:** Fitness assessments for aeromedical certification are based on assessing functional ability and incapacitation risk associated with any medical conditions an applicant has declared. With HIV seropositivity, the risks arise from secondary infections/AIDS defining conditions and associated co-morbidities such as mental health conditions, cardiovascular disease and the adverse effects of medication. There are also concerns about the development of neurocognitive impairment (NCI) and a number of risk factors have been identified for this. The UK CAA has updated its policy for assessing applicants living with HIV with co-operation and expert input from the British HIV Association. It is possible for applicants with well controlled infection, no demonstrable NCI and/or low risk for developing NCI to obtain unrestricted Class 1 certification. Publishing our guidance improves the transparency of our assessments and helps applicants living with HIV to make decisions about training for a commercial pilot's licence. The UK CAA announced a period of reset, where certificate holders who had previously failed to declare their HIV seropositivity could do so without risk of enforcement action. The medical history of 28 Class 1 applicants/certificate holders living with HIV, including 18 currently flying, were reviewed against the new policy. **DISCUSSION:** The issuance of medical certificates to applicants living with HIV who wish to start training for a commercial pilot's licence remains controversial in some parts of the world, as does the need for regular formal neurocognitive testing. We believe that the UK policy provides a safe and pragmatic assessment of fitness and makes it more likely that pilots will declare their status so that they can have a proper and fair assessment of their fitness.

Learning Objectives

1. The audience will learn about the risk factors for incapacitation that arise from HIV infection.
2. The audience will learn about the UK CAA's updated policy for assessing fitness of applicants living with HIV.

Monday, 05/22/2023 ***4:00 PM***
Napoleon Ballroom C1-C2

[S-21]: SLIDES: NEW ANGLES IN HUMAN SYSTEMS INTEGRATION

Chair: Jamie Harvey
Co-Chair: Connie Ramsburg

[113] INFLUENCE OF SEAT BACK ANGLE AND FLIGHT JACKET WEAR ON WORK OF BREATHING

Ross D Pollock[1], Mani Coonjobeeharru[1], Ilya Bychkov[1], Leann Maanum[1], Aiden Coffey[2], Camille Bilger[2], Gerreard F. Rafferty[1], Caroline J. Jolley[1], Peter D. Hodkinson[1], Thomas G. Smith[1]
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(Original Research)

INTRODUCTION: Altering the seat back angle in a fast jet may be considered as a mean to improve G-tolerance or comfort, however, the altered gravitational vector could increase work of breathing (WoB). The additional mass of a flight jacket and the items stored within it could further increase this load. Given the suggested relationship of some unexplained physiological events with WoB and the potential for seat back angle to influence this the current study aimed to determine the effect of seat back angle and flight jacket mass on WoB. **METHODS:** Eight healthy participants (3 males, 5 female) were secured in an ejection seat reclined to 20°, 35° and 50° using a 5-point harness. Testing was performed with and without a flight jacket which had a 5kg mass distributed in 2 pockets over the lower thorax. A gastro-oesophageal pressure catheter was used to determine transdiaphragmatic pressure-time-product (PTP_{di}) providing an index of WoB. Neural respiratory drive index (NRDI) was determined from surface electromyography of the parasternal intercostal muscles. Tidal volume (Vt), respiratory rate (RR) and minute ventilation (Ve) were recorded using a pneumotachograph. Each test condition lasted 3 mins with the participant breathing normally. All procedures were approved by a local ethics committee. **RESULTS:** PTP_{di} increased significantly (up to 60%) with more reclined seat back angles. Wearing a flight jacket increased PTP_{di} by 38% at a seat back angle of 50°. No effect was observed at 20° and 35°. Overall NRDI was significantly greater when wearing a flight jacket but was unaffected by seat back angle. Seat back angle and use of flight jacket had no effect on any other respiratory variables. **DISCUSSION:** Overall, WoB was increased with more reclined seat back angles, and further exacerbated at greater angles of recline (50°) when using a flight jacket. There was minimal effect of wearing a flight jacket on WoB in more upright postures. If ejection seats with greater angles of recline are to be used consideration should be given to lowering or redistributing the mass of the flight jacket (and associated equipment) to limit the impact on WoB.

Learning Objectives

1. Understand the influence of ejection seat back angle on work of breathing.
2. Describe the influence of fight jacket use in combination with changes in seat back angle on work of breathing.

[114] BREATHING RHYTHM COMPLEXITY AS AN INDICATOR TO RESPIRATORY COMPROMISE FOR FUTURE FLIGHT DECK SYSTEMS

Nicholas Napoli[1], Jeremy Prieto[1], Rheagan Pratt[1], Chad Stephens[2], Kellie Kennedy[2]

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(Original Research)

INTRODUCTION: Detecting the impact of respiratory loads and stressors on the respiration system is critical to understanding the dynamics within the respiratory system and the stresses imposed on the human within flight deck systems. Analysis of breathing rate, frequency, and period has been a commonly conflated terminology that is utilized in evaluating breathing. We propose a new approach to analyzing respiratory compromise using the induction of hypoxia, called Breathing Rhythm Complexity. **METHODS:** Professional pilots served as test subjects (n=57, 49 males) in a study involving simulated altitudes of sea level (21.0% O2) and 15,000 feet (11.2% O2) induced by an Environics, Inc. Reduced Oxygen Breathing Device (ROBD). Each subject experienced both non-hypoxic and hypoxic (SPO2 <= 95%) exposures while performing three 10-minute tasks (computerized neuropsychology tests, computerized multitasking battery, and fixed-based flight simulation). The quantitative approach leverages our understanding that the respiratory signal is not composed of a pure sinusoidal wave. The waveform is decomposed at its zero-crosses to calculate individual inspiratory and expiratory times. The difference between these times is calculated using sample entropy, producing Breathing Rhythm Complexity. **RESULTS:** Preliminary results comparing the hypoxic and non-hypoxic cohorts demonstrated no significant changes in time of inspiration and time of expiration variance and complexity (sample entropy). However, when observing respiratory rhythm complexity, a comparison between the cohorts demonstrated significant changes in respiratory rhythm complexity (sample entropy), achieving $p < 0.0214$. **DISCUSSION:** The preliminary results indicate the induction of hypoxic events and their impact on breathing rate, frequency, period, and rhythm under respiratory stress. The implications of these results suggest that a subject's breathing rate, frequency, and period may not always distinguish respiratory stress, but the dynamic nature of the breathing rhythm can. This understanding of breathing rhythm complexity can provide beneficial information into the nature of how human physiological systems (e.g. respiration) compensate under respiratory stress.

Learning Objectives

1. [The audience will learn about...] the importance of breathing rhythm complexity and its impact on respiratory compromise.
2. [The audience will learn...] the importance of extrinsic loads and environmental factors, such as hypoxia, and their impact on the respiratory system.

[115] ENDOTRACHEAL INTUBATION EFFICACY IN HELICOPTER CABIN VS. GROUND: A SYSTEMATIC REVIEW AND A META-ANALYSIS

Lydia Johnson Kolaparambil Varghese[1,2], Jochen Hinkelbein[3], Edoardo De Robertis[4], Jan Schmitz[3]

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(Original Research)

BACKGROUND: Pre-hospital endotracheal intubation (ETI) is a sophisticated procedure with a comparatively high failure rate. Especially, ETI in confined spaces may result in higher difficulty, longer times, and a higher failure rate. The aim of the present study was to analyze if HEMS intubation success and time are influenced by noise, light, restricted space in comparison to the ground intubation. The availability of literature reporting these parameters was very limited, thus we analyzed the reported differences between ETI in helicopter vs. ground by confronting parameters such as time to secure airway, first attempt success rate, visual Analog Scale (VAS) and Cormack-Lehane Score. **METHODS:** PUBMED, Cochrane Library and Ovid were consulted to perform a systematic review and meta-analysis in October 2022. Randomized control trails (RCTs) comparing ETI in helicopter to ground were included in the meta-analysis. The study was registered at the International Prospective Register of Systematic Reviews (PROSPERO) with number CRD42022361793. The database search provided 1049 studies, of which 3 studies met inclusion and quality criteria for the meta-analysis. **RESULTS:** The mean duration of intubation on helicopter was around 17,65 seconds vs. the 18,83s on ground. The median time to secure airway ± SD on helicopter was 217,00 s ± 16,00 vs 184,50s ± 46,50 on ground. The mean ± SD of the Visual Analogue Scala (VAS) on helicopter was 2,00 ± 1,00 vs 2,40 ± 0,40 on ground. Cormack-Lehane Score saw instead a mean ± SD of 1,33 ± 0,33 on helicopter compared to 1,26 ± 0,26 on ground. The difference of intubation success between each seems not to be significant. **CONCLUSION:** Further research is needed to assess the impact of environmental factors on the quality of ETI on HEMS.

Learning Objectives

1. The audience will learn about the differences in the airway management between a helicopter cabin and ground.
2. The participant will be able to learn the factors impacting the ETI in both environments, and the efficacy of each.

[116] DERIVING HELMET SYSTEM MASS PROPERTY REQUIREMENTS THAT MITIGATE AIRCREW NECK PAIN

Philip Farrell

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