

20-22 SEPTEMBER 2018, PRAGUE

6TH EUROPEAN CONGRESS IN AEROSPACE MEDICINE



"Trust and Care in Aviation Safety"

Welcome to Prague and the 6th ECAM. The Scientific Programme has been designed to reflect the ethos and emphasis of ESAM, including AsMA and our Czech hosts. The panel sessions are intended to educate, challenge and stimulate discussion and debate. The final phase of each session is dedicated to discussion from the floor and includes the participation of the presenters. Further debate and networking will happen around the coffee breaks etc.

As in previous years, the primary focus is the aerospace medicine professional, such as AME's, whether spending 5% or 95% of their professional lives in Aerospace Medicine. The programme is designed to flow through many of the Hot Topics in Aerospace Medicine from; Cockpit to Infinity; Aviate to Regulate; Pilot to Drone and Risk Assessment to Philosophy.

There is something in this ECAM for everyone touched by Aerospace Medicine.

I trust you will benefit and enjoy your experience of ECAM 6, Prague.

Declan Maher.
Chair, Organising Committee

A cooperation between

Aerospace Medical Association (AsMA),
The Czech Association of Aerospace Medicine
The Czech Institute of Aviation Medicine
The European Society of Aerospace Medicine (ESAM)

CME CREDITS

The 6th ECAM is designated for up to 17 hours of European external CME credits.

Each medical specialist should claim only those hours of credit that he/she actually spent in the educational activity



All Organising and Programme/Scientific Committee members associated with the development of content for this activity have signed appropriate disclosure forms and reported no relevant financial relationships.

PROGRAMME Outline

THURSDAY 20TH SEPTEMBER 2018

12:00	Opening Address – Venue: Rais Hall	Presidents ESAM, AsMA, Czech Aeromedical Society
12:30 – 15:00	Opening Lectures – Venue: Rais Hall	CHAIR: Roland Vermeiren
12:30 – 13:30	Opening Lecture 1 “Where the Earth touches the Sky” Above Everest: Science and Gliding Adventure	[1] Mr. Klaus Ohlmann
13:30 – 14:15	Opening Lecture 2 New Medical Technology and its consequences for Aeromedical Screening	[2] Melchor Antuñano, FAA
14:15–15:00	Opening Lecture 3 New Technologies in Commercial Air Transport	[3] Chris Redfern, Airbus
15:00 – 15:30	Tea/Coffee/Snacks Break – Venue: Maykovski Hall	
15:30 – 17:30	Session: Military and Civil Aerospace Medicine: where the twain shall meet – Venue: Rais Hall	CHAIR: Anthony Wagstaff, ESAM
15:30 – 16:00	Military and Civilian Aerospace Medicine: what can we learn from each other?	[4] Anthony Wagstaff, ESAM
16:00 – 16:15	The Safety of High Flight: Effects of Hypobaric Exposure Upon the Brain – Human Single Exposure Trial at 3 Years	[5] Paul Sherman, USAFSAM
16:15 – 16:30	Accelerated Cerebral White Matter Aging in a cohort of U-2 pilots and Air Force physiologists/chamber technicians	[6] John Sladky, USAFSAM
16:30 – 16:45	Determinants of Fighter Pilots’ Flight-related Musculoskeletal Symptoms in Early Flight Career	[7] Harri Rintala, University of Jyväskylä, Finland
16:45 – 17:00	Current Health Trends in Helicopter Pilots	[8] John Crowley, US Army Aeromedical Research Laboratory
17:00 – 17:15	Obstructive sleep apnea syndrome in aircrew members: the aeromedical assessment	[9] Jonathan Monin, French Military Health Service Academy
17:15 – 17:30	Molecular pathology in aircraft accident investigations	[10] Michael Schwerer, Air Force Centre of Aerospace Medicine Germany
18:30 – 20:30	Opening reception – Venue: Maykovski Hall	

FRIDAY **21TH SEPTEMBER 2018**

08:30 - 10:30		
IAASM Session: Implementing Commercial Human Spaceflight for Ordinary Citizens – Venue: Rais Hall		CHAIR: James Vanderploeg
08:30 - 08:50	Future Suborbital and Orbital Flight Operations	[11] Melchor Antuñano, FAA
08:50 - 09:10	Medical Screening of Spaceflight Participants at DLR	[12] Claudia Stern, DLR
09:10 - 09:30	Experience in the Medical Evaluation of 16 Orbital Spaceflight Participants	[13] Richard Jennings, UTMB
09:30 - 09:50	The legal, regulatory and medical foundations for commercial space tourism in the UK – the story so far and current and future challenges	[14] Stuart Mitchell, CAA-UK
09:50 - 10:10	Flight Crew Medical Standards and Spaceflight Participant Medical Acceptance Guidelines for Commercial Space Flight	[15] James Vanderploeg, UTMB
10:10 - 10:30	Discussion	
10:30 - 11:00	Tea/Coffee/Snacks Break Venue: Maykovski Hall – Posters Venue: Social Hall	
11:00 - 12:45		
Session: Pilot Mental Health: Enigmas feed Stigmas – Venue: Rais Hall		CHAIR: Ries Simons, ESAM
11:00 - 11:45	Clinical Readings of Aviation Accident Investigators' Reports: A Psychiatry Interactive Workshop	[16] Trang Dao
11:45 - 12:05	Psychiatric disorders and accident: limits of mental assessment in general aviation. (Case report.)	[17] Didier Delaitre, BEA, France
12:05 - 12:25	Pilot Peer Support Programmes: a Medical Perspective	[18] Ries Simons, ESAM, EPPSI
12:25 - 12:45	Just Culture in Aerospace Medicine: balancing safety, accountability and autonomy	[19] Diederik de Rooy, LUMC
12:45 - 14:15	Lunch	

14:15 - 15:55	Session: Vision and other aspects of aeromedical screening Venue: Rais Hall	CHAIR: Claudia Stern
14:15 - 14:35	Surgical Correction of Astigmatism of Senior Flying Staff: Clinical Outcomes after Implantation of Monofocal Toric IOL	[20] L.V. Novacek , Institute of Aviation Medicine, Prague
14:35 - 14:55	Retinal Artery Occlusion (RAO)/ Ischemic optic neuropathy (ION)/ Amaurosis Fugax (AF) and aeromedical considerations for certification.	[22] Ryan Anderton , UK Civil Aviation Authority
14:55 - 15:15	Bipolar Disorders: a challenge in the aeromedical fitness evaluation	[32] Simeone Izzo , Italian Air Force
15:15 - 15:35	Accreditation of Aviation-Psychologists	[24] Jörg Eidher , Austro Control GmbH
15:35 - 16:00	Discussion	
16:00 - 16:30	Tea/Coffee/Snacks Break Venue: Maykovski Hall – Posters Venue: Social Hall	
16:30 - 17:30	Session: Human Factors – Venue: Rais Hall	CHAIR: Eilis Boudreau
16:30 - 16:50	A Possibility of Human Voice Analysis as Method of Functional Mental State Evaluation in Aviators	[25] Oliver Dzvonik , Institute of Aviation Medicine, Prague
16:50 - 17:10	The interpretation of simulator test results in medical decision making.	[26] John Pitts , UK Civil Aviation Authority
17:10 - 17:30	Mental Health Examination Methods in Russia. Ways to Improve?	[27] Olga Verba , Aviation Medicine Doctors Association (AMDA), Russia
14:15 - 16:00	Parallel session: Aeromedical Examiners Refresher Course I Venue: Parlour 10	CHAIR: Trond Eirik Strand
16:00 - 16:30	Tea/Coffee/Snacks Break Venue: Maykovski Hall – Posters Venue: Social Hall	
16:30 - 18:00	Parallel session: Aeromedical Examiners Refresher Course II Venue: Parlour 10	CHAIR: Trond Eirik Strand

SATURDAY 22TH SEPTEMBER 2018

08:30 - 10:00		Session: Pilot Health – Venue: Rais Hall	CHAIR: Oldrich Truska
08:30 - 08:50	Bicuspid Aortic Valve Disease in pilots: single pilot, multi-crew or surgery?		[28] Fabrizio Palumbo, Aerospace Medicine Institute “Angelo Mosso”, Italy
08:50 - 09:10	Sudden (nonaccidental) Death among Czech Professional Civilian Pilots during last 25 years and a Fatal Case Report of Erdheim Disease		[29] Oldrich Truska, Civil Aviation Authority of the Czech Republic
09:10 - 09:30	Keratoconus – a Challenging Issue in Aeromedical Ophthalmology		[21] Veronika Polackova, Institute of Aviation Medicine, Prague
09:30 - 10:15	Keynote lecture: The hazard of drones to commercial aircraft operations		[34] Rob Hunter, BALPA
10:15 - 10:30	Discussion		
10:30 - 11:00	Tea/Coffee/Snacks Break Venue: Maykovski Hall – Posters Venue: Social Hall		
11:00 - 12:30		EASA panel: The limitations of regulation in a rapidly changing health environment – Venue: Rais Hall	CHAIR: Cristian Panait, EASA
11:00 - 11:20	Rulemaking challenges in combining two fast developing fields: aviation and medicine		[35] Cristian Panait, EASA
11:20 - 11:40	New tools for the appropriate AME’s oversight and evaluation of physical results		[36] Francisco Rios Tejada, AESA
11:40 - 12:00	Standardizing multiple national systems in aviation and medicine – challenges and limitations		[37] Janis Vegers & Virgilijus Valentukevicius, EASA
12:00 - 12:20	Difficulties and solutions attempting to harmonize global aviation medicine regulatory practices		[38] Ansa Jordaan, ICAO
12:20 - 12:30	Discussion		
12:30 - 14:00	Lunch		

14:00 - 15:30	Session: Onboard Medicine in Space- and Aircraft – Venue: Rais Hall	CHAIR: Felix Strollo
14:00 - 14:20	Introduction to ESAM Space Medicine Group	[39] Jochen Hinkelbein, ESAM-SMG
14:20 - 14:40	Cancer & Health Research In Space (CHRIS)- A Study on Glioblastoma in Microgravity	[40] Kolaparambil Varghese Lydia Johnson , University of Perugia
14:40 - 15:00	How to handle cardiac arrest in spaceflight – a guideline for cardiopulmonary resuscitation in microgravity	[41] Steffen Kerkhoff, University Hospital of Cologne, Germany
15:00 - 15:20	What kind of onboard medical equipment do healthcare pro- fessional volunteers use or expect in an inflight emergency? A study in one airline.	[42] Rui Pombal, TAP Air Portugal Group Healthcare Services
15:20 - 15:30	Discussion	
15:30 - 16:00	Tea/Coffee/Snacks Break Venue: Maykovski Hall – Posters Venue: Social Hall	
16:00 - 17:30	Session The Heart of the Matter – Venue: Rais Hall	CHAIR: Ries Simons
16:00 - 16:20	Advanced cross-sectional imaging in refining aircrew risk – the current and emerging role of cardiovascular CT and MRI	[43] Ed Nicol, NATO Cardiology Working Group
16:20 - 16:40	A 3D matrix as a help to assess the aeromedical risk: The premature ventricular complex example	[44] Olivier Manen, NATO Cardiology Working Group
16:45 - 17:00	Cardiovascular risk factors evaluation in air crew: Comparison between score calculators and empirical evaluation	[45] Sébastien Bisconte, Bordeaux Military Hospital
17:00 - 17:15	Safety management in cases of pilots who underwent coronary revascularization	[46] Elena Cataman, CAA Moldova
17:15 - 17:30	Prevalence of LDL-hypercholesterolemia and global cardiovascular risk in a population of 2,821 French aircrew	[47] Nicolas Huiban, French Military Health Service Academy
19:30	Drinks Reception – Venue: Francouzská Restaurace Art Nouveau	
20:00 - 22:30	Gala Dinner and After Party till midnight – Venue: Francouzská Restaurace Art Nouveau	

POSTER SESSIONS

Friday 21 + Saturday 22 September during all Breaks and Lunches

Venue: Social Hall

CHAIR: Trond-Eirik Strand

[48]	Marjan Bilban	Measles and measles-related risks among flight crew personnel and flight attendants
[49]	Gang Chen	Effect of aeronautical environment on biochemical markers of bone metabolism in aircrew members of civil aviation
[50]	Dingqiong Peng	Investigation on Bone Mineral Density in Airline Pilots of Civil Aviation
[51]	Hetty van Dijk	What do we have to do with pilots who have ADHD?
[52]	Margaret Grace	Aviation Podiatry: is there a Need?
[53]	Gizem Gülsuna	Face Off: Dietitian versus Obesity !
[54]	Jayashri Devi Sharma	Developmental Postures and Adaptations for Microgravity; Performance in Water, and Aero-Sports, for Aerospace
[55]	Syedda Uzma Khan	Spread of Infection during Air Travel among Aircrew
[56]	Carla Pontes	Return to work after cancer: Safety issues regarding innovative therapies
[57]	Carla Pontes	Taking corporate social responsibility to the next level in the airplane industry: Turning the Tide on Plastic
[58]	Andreas Nidos	Thinking and feeling inside the cockpit: Two-dimensional representation of psychological effect and cognitive error in the 100 most fatal civil aviation accidents.
[59]	Arthur Formanek	Microgravity Air Trap for Transfusion in Spaceflight
[60]	Zdzislaw Kobos	Achievements motivation and styles of coping with stress by aviation students during exams
[61]	Boris Oniščenko	Aeromedical training in Czech Air Force.
[62]	Harri Rintala	Glider pilots' psychologic performance on the way to World Championships
[63]	Kanzul Shafiq	Work-related musculoskeletal problems – Prevalence and Risk factors among PIA cabin-crew
[64]	Benjamin Stork	Obstructive Sleep Apnea in Army Aviators: a Review of current literature, demographic analysis and Pre-Publication Review of New Policy
[65]	Michael J A Trudgill	The United Kingdom Civil Aviation Authority (UK CAA) Aeromedical Examiner (AME) Audit programme
[67]	Andy Whale	The Inscrutable 1% Rule

Sunday 23 September 2018
11:00 - 13:00

ESAM General Assembly – **Venue:** Parlour 10



ABSTRACTS Programme

ABSTRACTS Programme

#1

OPENING LECTURE 1: "WHERE THE EARTH TOUCHES THE SKY" ABOVE EVEREST: SCIENCE AND GLIDING ADVENTURE

Klaus Ohlmann

Chief-pilot of the Mountain -Wave-Project, tells us the story of a modern adventure in the thin air above the top of the world.

A highly motivated team of experienced pilots and scientists combine their skills for common projects in the Himalayas of Nepal.

Melchor Antuñano, M.D., M.S., FAsMA, FAsHFA
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The implementation of advanced medical technologies are rapidly changing the scope and complexity of Aerospace Medicine and its impact on aerospace operations including:

- 1) Clinical aerospace medicine issues such as health monitoring, disease prevention, medical screening, diagnosis, treatment and rehabilitation of aerospace crews and passengers,
- 2) Medical safety implications for emergency and elective transportation of patients by air,
- 3) Medical certification/licensing implications (fitness for flight) for flight personnel,
- 4) Aerospace human factors considerations,
- 5) Human-machines-environment interactions,
- 6) Post-accident/incident investigation factors and analytical tools, etc.

This presentation will discuss practical Aerospace Medicine implications of a variety of medical technologies including: genomics, gene therapy, microbiomics, stem cells & regenerative medicine, artificial tissues & organs, neurotechnology, nanomedicine, and body-worn medical sensors & networks. Several life altering medical breakthroughs on the horizon include: restoring vision to the blind, tissues and organs on demand, brain repair and augmentation, elimination of genetic conditions, cures for neurological conditions, prevention of heart attacks, elimination of cancer deaths, development of smart drugs, development of vaccines against cancer, etc. All of these medical technologies have the potential of significantly impacting the safety of aerospace flight operations through improved medical selection, health maintenance and performance assessment/improvement of flight crews and passengers. However, the relative lack of knowledge and experience with some of these medical technologies makes it challenging to approve their use among flight crews and other aerospace vehicle occupants. Increased detailed knowledge of advanced medical technologies is required among aerospace medicine providers involved in the medical certification of flight crews and the medical screening of passengers, as well as forensic pathologists and coroners involved in the post-mortem analysis of fatalities resulting from aerospace vehicle accidents. It is important to keep in mind that by the time aerospace medicine providers are made aware of their use, some of these advanced medical technologies may have already been used by flight crews and passengers. Furthermore, in some cases, unless voluntarily reported by flight crews and passengers, aerospace medicine providers may not be aware at all of their use of advanced medical technologies. Finally, additional scientific studies are needed to identify the practical aeromedical safety consequences (positive and negative) of using advanced medical technologies during human exposure to the environmental and operational stress factors of aerospace flight.

Chris Redfern

Head of Future Engine Integration – Industrial Strategy Airbus
Airbus Industries, Toulouse, France

Chris has 15 years in aerospace engineering, starting as a graduate level designer at Rolls-Royce Derby UK he has contributed to the design/development of the full range of Trent engines and business jet engines. His final posting at Rolls-Royce was as Chief Design Engineer for a Rolls-Royce/SAFRAN start up joint venture based in Paris.

Latterly Chris has taken a role at Airbus where he draws on his design and production management experience at Rolls-Royce to help Airbus develop the future industrial systems for next generation aircraft.

He is a husband, a father of two young children and an avid cyclist. He lives with his family in the south of France, near the Airbus headquarters in Toulouse.

Anthony S. Wagstaff, MD PhD

Institute of Aviation Medicine, Oslo, Norway; European Society of Aerospace Medicine

Introduction

Aerospace medicine communities in most countries are small. The resources for scientific work and development may be scarce, however civilian and military institutions often collaborate only partially or not at all. A substantial part of the work performed by physicians in our field is done part-time, often fuelled by an interest in aviation. This enthusiasm is not always matched with an ability to develop our field further. However, there is an increased need for research and development in our field in a time where big changes in technology and flight operations go hand-in-hand with economic constraints in all sectors. To some extent we also find ourselves in an environment where the necessity for some of our activity is being questioned. Could improved collaboration between civilian and military sectors lead to synergies and provide a scientific and practice boost to our Aerospace Medicine?

Discussion

There are some different challenges in civilian and military Aerospace Medicine, particularly aircraft-specific challenges related to specific types of operations. However differences can be exaggerated, giving rise to an untapped potential in cooperation, learning and ultimately flight safety. Historical and recent examples of transfer of knowledge and common challenges will be mentioned, and models for possible improved cooperation within military and civilian sector will be discussed.

Paul Sherman, MD and **John Sladky, MD**
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Introduction

Repeated exposure to hypobaric conditions has been associated with magnetic resonance imaging (MRI) changes to include increased white matter hyperintensities and degradation of axonal integrity. Neurocognitive processing decrements have also been demonstrated in high altitude U-2 pilots. Our research goals are to characterize the physiologic and pathophysiologic responses of the brain to high altitude and understand the association with white matter injury and to maximize the safety of our aircrew and special operators.

Materials and Methods

Ninety-six U.S. Air Force aircrew trainees (32 female, 64 male, average age 21.2) were evaluated while undergoing initial occupational hypobaric exposure. Standard USAF procedure is a 30-minute exposure to 25,000 feet (7,620 m). Quantitative arterial spin labeling (ASL) and proton magnetic resonance spectroscopy (MRS) data were acquired on subjects at 24 hours prior, 24 hours after, and 72 hours after altitude chamber exposure on a Siemens 3 Tesla MRI scanner. Voxels were placed in the bilateral frontal white matter (FWM) and anterior cingulate gyrus cortex (ACC) with short echo times acquired, time of echo (TE) 30 ms. FWM values were averaged together. Metabolites analyzed included glutamate (Glu), choline (Cho), N-acetylaspartate (NAA), myo-inositol (MI), creatine (Cr), glutamate + glutamine (Glu+Gln), and glutathione (GSH). There were 68 healthy control subjects (9 female, 59 male, average age 22.4) meeting the same physical and physiological criteria minus hypobaric exposure. Serological neuroinflammatory markers were collected at the time of each MRI and just prior to and post altitude chamber exposure. Statistical analyses were performed with a linear mixed model for within group comparison and with a generalized additive model for intergroup comparison.

Results

Statistically significant increases in cerebral blood flow (CBF), as estimated by ASL response, in white matter in aircrew personnel with hypobaric exposure were observed when using gender and age as a co-variable (white matter $p < 0.001$, gray matter $p = 0.048$). This difference appears dependent upon age as a co-variable, although there is no significant difference in age between the exposed and control subjects ($p > 0.10$). ACC sampled areas demonstrated significant single MRS factor differences in all tested metabolites, except GSH, in aircrew personnel with hypobaric exposure: Glu, Cho, NAA, MI $p < 0.05$; Cr, Glu+Gln $p < 0.01$. FWM GSH ($p = 0.029$) demonstrated significant single MRS factor differences in the FWM. Age dependency was a covariant in all single factors.

Discussion

There is a highly significant increased CBF response after a single exposure to hypobaria over three interval MRI scans, with age as a contributing factor. It is unclear why age should affect CBF in the setting of extreme hypobaria, but it may reflect a difference in central nervous system maturation. There was a significant difference in most neurometabolites after exposure to extreme hypobaria. These differences may be representative of changes at a cellular level that are associated with changes in cerebral blood flow. Additional research is in progress.

Col John Sladky, MD and **Col (ret) Paul M. Sherman, MD**

U.S. Air Force School of Aerospace Medicine, Aeromedical Research Department, Wright-Patterson AFB OH
and Department of Neurology, 59th Medical Wing, Joint Base San Antonio-Lackland AFB, TX

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Introduction

Repeated human exposure to extreme hypobaria is associated with increased white matter hyperintensities (WMH) as observed on T2-weighted imaging and decline of axonal integrity as measured by fractional anisotropy (FA). The underlying pathophysiology has not been elucidated but hypothesized to be due to occlusion of small vessels and activation of innate immune response. Increase in WMH volume and decline in FA values are observed in normal white matter aging. We hypothesize that occupational exposure to hypobaria may lead to accelerated aging of cerebral white matter. We tested this by comparing the aging trends in U-2 pilots and Air Force physiologists/chamber technicians and age-and-health matched controls.

Materials and Methods

We collected MRI data in N=103 U-2 pilots and N=74 Air Force physiologists/chamber technicians (PHYS) and N=163 controls (CON) ages 28-58 years. The MRI protocol consisted of a 3D T2-weighted FLuid-Attenuated Inversion Recovery (FLAIR) and diffusion tensor imaging sequences to assess the integrity of cerebral WM. A general linear model was used to study group by age interaction as evidence of accelerated aging.

Results

Significant group by age interactions were observed for the whole-brain WMH volume and whole-brain average FA values ($p < 0.001$). Analysis of regional trends showed that the accelerated aging was limited to the subcortical rather than periventricular WMH volumes. In agreement, the accelerated aging in regional FA values was observed the long-range white matter bundles that originated in frontal and parietal lobes. However, there was no significant interaction between HWM volume and FA values.

Discussion

Our study demonstrates that U-2/PHYS group accumulated subcortical WMH volume at a faster rate as a function of age compared to age-matched CON. This group also showed an accelerated decline in whole-brain and regional FA values. We observed no significant interaction between WMH and FA values. However, the FA measurements were limited to normal appearing white matter to exclude the potential bias in measuring FA in a group with higher WMH load. Overall, our findings show that occupational exposure to hypobaria may result in acceleration of cerebral aging and that increase in HWM and decline in FA values may be independent processes.

Learning Objectives

- Following talk, audience members should understand the following key points:
1. Repeated hypobaric exposure can lead to accelerated deleterious white matter changes.
 2. Changes are seen in both visually abnormal and normal white matter
 3. Long-term sequela of such changes are still unknown.

Harri Rintala, MD

University of Jyväskylä, Department of Sports sciences, Jyväskylä, Finland 2013; Finnish Air Force HQ, Tikkakoski, Finland 1989-2012

Email: harri.rintala@jyu.fi**Introduction**

Over 90% of Finnish fighter pilots have had some kind of an occupational related, work disabling musculoskeletal symptom phase during their flight career. 13% of the pilots were also set an occupational disease status in the past decades due to the premature cervical degeneration. Typically first appointments to the health care are taken during the first very active flight training phases, where the pilot's physical performance is challenged. This paper presents typical occupational health related issues, that determine the prevalence of flight related symptoms in early flight syllabus.

Methods

67 randomly and voluntarily selected Finnish Air Force military pilots were clinically followed-up by their aeromedical data in FiAF Air base hospitals and Aeromedical Centre average 7,5 years (range 2-12 years), and their average jet trainer (BAe Hawk) flight experience was a little bit over 300 hrs (40-760). The pilot's flight-related musculoskeletal symptoms (MSK), other musculoskeletal symptoms and other typical sick leave diagnoses were thoroughly gathered individually. Basic physical fitness characteristics (VO₂max and maximal isometric muscular strength of abdomen/back/neck) were also gathered. SPSS statistical device were used to data analyzes, and simple mean results for basic health statistics and ANOVA for the relationships between MSK and fitness were utilized.

Results

During about 12 months conscript time with propeller plane (Valmet Vinka) they were suffered MSK average 1,3 days sick leave (2-18 days); in comparison normal flu caused almost 5 times (0-25) more sick leave days. During their about three years cadet-phase (1/3 Vinka, 2/3 Hawk), the pilots took medical appointments average 2,7 times (0-19) per pilot due to flight-related MSK (flu in this phase caused average 5,9 appointments). Totally 49% of cadets took an appointment due to flight related MSK in their cadet years. Finally, of the pilots, who entered to the active flight officer duties, totally 38% took an medical appointment due to flight-related MSK; this was done average 1,4 times (0-15) per pilots during this phase. "Flu appointments" were only 2 times more common than flight-related MSK. Together almost 25% of the pilots took flight-related MSK appointments during their beginning of the jet trainer syllabus. Back extension by those over 940N ($p=0,005$) and VO₂max over 55 ml/kg/min ($p=0,002$) decreased the amount of MSK appointments.

Discussion and Learning Objectives

Over one third of the pilot population seems to be prone to MSK already in the beginning of the flight syllabus, so there might be a tendency to be noticed. Athletic-level physical performance seems to decrease the appointments during the early flight years, so goal-oriented exercising could be beneficial in reducing the flight-duty work load and thus MSK. In the near future the follow-up, hopefully, gives more detailed information, which health and fitness factors might be the essential ones in predicting the career-long MSK prevalence and its prevention among fighter pilots.

No any conflict of interests include in this study. Design has been approved in Central Finland's health care District Ethical committee

John Crowley⁽¹⁾, Angelia Cost⁽²⁾, William Dodson⁽³⁾, Dustin Huber⁽⁴⁾

(1) US Army Aeromedical Research Laboratory, Fort Rucker, Alabama, USA

(2) Armed Forces Health Surveillance Branch

(3) USAF School of Aerospace Medicine

(4) Naval Medical Research Unit – Dayton

Purpose	The purpose of this project was to characterize the health of crewmembers flying current U.S. military rotary-wing aircraft, using an epidemiological approach based on a thorough review of the literature.
Design/ Methodology/ Approach	First, the published literature was searched for reports or studies of health problems attributed to flying helicopters. The search included the peer-reviewed scientific literature as well as government technical reports. Then, a retrospective epidemiological study of helicopter pilots and control groups from the U.S. Army, Navy and Air Force. The study utilized the U.S. Defense Medical Surveillance System (DMSS), which contains data on service member demographics, employment, and medical care. Health care data from 1998 – 2015 on selected aircrew was matched to exposure data (i.e., accumulated flying hours) obtained from each service's aviation record-keeping agencies. Comparison groups were determined to be a) maintenance officers and b) aircrew not flying helicopters or tiltrotor aircraft in the U.S. Air Force.
Results	Phase I: Literature Review. Recent health data on U.S. Army helicopter pilots suggests that musculoskeletal health problems account for >38% of all diagnoses over the past decade, with spinal conditions accounting for most. Most helicopter aircrew, internationally, experience aviation-related low back pain, although the etiology is unclear—vibration and posture are thought to contribute. Also common is neck pain, which appears in several studies to be related to head-supported mass (e.g., night vision goggles). Noise exposure is common in the military but is a known hazard in aviation. Other health-related problems were less-well documented. Phase II: Epidemiological Study. There was no statistically significant risk of any of the conditions investigated among the helicopter pilots compared to the maintenance officers, except for "Metabolic Syndrome." Compared to the fixed-wing pilots, helicopter pilots were at increased risk of Lumbago, Metabolic Syndrome, and Hyperlipidemia. Most outcomes were significantly less common among the helicopter pilots compared to the unexposed cohorts.
Discussion	Musculoskeletal problems are classically associated with flying helicopters. This analysis confirmed a higher rate of low back pain (lumbago) in helicopter pilots, compared to fixed-wing pilots. Potential explanations for this, and the apparent excess in metabolic syndrome and hyperlipidemia, will be discussed.

Jonathan Monin (1,2,3) , **Magali Sallansonnet-Froment** (3,4) , **Gaëtan Guiu** (1,2) , **Nicolas Huiban** (2,5), **Sébastien Bisconte** (6) , **Sébastien Coste** (2) , **Eric Perrier** (1,2) , **Olivier Manen** (1,2).

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(3) Department of Sleep disorders, Percy Military Hospital, Clamart, France;

(4) Department of Neurology, Percy Military Hospital, Clamart, France;

(5) Aeromedical Center, Sainte Anne Military Hospital, Toulon, France;

(6) Aeromedical Center, Robert Picqué Military Hospital, Bordeaux, France

Introduction	Obstructive sleep apnea syndrome (OSAS) is a major problem in aviation medicine because it is responsible for sleepiness and higher cardiovascular risk, which could jeopardize flight safety. The aim of this presentation is to understand the arguments leading to the aeromedical decision in aircrew members with an OSAS.
Methode	Based on recommendations of the literature, some studies performed in the Aeromedical Center of Percy (Paris), and on the medical files of aircrew members with OSAS, the authors will discuss about the investigations necessary for the diagnosis and the return to flying duties.
Results and Discussion	The diagnosis of OSAS should be discussed in case of predisposing medical history (obesity, hypertension, metabolic syndrome, cardiovascular diseases...), and also in case of suggestive symptoms (snoring, sleepiness, nycturia...). The diagnosis is generally posed thanks to ambulatory sleep monitoring, or to polysomnography for atypical or complicated situations. In case of severe OSAS, a treatment by continuous positive airway pressure (CPAP) is generally proposed. For the fitness assessment, an evaluation of the CPAP efficiency is required, looking for a reduction or disappearance of apneas and hypopneas, but also with an objective proof of the absence of sleepiness, with maintenance of wakefulness tests. In addition, the CPAP must be well tolerated with a proof of a good observance. Finally, a cardiovascular and metabolic evaluation is to be discussed. A fit decision is possible, even for solo pilots, if the complete evaluation is done and successful. Time limitations should be discussed in some cases.
Conclusion	In aircrew members treated with CPAP for a severe OSAS, the decision depends on the treatment efficiency and tolerance, and on the cardiovascular risk. A regular follow-up is required.
Learning Objectives	► Understand which investigations are necessary for the aeromedical assessment in aircrew members with an OSAS ► To understand the arguments leading to a fit decision in aircrew members with an OSAS

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Introduction	Legal medical examination of the victims of aircraft mishaps mandatorily involves forensic autopsies along with additional investigations. To confirm or to exclude physical disabilities resulting in a pilot's sudden incapacitation during flight, histopathology of the organs is required. Especially pre-existing or exacerbated cardiac problems in pilots are accountable for a significant number of aircraft accidents. Hence, the detailed examination of heart samples is unavoidable in good forensic medical practice. However, the quality of standard histopathological assessment is limited in many of such cases, because of severe destruction of the bodies during the crash or because of secondary changes by fire or putrefaction.
Methode	A literature review of novel pathological techniques that provide insight into a flyer's pre-existing disease burden or sudden health problems during flight was carried out. Recently published molecular pathology techniques on samples from living patients were applied in a preliminary study on postmortem material in our laboratory. Circulating DNA and RNA in postmortem blood specimens from more than 100 corpses were prepared and analyzed. Special emphasis was placed on the evaluation of disease-related gene expression alterations.
Results	Promising molecular pathology applications include the quantitative assessment of cell-free DNA in blood samples obtained during postmortem examination. Furthermore, the qualitative sub-specification of the circulating DNA, employing the so-called CpG-methylation analysis is strongly informative for tissue specific pathological alterations. Other markers, including messenger RNAs, as well as microRNAs are comparably employable to identify specific organs or tissues involved in defined longstanding or near-term pathological processes. Our own preliminary study showed that sufficient quantities of DNA and RNA for these procedures can be obtained from the vast majority of bodies, even in cases with severe exsanguination from trauma. Furthermore, suitable quality of DNA and microRNA for tissue- and disease-related sub-specification of the samples was confirmed, even in a subset of bodies with advanced alterations from fire or decomposition.
Discussion	The implementation of molecular pathology techniques in forensic medical practice widens the possibilities of aircraft accident investigators to recognize pilots' health problems during flight. By employing DNA- and RNA-based techniques, both longstanding, pre-existing disease, as well as conditions resulting in sudden deterioration in organ and tissue function can be reliably detected. Even prolonged decomposing of bodies or fire artefacts, frequently leading to the impossibility of reliable histological specification of disease-related changes, do not exclude successful molecular pathology assessment.

Learning Objectives:

Knowing the basic importance of pre-existing disease burden in the chain of events leading to aircraft mishaps in a significant number of events.

- Knowing about the limitations in the histopathological assessment of organ samples from victims of aircraft accidents, for instance because of putrefaction or fire changes.
- Getting to know recent developments in the medico-legal investigation for incapacitating diseases, especially of the heart, employing molecular pathological techniques.
- Getting to know the availability of co-operations with our institutions when in need for molecular pathologists' support in aircraft accident investigation.

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The space flight operations market continues to grow in support of the global space economy. Since 2004, there has been a steady increase in the number of orbital launches conducted worldwide. The high demand for satellite communication services, government space activities, global navigation satellite services, satellite television, and other space services is estimated to be about \$345 billion dollars. In 2017 alone, space services providers conducted a total of 90 orbital launches from launch sites in 7 countries. The US has increased its share of the global space launch market due to several factors including new companies such as Space Exploration Technologies (SpaceX) which provides its Falcon 9 vehicle to the global space market at very competitive prices. This represented in 2017 a 54% share of the global space launch market. In 2017, the US had a record number of 23 launches (22 orbital and 1 suborbital) under licenses issued by the FAA Office of Commercial Space Transportation.

The growth trend is expected to continue as SpaceX fulfills its backlog and new companies like Blue Origin, Rocket Lab, Vector, and others introduce launch services. In 2017, Virgin Galactic conducted four glide tests of its second SpaceShipTwo vehicle, the VSS Unity. The company received a license from FAA AST in July 2016 and is planning to conduct powered flights in 2018. Vector conducted two successful suborbital tests of its Vector R vehicle as the company prepares to provide orbital flights in 2018. The first flight of Blue Origin's third New Shepard vehicle successfully flew in December. The number of orbital launches conducted by China has increased since 2010 with a peak of 22 in 2016, including the introduction of 5 new space vehicles. There are about 50 proposed small launch vehicles being developed worldwide, but most of them are in conceptual stages. Some of these new vehicles have recently launched or are in advanced stages of development, like Electron, LauncherOne, and Vector H, with all three vehicles expected to start launching payloads in 2018. New vehicles are being developed to replace older ones or to augment capabilities, while new satellite operators stand poised to release large constellations of telecommunication and remote sensing satellites. Human spaceflight activities continue, with operational flights of suborbital systems and test flights of commercial orbital systems expected to begin in 2018.

This presentation will include a brief summary of:

- 1) Launch vehicles (US and non-US),
- 2) Launch and reentry sites (US Federal sites, FAA AST-licensed sites, non-licensed US sites, and non-US sites),
- 3) State of the spacecraft industry (US, Non-US, commercial on-orbit vehicles and platforms),
- 4) Commercial Space Transportation Forecast (communications satellites, remote sensing satellites, crew and cargo transportation services, launch vehicle test and demonstration launches), and
- 5) US and International commercial space transportation laws and policies.

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Spaceflight exposes passengers to a unique and potentially dangerous environment. Pre-existing medical conditions can worsen by exposure to spaceflights or previously non-detected illnesses may become obvious for the first time. Prospective passengers may be of any age and in various health conditions. It should be the goal to reduce the risk of inflight medical emergencies or deaths and to increase the possibility of a "once of a lifetime event" with no negative impressions. There are no experiences with the inflight reaction of commercial space flight participants so far, but in the last years science has been conducted concerning the reaction of test subjects with common diseases on simulated suborbital spaceflight G force profile centrifugation.

At the beginning a questionnaire targeting the medical history of the applicant about possible no go criteria provides a first estimation for applicants and aeromedical examiners whether there will be a chance of being accepted as a passenger. This also serves as information whether additional medical examination results of the past should be requested.

The medical examination follows an EASA class 2 medical for private pilots and should also include an extended cardiopulmonary evaluation depending of age and medical history. In addition to that a neurologic, spine and musculoskeletal and ENT evaluation, as well as visual acuity and lab testing should be performed. It also should be checked that the applicant understands the communication in volume and the language used on the spaceship. But the applicant should also undergo a brief psychological and/ or psychiatry evaluation to make sure that he or she does not impose any hazard to the mission and depending on the size of the space flight participant crew it may be worthwhile to match the participants.

After the certification a training program must follow including lectures concerning hypoxia, motion sickness, effects of medication against motion sickness, effects of G forces and possible countermeasures and critical situations as rapid decompression and fire on board. For an optimal flight preparation the G force profile of the flights can be experienced in a centrifuge and countermeasures can be trained. But also hypoxia can be demonstrated in a hypobaric chamber, as well as microgravity during parabolic flights.

Immediately before the flight a basic medical physical evaluation including the interim history shall be performed. EASA has studied several options to allow suborbital and orbital flights within the EU. It has not been decided yet whether the oversight will be taken by EASA or the individual member states. As long as there is no European regulation the chief medical officers of the individual spaceflight companies will decide about the necessary examinations, certifications and trainings

Richard Jennings

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Eight privately supported Soyuz flights to the International Space Station involving 7 different spaceflight participants have been completed. However, examinations for several additional backup crewmembers and others planning future flights have also been completed. As the commercial crew era begins and increased public access to spaceflight is achieved, the number of individuals that need screening medical examinations will expand. Up until now, the primary medical certification has been through the Russian medical team with the ISS International Partners in secondary roles through the ISS Multilateral Space Medicine Board. Under the commercial crew paradigm, NASA medical operations will provide the lead for the initial medical certification for commercial crew spaceflight participants instead of the Russian medical team. However, other Soyuz flights may still be conducted.

UTMB Aerospace Medicine has provided medical support for commercial spaceflight participants for six of the Soyuz flights to the ISS and examined a total of 16 individuals for primary crew, back-up, and potential future missions. The evaluations are initially conducted under the Russian spaceflight medical standards, Med Vol C for the International Partners, and more recently Appendix F for commercial crew participants. Interestingly, 13/16 of those examined to date were born outside the U.S. and five were female. The mean age at initial examination has been 48 but the range 29–67 years. Of course, the flights often occur several years after the initial examination. Many of the spaceflight participants have had medical deficiencies that required medical interventions or a thoughtful waiver process. Specific medical findings and medical intervention requirements from this large group will be discussed.

We predict interesting certification dilemmas will continue since individuals from the public with the financial strength to afford these flights tend to be older and experience a higher prevalence of medical conditions and physical limitations compared to military pilots or traditional career astronauts. We will demonstrate the process of medical risk mitigation and preparation for flight for specific medical challenges.

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In the 1960s the UK developed the capability to launch rockets to deliver payload into space. Budgetary constraints evolving into partnership in Europe in the 1970s led to a loss of national capability for launch operations. Since then the UK has enjoyed a buoyant space technology and satellite manufacturing industry and had some small-scale success with unmanned probe projects. In 2011 the UK government decided to make a substantial investment in the UK space industry and the infrastructure required to support it. A detailed review of the challenges and issues including medical fitness and training reported to the UK Department for Transport (DfT) in 2014. Since then teams of the regulatory experts from the UK CAA and the UK Space Agency have been working with the DfT to draft the UK Space Bill which became the Space Act earlier this year. The teams are now working on the detail of the secondary legislation and areas requiring guidance material that will set the legal framework and requirements for launches from the UK of both manned and unmanned space vehicles with and without spaceflight participants. The regulatory approach that is being taken is quite different to current regulatory mechanisms for commercial aircraft operations, particularly in the realms of medical interest including informed consent, physiological training requirements, and medical fitness assessments. The present challenge discussed in this presentation is to devise a system of regulations and guidance for operators that facilitates different spacecraft types, flight paths and environmental exposures for human occupants as most of the proposed craft are still in development and there is currently a limited available literature of studies of individuals likely to be the crew or participants.

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Introduction

Between 2001 and 2012 a number of documents were produced by the FAA, AsMA, and other groups that provided guidance and recommendations for medical evaluation of crew members and spaceflight participants (SFP). These recommendations and guidelines were consolidated in 2012 by a working group of the FAA Center of Excellence for Commercial Space Transportation (COE-CST). Since that time, the COE-CST recommendations and guidelines have been validated through their use while conducting research and training protocols with simulated spaceflight acceleration profiles produced by the centrifuge at the NASTAR Center in Southampton, Philadelphia.

Methods

Research test subjects and potential SFPs are asked to complete a detailed medical questionnaire as part of their medical evaluation for consideration of acceptance for a future spaceflight or acceleration training in a centrifuge. Each individual's medical questionnaire is independently evaluated by two aerospace medicine specialists and scored on a 1 to 10 scaled with 1 being no medical concerns and 10 being highest risk and unlikely to be accepted for spaceflight or acceleration research participation. Further information is requested from individuals who have significant medical history or ongoing medical conditions.

Results

Our results from evaluating over 300 individuals indicate that approximately 85% are scored in the "Green" range of 1 to 4; 12% are scored as "Amber" in the 5 to 7 range; and 3% are scored in the "Red" range of 8 to 10. Those in the Amber range are considered for research participation or future spaceflight if their medical status can be further improved or is stable with proper medical treatment. Those in the Red range are excluded for future participation unless significant improvement in their medical status can be achieved.

Conclusions

Empirically we can postulate on what increases risk levels from a medical perspective and prophylactically attempt to mitigate that risk. However, informed consent, at this stage, should identify that added risk is largely unknown until we have actual spaceflight experience with sufficient people with various medical conditions to make evidence-based risk assessments.

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In the wake of the investigation into the “Deliberate flight into terrain” accident of 24 March 2015 (1), the study of an unexplained general aviation fatal accident that occurred at the same period of time (2) questions the applicability of article MED.A.020 of Regulation (EU) No 1178/2011 (3). The BEA report states that a “witness indicates that after the last turn, aligned with the centre-line of runway 04, the aircraft pitches up, turns left, and then descends. The aircraft collided with the ground at approximately 1715. The 40-year-old pilot and the three passengers, her children, died and the aircraft was destroyed. The investigation revealed that “The pilot was taking these drugs [psychotropic], prescribed in February 2015 by a psychiatrist, as part of a medical follow-up. Their dosages were compatible with induction of antidepressant therapy (...). As during the examination of the pilot’s past history by the medical examiner, the safety investigation allows a posteriori sense-making from the cross-checking of the collected data. However, the means available to the examining doctor are very limited alongside the investigators’ powers of public authority (4). In all these cases, the signs of the pilot’s mental illness could only be known to his Family doctor and possibly his closest family and friends, who were also inclined to keep secret her (and their) private life. The necessary cooperation of the pilot to make the decision of fitness to fly framed by article MED.A.020 cannot be obtained. In conclusion of this survey, the BEA suggests to improve the quality of the information on the risks given by the Family doctors to their pilot-patients. To this aim, it is first necessary to set up an information chain between doctors and aero-medical specialists. In France, this relationship can be set under the auspice of the departmental level of the Conseil de l’Ordre des Médecins in order to comply with the provision of professional secrecy.

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- (3)** Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council
- (4)** <https://www.bea.aero/fileadmin/documents/docspa/2001/f-fp010930/pdf/f-fp010930.pdf> (FR)

Ries Simons, MD

Founding Board European Pilot Peer Support Initiative (EPPSI)

Web: www.eppsi.eu**Introduction**

With the provisions of EASA 'Rule Making Task.0700'(RMT.0700) about to find their way into EU legislation sometime this year, operators, regulators and other stakeholders will face a number of challenges, especially when it comes to proper implementation of the provisions related to Pilot Support, especially Peer Support. "Pilots, like other professionals, are susceptible to the effects of stress or negative personal situations and may be hesitant or reluctant to seek help and support for a number of reasons. The obvious stressors include the work environment, psychosocial hazards such as fatigue and workplace or private problems, time pressure and stress sources all adults must deal with. This combination of factors may lead to temporary mental health issues or, if not recognised and treated, possible permanent issues"(EASA, 2015). According to EASA the wider benefit of a Peer Support Programme (PSP) is that it "provides individuals a place to turn to in order to share their issues with trusted peers in as close to a non-threatening environment as possible, with the knowledge that fellow pilots are likely to help rather than immediately seek to penalise a colleague. The structures also enable organisations to more easily approach individuals that display behavioural or other issues via their peers. As a last resort, reporting systems may be used in case of identified unresolved perceived safety issues. A well organised support system may prevent mental or personal issues from becoming a greater liability to both the individual's career and the organisation's safety performance."

The present presentation

The present presentation will discuss the medical aspects and perspectives of a PSP. PSPs can facilitate prevention of severe mental health problems. Pilots can learn to cope with their mental health problems and this may prevent more severe problems and improve wellbeing and job satisfaction. A PSP offers a "safe harbour zone" where pilots can be open without fear of retribution or endangering their pilot career and livelihood

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Background	The mental health of aircrews is paramount to aviation safety. To improve aircrew mental health, peer support programs and other initiatives have been established. Ideally, these cooperate with aviation safety management and healthcare. Just culture was originally developed for safety and accident investigations, to make safe reporting on incidents and accidents possible, and is highly appreciated in aviation. It means that people can report on errors, mistakes, incidents and accidents without a risk of punishment, unless they were dishonest, grossly negligent or performed willful misconduct. The just culture philosophy may be expanded to mental and other health problems, as long as it is compatible with legal requirements and medical ethics.
Methods	The just culture philosophy will be examined from a legal and ethical perspective to determine how it can be used in case of mental and other health problems.
Results	Just culture is generally regarded to balance the goals of improving future safety and providing accountability. Although little case law is available, and it seems somewhat controversial from a legal viewpoint, just culture principles have been adopted in some EU-regulations and have been accepted in a recent judgement by the High Court of England and Wales. Just culture can be connected to medical ethics as both are to a large extent based on utilitarianism and deontology. Utilitarianism aims to achieve the best for society as a whole, and can be regarded the moral reason for improving future safety. Deontology states that moral rules are absolute and that people should never be used as a means to achieve goals. It provides a moral rationale for providing accountability in just culture. Deontology establishes and safeguards human dignity, which is fundamental to patient's rights. In our view, autonomy should be added to balancing safety and accountability when using just culture principles for aerospace medicine, to represent human dignity and patients' rights.
Discussion	Using just culture principles for aerospace medicine in our view means balancing accountability, autonomy and safety. Just culture principles can well be applied to mental and other health risks, and may help to connect peer support systems, human resource management and mental healthcare. Practically, a just culture for mental and other health problems should mean that air crews can report problems in a supportive environment and without a risk of job or income loss.
Learning objectives	Just culture originally means that people can report on accidents, incidents, mistakes, errors and other mishaps without a risk of punishment. Only in case of gross negligence or wilful misconduct, punitive measures are taken. Just culture seems to be based on the moral theories of utilitarianism and deontology. Notwithstanding some legal challenges, it can well be connected to medical ethics and be used in case of (mental) health problems. When using just culture in aerospace medicine, it means balancing safety, accountability and autonomy.

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Background	Recently most population undergo cataract surgery in EU between 50-70 years of age. Our goal is to make them as most as possible glasses independent. New intraocular lenses can achieve this target refraction. Not every lenses are allowed to use by flying staff. Toric lenses can bring significant benefits for night condition vision. The aim of the study was to evaluate clinical outcome, rotational and refractive stability after the implantation of monofocal toric IOL: Bi-Flex 677TY (Medicontur).
Methods	In this prospective, interventional case series study 20 toric Bi-Flex 677TY (Medicontur) were implanted in 13 consecutive patients with topographic corneal astigmatism between 1.0 and 4.7D. Clinical outcomes were assessed 1 and 7 days, 1 and 3 months postoperative. all patients underwent biomicroscopic examination, included measurement of intraocular pressure (IOP) with Goldmann tonometer. Best distance-corrected (BCDVA) and uncorrected (UCDVA) visual acuity were tested at distance (4m) using ETDRS charts. For each visit photo-documentation in retro-illumination was performed to evaluate torus position and potential IOL rotation.
Results	The improvement of the mean spherical equivalent was from 5.75D to 0.5D and improvement of the mean cylinder was from 3.2D to 0.25D. The mean monocular UCDVA, was 0.92 in decimal scale. All patients achieved spherical refractive precision within plus/minus 0.5D. Intraoperative to 3 month postoperative comparison of IOL axis alignment showed low levels of rotation. Mean rotation was $1.94 \pm 1.84^\circ$. Majority of rotation occurred first 24 hours after surgery.
Conclusion (Learning Objectives)	The evaluated toric IOL provides safe and effective correction of pre-existing regular corneal astigmatism in patients after cataract surgery. The lens provides very good level of refractive precision and rotational stability. This Surgical Method is very convenient to increase glasses independency by patients after cataract surgery.

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Keratoconus is a bilateral non-inflammatory eye disease leading to progressive corneal thinning and ectasia. Asymmetrical reshaping of cornea causes irregular astigmatism and significant decrease of visual acuity (uncorrected, but also best corrected). Prevalence is 1: 2000 in Caucasian population and is almost 4x more often by Asian patients. Onset is typically during puberty or early adolescence and progresses till third decennium.

New diagnostic methods – such as corneal topography (Pentacam, Orbscan) – help us to monitor progression of the disease and to detect subclinical cases. Detection of these subclinical, potentially disqualifying, cases can be challenging in aeromedical decision making. We are able to reveal them, monitor them, but we are not able to predict evolution of visual acuity in borderline cases.

Second aeromedical issue is the treatment of keratoconus. Classical management were (according to the degree of keratoconus) – spectacle correction, soft contact lenses, hard contact lenses and corneal transplantation.

Nowadays treating spectrum is much wider – we have crosslinking (CLX) for stabilizing cornea in mild degrees of keratoconus and implantation of intrastromal rings into cornea (Keraring, Myoring) that helps to stabilize and flatten ectatic cornea and can also increase visual acuity. This kind of treatment is unfortunately not suitable for flying personnel because of its side effect on mesopic and scotopic vision.

In the first part of presentation diagnostic methods and treatment options with emphasis for flying personnel will be discussed. Second part deals with clinical cases and gives some practical recommendations in aeromedical context.

Ryan Anderton MD, John Pitts MD
UK Civil Aviation Authority

Arterial vascular disease affecting the eye and anterior visual pathways can reduce visual acuity and field of vision on the affected side, either transiently or permanently, but have wider implications for aeromedical certification.

The aeromedical fitness assessment therefore needs to take into account not only the effect on visual function, but the effects of the underlying pathology in terms of incapacitation risk to the fellow eye and cardiovascular system as a whole. It is important to identify disease due to emboli from the left side heart and carotids as this carries a higher cardiovascular risk. Infective endocarditis and the systemic vasculitides, including giant cell (temporal) arteritis and thrombophilia must all be excluded, as these conditions have their own treatment protocols and aeromedical implications. Investigation may need to include blood parameters such as platelet count and viscosity. Non-traumatic, non-arteritic, non-embolic arterial vascular disease affecting the eye is usually due to atherosclerosis and so is associated with an increased risk of cardiovascular morbidity and mortality and so cardiovascular risk factors need to be identified and managed before re-certification.

Aeromedical cases will be discussed as examples to stimulate discussion about aeromedical considerations and disposal.

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Introduction

As a consequence of the Germanwings-Flight-9525 accident on 24/March/2015 EASA developed a legal package of different requirements to increase the sensitivity on mental health issues of aircrew to enhance flight-safety.

The amendment of PART.MED (Reg. (EU) No 1178/2011) will mandate a comprehensive mental health assessment as a part of every aeromedical-examination, especially for commercial pilots. Aeromedical-examiners (AMEs) should be trained in identifying signs of relevant mental health abnormalities to increase referrals to aviation-psychologists and/or psychiatrists. In this context EASA realized that there is a need of "accredited clinical psychologists with expertise and experience in aviation psychology".

Furthermore new operational rules will focus on pilots' mental fitness (Reg (EU) No 965/2012). Operators should ensure that all pilots have access to support-programs and a comprehensive psychological-assessment "performed by a psychologist with expertise in the psychological selection of aviation personnel and knowledge of the flight crew's operational environment".

National-civil-aviation-authorities (NAAs) are responsible for defining criteria, responsibilities and procedures for monitoring and oversight of those requirements.

Due to the increased demand of aviation-psychology-expertise (e.g. selection, clinical-psychological-assessments) more and more psychologists are working in aviation.

However, there was no explicit legal ground for a specific training until now.

So far the specialization "Aviation Psychologist" has not been legally recognized. The European-Association-of-Aviation-Psychology (EAAP) has offered a peer accreditation for aviation psychologists for several years. However, the accreditation-criteria do not distinguish between clinical and other legal prerequisites. Furthermore there is no consistent system of legally standardized psychological professions in the EU. EASA did not define concrete criteria for the accreditation and gave the mandate to the member states. There are many cross-border-issues in aviation to be considered. Therefore it is indispensable to ensure equal expertise of mental-health-specialists in every member state.

Methods

A review of professional laws, legal acts and training and accreditation requirements for psychology groups (e.g. clinical, occupational), as well as medical doctors' tasks in different member states was performed. A line to promote a practicable assignment of tasks of AMEs and mental-health-specialists within the aeromedical-assessment-process was drawn and NAAs were surveyed for initial feed-back.

Results

Considering all research results a concept of accreditation was developed - with mainly positive feed-back from stakeholders. The review of the research resulted in the need of two types of Aviation Psychologists. The Clinical-Aviation-Psychologist (CAP) and the Operational-Aviation-Psychologist (OAP). Accreditation-criteria consider both theoretical knowledge and practical experience in aviation. The CAP should mainly be specialized in clinical-diagnostics and psychological-evaluations, while the OAP is mainly dedicated to operational-risk-assessments and psychological-aptitude-testing.

Discussion / Learning objectives

The concept should be discussed in the context of the new EU-requirements. ECAM-participants should become aware of the necessity of specific mental-health-specialists' training. Harmonized accreditation could provide AMEs and medical-assessors a guarantee of equal quality of psychological assessments performed by mental-health-specialists.

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Introduction

Human voice encompasses the specific information especially about individual who is speaking and their psycho-physiological state. Emotional stress or fatigue can be significant elements of human voice changes in demanding conditions of workload or information overload. The voice analysis systems claim to be able to measure these changes (e.g. tremors resulting from different emotions a reactions to stress, fear, fatigue, etc.) which are transformed into the human speech. Stress and stress manifestation in acoustical signals have been a topic of interest of many research studies. A prediction of emotionally specific profiles, based on assumption of physiological components of emotional reactions has encountered some successes in empirical research.

Methods

The methods based on Layered Voice Analysis™ (LVA) by Nemesysco have been applied. Nemesysco's LVA technology is designed to detect and measure a wide range of emotions and cognitive states, collect them over periods of time, and estimate the tested parties emotional profiles based on the aggregated data. A small group of 6 fighter pilots were repeatedly tested during several simulated tactical exercises. LVA method evaluates 17 parameters, but for the presented research results were used Stress, Imagination activity and Intensive thinking only. A voice analysis from communication, heart rate (HR) and subjective rating scale were simultaneously evaluated and correlated. An additional approach evaluation was based on common context of eye tracking and HR measurements.

Results

It seems to be more likely that correlation between several psycho-physiological parameters and operational load is not always linear and immediate. Some parameters are relatively sensitive (e.g. HR, stress, intensive thinking) towards sudden and/or rapid changes and some of them are not. Closer correlation between stress and imagination activity implies much higher anticipation stress or workload of trainees before than during the simulated missions.

Discussion

Human voice analysis seems to be a promising psycho-physiological method in measurement of cognitive and emotional workload or stress in aviation operator's professions (e.g. pilots and air traffic controllers). Workload, stress and fatigue are worth to be explored not only from their relations on human performance but also from the view of their effects on aviation mental health and fitness. If the next research verify the closed correlation between voice analysis and stress or fatigue the voice analysis would be the new noninvasive and very comfortable method for stress or fatigue testing. This method don't need any sensors and operators can be tested on-line.

Discussion / Learning objectives

to propose and demonstrate a different approach to functional state including mental health issues through non obtrusive psycho-physiological method of voice analysis

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The results of medical flight testing are used in decision-making by medical assessors in conditions where the main concern is the effect of the condition on the ability to operate the aircraft (as opposed to conditions where the primary concern is sudden incapacitation).

Examples of such conditions are diplopia, demyelination, amputation and prosthesis, and spinal injury. In a similar way, there are neurological and psychological conditions (e.g. head injury, HIV and antidepressant medication) and their treatments which might impair a wide range of functions including cognition, decision-making and psychomotor performance. There are many batteries of psychological tests that can take many hours to complete which indicate performance on a scale, but there is only weak evidence that the results translate to the overall piloting task. The commercial flight simulator, by contrast – particularly the LPC/ OPC (Licensing and Operator Proficiency Checks) – are a test of what is expected of the airline pilot in both routine and emergency situations. They effectively test or sample all the skills of the airline pilot including situational awareness, flying skill/ability, workload management, problem solving & decision-making, dynamic & proactive risk assessment/ mitigations, communication, automatic flight control, and leadership & teamwork and thus can be used as a surrogate for formal neuro-cognitive testing.

One caveat is that reports received from simulator assessment are complex and expressed in technical terms. It is, therefore, not always easy for doctors to interpret the results. In addition, when it is being used for specific medical purposes, the person carrying out the sim test may not be clear on what extra tasks should be assessed to turn a routine competency check into a medical flight test.

The key to success is for the medical assessor to understand the LPC/OPC system and for the Type Rating examiner to understand the needs of the test. We have therefore looked at:

1. What is routinely tested in the sim? How can we use this information? How do we find the information we need in a complex report?
2. What additional information do we as medical assessors sometimes need from the sim test? In these circumstances, how could we better we communicate our needs to the sim examiners so that the additional tests are performed, and how do we interpret the results in making a medical assessment?

These issues will be explored, and anonymised examples presented.

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Nowadays civil aviation pilots are expected to have not only piloting capabilities but also personal and mental features that allow operating an aircraft and interacting with crewmembers with an optimum level of safety. Mental health examination is an integral part of flight safety measures in Civil Aviation and is regulated by "Manual on psychological provision of recruitment, training and professional activities of civil aviation personnel". The examination methods are divided into:

I. Assessing personal psychological features:

1. Standardized method of personality assessment
2. Color Selection Method
3. Method of portrait choices

II. Assessing higher mental functions and cognitive skills:

1. Landolt's test
2. Working memory test
3. "Compass" test
4. Reaction on moving subject
5. "Labyrinth"

SMPA methodology is the main and mandatory in psychological examination, other tests are supplementary and regarded as supporting and refining.

A psychologist can apply additional methods at his own discretion. However, only the mandatory SMPA method allows to evaluate the individual psychological characteristics, their compliance with the regulations, and to estimate the signs of the expressed accentuation, neuro-psychic instability and socio-psychological maladjustment. Since the method of SMPA is a verbal self-report, the reliability and quality of the results obtained is largely determined by the ability of the subject to evaluate themselves objectively. Here we face the main problem:

Tasting environment predetermines the presence of a "closed" (ego-protective) reaction of the examinee.

In order to level out the effect of the ego-protective reaction the following is applied:

1. Performing the procedure exclusively in the psychologist's office.
2. An extensive, well-considered pre-test conversation
3. Opportunity to do the test again in case of receiving unreliable results.
4. Comparison of data from previous examinations and analysis of the dynamics.

For all the above cognitive test methods, clear normative corridors of "compliance" - "non-compliance" with the required level of expression (formation) of one or another test indicator have been developed: the scores obtained for all five test-required tests are summed up.

Since 2013 CFEMC at CCHCA has performed survey of 1115 pilots and aircrew members where 634 persons were 40-65 years old (including 410 persons aged 50-60).

Nowadays the indication of nationality in a is omitted. However, for a psychologist this is quite an issue as it is connected first with the language. From the point of view of classical psycho diagnostic science, many tests can be applied correctly only for representatives of their native language and nationality. Mentality, cultural characteristics and language affect both on understanding assignments and stimulus material, and on the interpretation of the data obtained as well.

Fabrizio Palumbo⁽¹⁾, **Marco Agrifoglio**⁽²⁾, **Guido Stivali**⁽³⁾, **Stefano Farrace**⁽³⁾

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(3) Cardiologia 1, Aerospace Medicine Institute "Angelo Mosso", Italy Air Force, Milan, Italy.

Introduction

Bicuspid aortic valve disease is the most common congenital cardiopathy as the prevalence in adults is approximately 1% to 2% and the bicuspid valve is more prevalent in men, accounting for 70% to 80% of cases; a familiar clustering could sometimes be present. We know that the majority of patients with bicuspid aortic valve develop complications requiring treatment, including aortic valve surgery. The presence of a bi-leaflet valve is associated with increased risk of aortic dilation and a risk of aortic dissection five to nine times higher than general population. Very often the diagnosis is echocardiographic and the ultrasound scanning may be required during a flight physical for a systolic or diastolic murmur and/or for electrocardiographic abnormalities. In Italian military pilot selection the bicuspid aortic valve is cause of exclusion but it may happen that some cases are missed at the first visits.

We present three clinical cases (two civilians 1st class, one military) of asymptomatic male pilots in whom the bicuspid aortic valve disease required no limitation of flight fitness in one case, multi crew in another, and in the last surgery of the valve with Ozaki technique based on autologous pericardium in the Centro Cardiologico Monzino in Milan, Italy.

Methods

All the patients underwent laboratory routine testing, surface resting 12-lead ECG and cardiac auscultation. Since a murmur was detected a cardiological evaluation was performed including stress test and echo-Doppler echocardiogram. When needed, second level cardiological tests such as transesophageal echocardiogram (in one case) were performed in Centro Cardiologico Monzino, an University Hospital with which our institute has a convention approved by ENAC, the Italian Civil Aviation Authority.

Results

Of the three clinical cases two were fit for flying with SIC but one required a multi crew limitation for the presence of aortic regurgitation. In one case high velocities required further evaluation and a surgical operation of reconstruction of the aortic valve according to Ozaki procedure, based on autologous pericardium performed in Centro Cardiologico Monzino. No anticoagulation was needed after the operation.

Discussion

The bicuspid aortic valve is the most common congenital cardiac abnormality and it is a disease of the entire aortic root. In our experience a very close follow up with echo doppler is strongly suggested in pilots with bicuspid aortic valve disease. Aortic valve replacement using autologous pericardium may represent a very good option in pilots.

Learning Objectives:

The natural history and the complications of a bicuspid aortic valve.
When is required a multi-crew limitation in bicuspid aortic valve disease.
When an aortic stenosis is severe and not fit for flying.

Oldrich Truska, MD

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Introduction	One of the definitions of the sudden death (SD) is that it is a death within 24 hours of the onset of symptoms, the most often cause is still the cardiovascular death (IHD, cardiomyopathia, rhythm disturbances).
Methods and results	We reviewed data during the period of 25 years (1992 – 2017) and we have seen the SD mainly due to cardiovascular causes, usually due to the myocardial infarction (7x), neoplasma (5x), leucaemia (2x), acute pancreatitis, liver failure, decompensation of asthma bronchiale and Erdheim disease.
Case Report	The most serious event was the fatal in-flight incapacitation in a Czech airline captain during the approach for landing in 2012. The post-mortem examination showed the cause of the SD to be an aortic dissection with a cardiac tamponade due to the cystic medial necrosis (Erdheim disease).
Discussion	The major cause of in-flight fatal incapacitation in civil and military pilots are acute coronary events, new onset of idiopathic epilepsy and physiological problems (disorientation, hypoxia, G-effects, etc.). Less than 1% of all civil air accidents are due to a sudden incapacitation. The most common cause of the incapacitation is gastrointestinal problems which are usually debilitating but not fatal; on the other hand, an acute cardiovascular event can often have very serious or fatal consequences. Cystic Medial Degeneration The normal aorta contains a collagen, an elastin and smooth muscle cells that form the vessel wall. Degenerative changes lead to breakdown of the collagen, elastin, muscle cells, and an increase in basophilic ground substance with the formation of cysts and accumulation of mucopolysaccharides. The leading causes of fatal in-flight incapacitation are myocardial infarction, cardiac arrhythmias, and epileptic seizures; cystic medial necrosis is very rare and no similar case was found in the aviation literature.
Learning Objectives:	The return to any kind of flying should be prohibited for the pilot with Erdheim disease when diagnosed (but a problem is how to diagnose it in a person who has no clinical symptomatology).

Simeone Izzo MD, Gualberto Arduino MD
Italian Air Force

Introduction

The implementation of high standard procedures has led the airplane to be considered as the safest mean for human transportation around the globe. Specific rules and medical monitoring of the crew has also played a relevant role for the achievement and maintaining of this result. As for all the physiological aspects, the role of the AMEs is crucial in the evaluation, both initial and periodical, of the mental fitness as well. Among the mental dysfunctions the Bipolar Disorders (BD) represent an insidious pattern, not always easy to be detected, allowing us to hypothesize even a causal role in some unexplainable air disasters.

Discussion

Considering its epidemiologic features and phenomenology, it is not rare that this condition might remain undetected or unrecognized, especially in young population or in subjects with high cultural/educational level. There is also the risk to underestimate it during the so-called "free interval", when the symptoms are mild or, for the worse, some hypomanic features can even be considered as positive attitudes for piloting. But it is well known that during the clinical evolution of this syndrome there are phases where impulsive or intrusive thoughts or delusions can occur, leading the subject to make unpredictable decisions or disruptive behaviors.

Learning Objectives

It would be desirable if a systematic mental evaluation were not limited to the initial aero-medical examination. Since an increasing of psychosocial stressors, which are effective triggers to set off a BD, the AMEs should be aware of such aspects while evaluating the pilots fitness and be trained for this purpose. There are some subclinical conditions or specific endophenotypes, like personality traits or cognitive patterns that, if properly detected, could address to further specialistic investigations.

Rob Hunter MD, **Cpt Tim Pottage**

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Introduction	The number and type of drones competing to use airspace is set to dramatically increase. The increase is driven by a phenomenal exploitation of technology and the phenomenal utility of drones. However, strategies to mitigate collision with manned aircraft have not kept pace with this increase.
Method	The UK's Military Aviation Authority, BALPA and the Department for Transport have collaborated in a study of physical and modelled impacts of drones on aircraft structures.
Results	▪ Non-bird strike certificated general aviation and helicopter windscreens, and helicopter tail rotors have very limited resilience to drone strikes ▪ Airliner windscreens can be critically damaged under certain conditions ▪ Speed and mass being equal, drone strikes are significantly more damaging than bird strikes
Discussion	The regulatory approach to the segregation of drones and manned aircraft
Learning objectives	▪ To understand the special vulnerability of helicopters and general aviation ▪ To understand the vulnerability of airliners under certain conditions.

Cristian Ionut Panait MD,

Aircrew & Medical Department-European Aviation Safety Agency (EASA), Cologne, Germany

The medical field is evolving rapidly, we face new developments in regard to the diagnostic measures as well as new treatment methods. In the same time, the new developments are not validated for aviation medicine and might have hidden side effects that may negatively impact the flight safety.

Some applicants that were assessed as unfit look forward to the implementation of the new developments which would allow them to be medically certified.

The assessment and implementation of the new medical developments may differ among the EU Member States, which leads to different views among the aviation medicine experts.

On the other hand, new developments in aviation environment have an impact on the fitness assessment process of the applicants. The cockpit ergonomics as well as the working conditions of ATCOs also have a great impact on the fitness assessment of the applicants.

EASA's goal is to update the requirements based on scientific evidence and to incorporate the changes of both fields – aviation and medicine – as soon as these have proved to be safe and fit for purpose.

Among the topics that are to be tackled by EASA on short and medium term are: pilot age limits, colour vision, HIV positivity and 1% rule.

Francisco Rios Tejada, MD.
CMO AESA, Madrid, SPAIN

Introduction

EASA establishes standarization inspections annual or multianual in order to take into account emerging risks stemming from its continous monitoring activities. National Authorities must maintain and update the information collected from the comprehensive and focus inspections for the purpose of adequate monitoring, provide corrective actions and evidence of implementation of the agreed corrective actions. This approach entails four major components: collect information, analyse and prioritise, act as appropriate and follow up and closure of findings stemming from these inspections. Most of EASA Member States already developed comercial or selfmade computarized systems to handle the process of issuing or denied medical certificates. A comprehensive approach to the two main roles of National Authorities (NA), oversight of AME's and AeMC's, and handling of medical exams leads to the need of systems able to analyze the collection of data bases, provided by AME's, AeMC's and the interface with the corresponding Aeromedical Authorities.

Method

AESA data base collection of physicals provided by AeMC's and AME's during 2017 has been subjected to analysis by a system so called "Control Panel". Purpose of analysis seek two main objectives: 1. Evaluation of the health status of the aviation community and 2. To assess the number of established deviations of physical results once the mean and threshold baseline has been determined.

Results

A total of 11.996 AESA Class 1 files has been reviewed throughout the year 2017. A sum of 145 applicants were denied. By system the highest rate correspond to psychological problems, followed by psychiatric disturbances, then color vision deficiencies and cardiological and visual problems. The analysis of denials by comparing AME's againts AeMC's showed a higher percentage towards AeMC's.

Conclusions

Control Panel Analysis System, has demonstrated that its provides a wide arrange of data on behalf of information regarding the health status of our aviators and trends and deviations of denials among AME's and AeMC's. It might be a close relationship between a more extensive mental health evaluation and results. We foresee a potential impact of GW accident and the implementation of the "Ad Hoc" EASA recomendations. The more comprehensive evaluation of candidates supported by specialist associated to AeMC's makes the exam more reliable and able to show up findings that might not be identified by the AME. Other associated factors are discussed.

Janis Vegers, MD, **Virgilijus Valentukevicius**, MD, **Ionut Panait**, MD
European Aviation Safety Agency (EASA), Cologne, Germany

One of the main tasks of the European Aviation Safety Agency (EASA) is to ensure a full and harmonised implementation of the medical requirements for aircrew and air traffic control officers. The Agency is using several instruments to accomplish this task. Standardisation Inspections of Member States is one of them. There are several challenges and limitations regarding the performance of medical standardisation teams, such as different national medical systems of the 32 EASA Member States, the shortage of the fully qualified standardisation team members from national aviation authorities, short time allocated to the inspections on site, etc. The presentation will provide an explanation of the medical standardisation process and possibly raise a discussion in order to introduce some improvements.

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It is the responsibility of the International Civil Aviation Organization (ICAO) to manage compliance to the Convention on International Civil Aviation. The convention is supported by Standards and Recommended Practices (SARPs) contained in 19 Annexes, of which 9 is applicable to aviation medicine. The SARPs is supported by guidance material, which could be used as a means of compliance to the SARPs by States; and supplemented with programmes, seminars and other training initiatives.

ICAO works with its 192 signatory States, international organizations and industry partners to reach consensus on international civil aviation SARPs; and to develop guidance material. Harmonizing aviation medical SARPs and related regulatory practices across 192 States and various industry groups present numerous challenges. Such challenges will be discussed e.g. the pace of developments in aviation, medicine and technology; the requirement to consider the needs, capacities and capabilities of all signatory States, etc.

One of the solutions implemented by the Aviation Medical section at ICAO is the use different working groups, with the members of a working group being representative of subject matter experts, international, regional and industry stakeholders, States from different geographical areas and industry members. Each working group focuses on a separate area of expertise, with specific terms of reference and a list of deliverables to be submitted to the ICAO MPSG (Medical Provisions Study Group) for consideration. Current working groups include Mental Health, Alcohol and substance use, colour vision, air ambulances, human factors (age, fatigue and aviation medical taxonomy), RPAS, airport and aircraft disinsection, airport and aircraft disinfection and CAPSCA (Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation). Some of the working group activities will be discussed in more detail during the presentation.

The MPSG has oversight of the activities of the working groups, evaluates the recommendations; and assists the ICAO secretariat to develop proposals for amendment of the SARPs. Once an amendment to a Standard has been approved by the ICAO council, a State could file a difference with ICAO, but it might impact on the State's ability to participate in international operations. Filing of differences by signatory States and its possible impact will be briefly discussed.

Jochen Hinkelbein, MD Prof.

Chairman ESAM Space Medicine Group, Cologne, Germany

The Space Medicine Group of the European Society of Aerospace Medicine (ESAM-SMG) was established in 2018 by a decision of the Executive Committee of the European Society of Aerospace Medicine (ESAM). The ESAM-SMG has now 14 participants from all over Europe and is open to everyone from ESAM and associated societies.

The aim of the group is to provide a specific basis for space medicine – especially for networking, research projects and to facilitate scientific exchange of ideas. Scientific questions can be discussed together with colleagues to get feedback of other specialists. Especially for young researchers, not involved in the space medicine research community so far, the ESAM-SMG will provide support, facilitate research projects, and give assistance.

So far, several projects have been started by the participants. Some of them will be presented in the session and being published in the future to facilitate visibility of the ESAM-SMG.

Kolaparambil Varghese Lydia Johnson (1), **Guarnaccia L** (2), **Navone SE** (2) , **Nascetti A** (3),
Cappelletti C (4) , **Marfia G** (2)

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(3) University La Sapienza, Rome, Italy;

(4) Universidade De Brasilia, Brasil

Introduction

Glioblastoma (GBM) is the most aggressive and fatal human brain tumor, with a median survival of 14 months. GBM is characterized by uncontrolled proliferation, massive angiogenesis, high genomic instability, and resistance to radio and chemotherapy. This resistance to therapies as well as the high frequency of relapse is due to a subset of tumorigenic stem-like cells called glioblastoma stem cells (GSCs) which are self-renewing and multipotent. Previous studies suggest that microgravity may influence negatively the rate at which tumor mass progresses. In particular, microgravity simulations on GBM cell lines performed by specific tools, as 3-D clinostat, showed a decrease in cell proliferation and an increase in sensitivity to chemotherapies, demonstrating that GBM is particularly sensitive to the environmental conditions on spacecraft.

Method

Primary GSCs will be inoculated into mice brain to create an in vivo model. Subsequently, mice with GBM and healthy mice will be sent on the International Space Station (ISS). Following the same injection protocol, mice with GBM and healthy mice will be maintained in our laboratories for the corresponding on-ground experiments. Procedures involving animals will be conducted in accordance with the international guidelines of the National Institutes of Health Guide (NIH). On board the ISS, mice will be kept in special cages and they will be monitored 24/7 thanks to internal cams. Cages will be equipped with automatized systems to provide food and water, hygiene and adjust sleep/wake cycles.

Results

At the end of the mission, mice will be examined with behavioural tests through our specifically projected maze to evaluate their cognitive abilities and Magnetic Resonance Imaging will be exploited to rate the variation in dimension and vascularization of the tumor mass. Furthermore, tumor mass will be explanted and studied at morphological, cellular, molecular, and genetic levels. We expect to assist to a decrease in GSC viability and an increase in sensitivity to chemotherapies, in order to demonstrate that GBM is particularly sensitive to the environmental conditions on spacecraft and to improve the current therapy through the translation of results obtained on the GBM management.

Discussion

Cells exposed to microgravity may be profoundly affected by the physical changes that occur in the ISS unique environment, which include the loss of gravity-dependent convection, hydrodynamic shear, and lack of sedimentation. Our study intends to investigate microgravity and ionizing radiation effect on tumor mass, in order to improve our knowledge of GBM biological mechanisms. Data collected from this research will help us to develop new therapeutic strategies and improve GBM clinical outcome.

Learning Objectives

- Analyse the effects of microgravity and ionizing radiations on GBM
- Use the results obtained in the ISS to improve the current therapy on-ground

Steffen Kerkhoff (1, 2, 3), **Stefan Braunecker** (4), **Fabrizio Cirillo** (5), **Edoardo De Robertis** (5), **Eckard Glaser** (2, 6), et al.

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Background	As mankind strives to explore space beyond the moon by planning space exploration missions to Mars and as space tourism becomes closer to operational viability, medical planning for those missions must consider the possibility of life threatening medical emergencies. On Earth, well-established and proven guidelines concerning cardiopulmonary resuscitation (CPR) are published. Nevertheless, such a guideline does not exist for the special environment of microgravity, despite mankind exploring space since 1961. Nonetheless, several studies have been conducted to investigate the feasibility and best technique of CPR in microgravity. The aim of this guideline is to critically appraise all the literature of CPR in weightlessness and create the most up to date evidence-based guidance for its application under the special circumstances of spaceflight.
Method	A task force was created by the German Society of Aerospace Medicine (DGLRM) to develop a guideline for CPR in weightlessness, based on the member's clinical and scientific background. Then standardized questions using the PICO-model were created, to guide the systematic literature review, which was mainly performed using "PubMed". The retrieved 4,356 abstracts were then screened using the browser-based tool "abstrackr" in double-reviewer technique, and the selected papers were subsequently reviewed utilizing the GRADE-method. The guideline was then divided into 15 sections and the recommendations for each section were finalized by 2 experts. All proposed recommendations were then presented to the whole task force and subject to a structured consensus finding process using the RAND-DELPHI method.
Results	Similar to Earth-based guidelines, a differentiated approach to CPR with a division into basic life support (BLS) and advanced life support (ALS) is necessary for the special environment of microgravity. In immediate BLS, the chest compression method of choice is the Evetts-Russomano method (ER), whereas in an ALS scenario, with the patient being restrained on the Crew Medical Restraint System, the handstand method (HS) should be applied. Airway management should only be performed if at least two rescuers are present and the patient has been restrained. A supraglottic airway device should be used for airway management where crew members untrained in endotracheal intubation (ETI) are involved.
Conclusion	CPR in microgravity is feasible and should be applied according to the Earth-based guidelines of the AHA/ERC in relation to fundamental statements, like urgent recognition and action, focus on high-quality chest compressions, compression depth and compression-ventilation ratio. However, the special circumstances presented by microgravity and spaceflight must be considered concerning central points such as rescuer position and methods for the performance of chest compressions, airway management and defibrillation.

Rui Pombal, MD

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Introduction	o define the contents of their Emergency Medical Kits (EMKs) European airlines need to comply with EASA regulations and to take into account IATA/IOSA and other relevant international organization's recommendations, as well as epidemiological data from their inflight events and operational specificities and constraints. This is a dynamic process that requires periodical monitoring. According to the literature, medical volunteers help in the management of inflight events in 35%-86% of cases. This study aimed to find out what type of equipment and medication healthcare professional volunteers use and expect in those events.
Methods	Using the inflight medical event monitoring procedure of a medical department of an international, medium-sized airline based in Europe, the reports from the use of EMKs in a sample of two nonconsecutive semesters were analyzed. Collected data was fully and irreversibly anonymized.
Results	A total of 736 medical events were analyzed. In 65% (475) of these, there was some intervention by an onboard medical volunteer. In 99.6% of cases the passenger's condition apparently improved/stabilized. In 94% of cases one or more diagnostic or therapeutic devices were requested. A sphygmomanometer, a stethoscope and a glucometer were the devices most frequently requested. Some form of medication was used in 42% (201) cases. Three or four drugs were requested in 6% of those cases. Suggestions to change some item of equipment or medication were offered by the volunteers in 4% (16) of events.
Discussion	The rate of medical volunteer presentation was within that reported in the literature. Volunteers mostly requested devices and medication that are not unexpected when the epidemiology of inflight medical events is considered. They made suggestions regarding onboard medical equipment or medication in only 4% of cases; these will be discussed in terms of evidence available and operational specificities. One minor change to the onboard glucometer was made as a result of this analysis. Increased awareness of the medical and flying community on inflight emergencies and passenger clearance procedures, as well as monitoring/auditing of inflight medical events, and realism and good communication, could probably improve the management of expectations and help to keep onboard medical equipment relevant to each type of flight operation.
Learning objectives	▪ To know what kind of medical equipment medical volunteers in inflight events expect as compared to what is usually available on commercial airline flights. ▪ To know the rate and profile of use of onboard medical diagnostic/therapeutic devices and medication. ▪ To know the rationale for changes to onboard medical equipment and medication.

Ed Nicol, MD

Consultant Cardiologist Royal Brompton Hospital and Consultant Advisor in Medicine to the Royal Air Force UK

This talk will focus on the increasing role of advanced cross-sectional cardiovascular imaging in the assessment of cardiovascular pathology, whether this be for coronary artery, structural, valvular or congenital artery disease. The talk will introduce cardiovascular CT and cardiac MRI, the evidence for their use in aircrew assessment, and how they may be used to refine risk assessment in this population, both currently and as we look to the future, with advanced CT technologies such as computational flow dynamics and peri-vascular fat analysis.

Olivier Manen,

French Military Health Service Academy & NATO Cardiology Working Group

Co-authors : **T Syburra, J D'Arcy, N Guettler, D Bron, R Rienks, G Gray, E Davenport, E Nicol,**
NATO Cardiology Working Group**Background**

Heart diseases are a cause for disqualification in aircrews because they may suddenly impact the flight safety with various mechanisms and symptoms. Theoretically, in case of a cardiac finding, the aeromedical decision should take into account the likelihood that a clinical event will occur, the possible consequences of this event on the mission or flight safety, and the real function of the aircrew on board. The Royal Canadian Air Force has designed a risk matrix approach which includes these three parameters.

Method

Premature ventricular complexes (PVC) are a common finding during expertise in aircrews and yet the assessment of the real risk remains a challenge. This presentation will develop different case reports in aircrews with a history of PVC who were examined and assessed in Percy Military Hospital (Paris, France). We tried to retrospectively submit each one to the matrix to calculate the whole aeromedical risk.

Results

The following sub-groups of aircrew will be discussed: PVC with all reassuring criteria during non-invasive investigations; PVC with a short episode of non-sustained ventricular tachycardia; arrhythmia with a high PVC burden during 24h-Holter; PVC whose origin is compatible with a sequela of myocarditis on CMR; PVC considered as « benign » until a diagnosis of arrhythmogenic right ventricular cardiomyopathy; and symptomatic PVC with radiofrequency ablation and post-procedure myocardial findings during CMR.

Discussion

This matrix is interesting to understand the decision making-process with the representation of the factors to take into consideration. However, a precise risk estimation remains difficult, particularly in complex situations or when cumulative risks exist. Finally, it does not include the arrhythmogenic effect of +Gz accelerations which may have a triggering or aggravating role in pilots of high-performance aircrafts.

Sébastien Bisconte, Morgan Chasseriaud, Jonathan Monin, Nicolas Huiban, Violaine Maricourt, Sylvain Nguyen-Hyunh, Olivier Manen

Bordeaux Military Hospital

Background	Airmen are subjected to periodic medical examinations during which aeromedical examiner searches for causes of sudden incapacitation in flight such as cerebrovascular and cerebrovascular events. That's why cardiovascular risk prediction models should be used in clinical practice to identify high-risk populations. Gold standard scores are often time consuming. For this reason, this assessment is frequently replaced by an empirical evaluation.
Aim	of this study is to compare global cardiovascular risk factor assessment by gold standard scores (Framingham score, ASCVD, Systematic COronary Risk Evaluation) and by empirical evaluation. The secondary goal is to analyse the over- or under-estimated population by the empirical evaluation.
Methods	The global cardiovascular risk of over 40 yo aircrew members (AM) examined for fitness assessment, including a regulatory blood test, at the aeromedical centre of the Bordeaux military hospital were assessed by an aeromedical examiner after clinical examination and, in a second time, compared with the results of three main cardiovascular factors risk scores.
Results	From 05/01/2017 to 04/30/2018, 580 AM [92.2% male, mean age: 48.7 yo +/- 6.2 y, range 40-74 yo, 76% military aircrew] was included. Cardiovascular risk factors were low prevalent : smoking 13.8%, obesity 10.9%, hypertension 7.1%, diabetes mellitus 3.3 % and treated or declared hypercholesterolemia 6.7 %. In our study, we observe a good correlation between the empirical assessment and the three main cardiovascular risk score results. In the underestimated population by empirical assessment, a majority of them didn't present cardiovascular risk factor as WHO defined it. In the over estimated population, empirical assessment takes into account progressive risk factors like overweight and other factors normalize with treatment (hypertension and hypercholesterolemia).
Conclusion	Empirical evaluation has a good correlation with cardiovascular risk scores but it's important to be aware of the reasons for misjudgment in some subpopulations.
Keywords	cardiovascular risk factor, empirical assessment, Air crew

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Introduction	New medical and aviation technologies have permitted to change the approach in assessment of pilots' fitness who have coronary artery disease (CAD) and underwent coronary revascularization. The actual requirements do not cover all variations and complexity of every individual case and the aeromedical decision related to it. Still it remains a challenge for an aeromedical examiner to make a risk assessment after the coronary revascularization and to assist pilot to prolong his flying carrier afterwards.
Methods	The scope of this research is to define more fully the medical risks for flying duties of pilots who have had the coronary revascularization. We reviewed the data of literature and our experience on risks related to CAD after revascularization procedure in general and especially in pilots' population. The risk factors related to the progression of the CAD itself, perioperative risks, major adverse cardiac events (MACE) following the different types of revascularization procedures were analyzed. Different studies on long-term outcome with comparative analysis and benefits related to the type of revascularization procedure were also considered.
Results	In risk assessment of pilots who underwent coronary revascularization the following conditions should be considered: initial degree of a lesion, number, size and functional significance of coronary arteries involved, concomitant lesion of other arteries, the type and completeness of revascularization. Two cases of ATPL pilots: one after the PCI with stents implantation and the other after the CABG are presented as examples of medical certification and follow-up. Predictors for the better prognosis in aeromedical certification are underlined.
Learning Objectives	Conditions related to the favorable long-term outcome after the coronary revascularization should be considered for the safe performance of pilots. The new invasive and non-invasive diagnostic methods might be useful in risk assessment for better investigation of the lesion and its hemodynamic significance. Perioperative planning for the coronary revascularization in pilots is essential for each individual case. Understanding of the CAD progression as a major risk for the post revascularization cardiac event and regular follow-up of the modifiable risk factors, as well as completeness of revascularization procedure should be considered in safety management of aeromedical certification of the pilots.

N Huiban*, **FX Brocq**, **L Corgié**, **G Guiu**, **J Monin**, **S Bisconte**, **O Manen**, **M Monteil** and **E Perrier**

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Introduction	Cardiovascular prevention remains a key issue in aviation medicine. LDL-hypercholesterolemia is a major risk factor and it has been shown that a decrease in circulating concentrations leads to major coronary events reduction. The latest epidemiological studies show a prevalence that remains high despite a significant decline in the last ten years. We propose to extend this field of study to flight members as an original sample of the presumed healthy French general population.
Methods	The data come from a monocentric prospective study conducted between October 2017 and April 2018 (AeMC Toulon). The main objective was to describe the distribution of values and the prevalence of LDL-hypercholesterolemia relative to global cardiovascular risk according to the current recommendations. The main factors taken into account in validated risk models were also collected : age, gender, blood pressure, smoking, antihypertensive treatment, diabetes and cholesterol fractions. Fasting glucose and waist circumference were used to assess the distribution of the metabolic syndrome (criteria from International Diabetes Federation, 2005).
Results	A total of 2,821 persons aged from 16 to 83 years were received during the period concerned on initial visit or renewal of an aeronautical license. The mean concentration of LDL-cholesterol was 1.16 g/L (95% CI: [0.48-1.84]) with no significant difference between men and women. In this cohort, 9.3% had LDL greater than 1.6 g/L and 2.3% reported taking lipid-lowering therapy by statins. The prevalence of other major risk factors will also be described. The overall prevalence of hypercholesterolemia measured (> 1.6 g/L) or (bizarre de mêler les 2 résultats) treated (at lower values) was equal to 11.3%. It increased with age, reaching 25.5% beyond 50 years old. According to the SCORE model, 20% of the subjects were considered intermediate or high cardiovascular risk, increased up to 24.6% when including metabolic syndrome. Secondary prevention after a cardiovascular event concerned 0.8% of the subjects, considered at very high risk. Finally, 15.3% of the population studied had a LDL-cholesterol level higher than recommended target values, 1% was already treated but insufficiently while 1.3% was treated with consistent values to the recommended goals.
Discussion	At the French national level, this survey represents the largest recent cohort of presumed healthy subjects for the description of the main cardiovascular risk factors, on the way of the 2006-2007 National Nutrition and Health Study and the 2015-2016 ESTEBAN Study (2,035 and 2,074 subjects). In our survey, the prevalence of LDL-hypercholesterolemia appears to be lower. This result is to be seen in the light of the process of selection and close medical follow-up that aircrew benefit from.
Learning objectives	to know the prevalence of LDL-hypercholesterolemia and the distribution of global cardiovascular risk in French aircrew.

Prof. Dr. **Marjan Bilban**

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Introduction

Measles is a contagious childhood disease caused by the measles virus of the genus Morbillivirus within the family Paramyxoviridae. The virus is transmitted by infected oral and nasal secretions; it may be transferred directly or indirectly, by infected particles in the air that has been breathed or coughed out. The incubation period of the disease is 4–10 days. The patient is infectious to others from the onset of symptoms to 3–5 days after the appearance of the rash. Measles can infect anybody who had not had it before or had not been successfully immunized through vaccination. Children and adults who had not yet been vaccinated against measles are vaccinated using two doses of a live but weakened measles virus administered one month apart. Serological and epidemiological studies show that the immunity conferred by the vaccine is long-lasting, in most cases life-long. The probability of measles outbreaks in Europe is high, as most countries do not have a vaccination rate above 95%. This allows for the disease to spread within countries but also from one country to another, which is a particular problem in our time of strong migrant flows, meaning that traveling across Europe can increase one's risk of being exposed to the measles virus. According to the European Centre for Disease Prevention and Control, thousands of cases of measles have been detected in the past few years in Europe, most of them in France, but also in Belgium, Switzerland, Sweden, Serbia, Denmark, Norway, Germany, the Netherlands, Russia, the UK, Turkey, Romania and Italy. Globally, the annual incidence of measles is 36 persons per million, and the overall mortality is about 132,200.

Study

In Slovenia, single-dose measles vaccination was introduced in 1968, and a second dose was added in 1987. Additionally, we also vaccinate and check the immunity of persons with elevated risk (healthcare personnel, etc.). As recently as 2007, the immunization rate in Slovenia was about 96%, and now, in 2016, it is only 93%, at least 3% below the threshold of acceptable risk. Due to the increased number of cases in some destination countries of our national airline, concerns were raised regarding the risks faced by pilots and other flight staff who fly to remote locations and are possibly exposed to direct contact and risk. We have thus decided to check the immunization status of over 200 employees of the airline and found that 89.7% of them had acceptable Ab levels, 6.34% had negative Ab titre (complete vaccination with two doses was recommended), while there were 3.96% with borderline Ab titre, for whom, absent the proof of complete vaccination, it was recommended that they receive a single booster shot of the vaccine. Only after completing the recommended immunizations and showing acceptable Ab levels were these employees again allowed to fly to locations with elevated risk of measles.

Conclusion

In Slovenia, most measles cases are connected to international travel. As everybody not immunized against the measles virus is at risk, it is important for people to check their immunization status before travelling. We have also advised the airline to implement appropriate epidemiological and educational measures and to adopt a detailed action plan to use in case of a suspected or confirmed case among the flight crew and staff as well as among the passengers.

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Key words

bone mineral density, bone metabolism, body compositions, airline pilots

Objective

Studies suggest aircrew may be more prone to develop spinal disabilities. Maintaining the health of bone assume significance for pilots because of variety of reasons. The aim of our study was to investigate the bone mineral density (BMD) in airline pilots of civil aviation.

Design and methods

200 healthy male airline pilots of civil aviation (20~59 years) and 180 healthy male controls (20~59 years) were randomly selected and were divided into four different age groups (20~, 30~ 40~ 50~ years old). Bone mineral density (BMD) was measured at the lumbar spine (L1–L4) in the anteroposterior position and the hip including femoral neck (FN), trochanter, intertrochanter, and total hip (TH), using dual energy X-ray absorptiometry (DXA). Total body fat mass (TBFM), total body lean mass (TBLM) and total bone mass content (TBMC) were also assessed by using the DXA.

Results

In airline pilots, the whole body BMD and TH BMD in 30~ years old group was significantly higher than those in control group ($P < 0.05$), and there was no significant difference between airline pilots and controls in 20~, 40~ and 50~ years old groups ($P > 0.05$). TBMC of airline pilots was higher than controls in 30~, 40~ and 50~ years old groups ($P < 0.05$), and TBLM of airline pilots was higher than controls in 30~ years old groups ($P < 0.05$). TBFM of airline pilots was lower than controls in 20~ and 30~ years old groups ($P < 0.05$).

Conclusions

Our study showed that the BMD of airline pilots was as the same level as non-flying controls and more exercise might be maintain BMD of airline pilots of civil aviation.

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Objective	To explore the effects of aeronautical environmental factors on bone metabolism in aircrew members of civil aviation, we analyzed the correlations between the level of biochemical markers of bone metabolism and flight duration in aircrew members of civil aviation.
Methods	200 healthy male aircrew members of civil aviation (23~59 years) and 180 healthy male controls (23~60 years) were randomly selected and were divided into four different age groups (20~, 30~, 40~ and 50~60 years old). The levels of blood calcium (Ca), serum inorganic phosphorus (P), 25-hydroxyvitamin D [25(OH)D], bone alkaline phosphatase (BALP), Osteocalcin (OC), Procollagene I C- and N-terminal propeptides (PINP), Type collagen carboxy-terminal peptide (CTX) and Tartrate-resistant acid phosphatase (TRACP) were measured.
Results	The results showed that the OC was significantly higher in the aircrew members aged 30~39 and 50~60 than in the control groups ($P = 0.004$, $P = 0.036$), while there was no statistical difference between groups in 20~ and 40~ group ($P > 0.05$). There was no significant difference in the levels of Ca, P and 25(OH)D between the two groups. The levels of 25(OH)D, CTX, OC and PINP decrease with age in both groups, in addition, all the above parameters in all ages were higher in the pilots than in the control group, however, there was no statistically significant. The cumulative flight duration was negatively correlated with bone metabolic parameters. Nevertheless, there was no significant correlation between flight duration and bone turnover markers after adjusted for age.
Conclusions	These results suggested that the aeronautical environmental factors have no effect on the bone metabolism biomarkers in aircrew members of civil aviation.
Keywords	aeronautic, bone metabolism, civil aviation, aircrew members

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Introduction

Situation in the Netherlands: 2-7 % of all juveniles has to live with the diagnosis ADHD. 6,05 % of all juveniles (0-25yo) use psycho stimulants i.e. methylphenidate with positive results on their ADHD symptoms. 70% of them still have symptoms as adults.

Use of psych stimulants in general population is increasing. Thresholds for treatment ADHD are contentious. Recently (December 2017) the Dutch college for the rating of medicines (CBG) together with other European countries, allowed the use of methylphenidate for adults under certain restrictions.

Up to now the use of psycho stimulants is not allowed in EASA Part Med.

Dilemma

Imagine a candidate with ADHD, who uses methylphenidate, wants to become a pilot. He knows he will be refused because of his medication, so might deny diagnosis and treatment during AME. Current policy if applicant mentions ADHD and use of methylphenidate is an assessment by a psychologist and/or psychiatrist, and finishing medication. Many ADHD 'ers however function much better WITH medication.

Questions 1: Is it wise and safe to let an applicant with ADHD fly? And if 'yes '

Questions 2: Is it wise and safe to develop a policy in which an applicant who presents with diagnosis ADHD may continue methylphenidate use under strict conditions?

Discussion and learning objectives

How reliable is the diagnosis: who made it? (should be made by a licensed clinician with expertise in ADHD). There seem to be significant over-diagnosis. As a general practitioner and AME I have seen many people with a diagnosis of ADHD, who are without symptoms at any later moment in their life, with and without medication. Therefore we have to ask ourselves with any candidate if there still is a clinically significant illness. The diagnosing clinician should also exclude other medical or psychiatric condition (2/3 of real ADHD has psychiatric co-morbidity). Was the applicant diagnosed during childhood? What symptoms persist nowadays?

Requires understanding of safety, side effects and withdrawal effects of methylphenidate, efficacy with adults in short term and long term use, short-acting and slowed-release forms. Which restrictions? Which conditions? Interdisciplinary approach desirable and possible?

Margaret Grace

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Email: magsayr@rocketmail.com**Introduction**

What place does podiatry have in aviation medicine? Observations at a leading airline in the Middle East found that many of the industrial injuries occurring amongst its cabin crew, were frequently related to the lower limbs. Problems associated with poor foot mechanics often presented as symptoms in the lower back, hips, knees, ankles, feet and connective tissues in these areas.

Gathering Evidence

Screening of 250 ab-initio cabin crew over a 12 month period revealed many to have abnormal foot mechanics. Whilst many were asymptomatic and/or compensating for such abnormalities at this early point in their career, it was noted that many crew started to develop symptoms after they started to fly. In 2012 – ab-initio cabin crew were assessed over a 12m period. Over that time, 34% of crew were found to have a podiatric issue with 30% requiring orthoses. Of the 34%, 30% of this group had footwear issues. It was considered that the occupational role of cabin crew along with the wearing of a corporate style shoe, fatigue and physiological changes over 10,000ft altitude were largely responsible for the apparent rise in symptoms following the commencement of a flying career. Differences in the number of crew presenting with issues amongst cultural and gender groups also existed. The screening of crew also served to highlight common biomechanical problems. Each person was screened once using an electronic pressure plate scanner and a hands on assessment to check the range and type of motion in the lower limbs. Six common conditions were noted amongst the group: Hypermobility; Over-pronation with/without secondary issues including plantar fasciitis; Forefoot Equinus; Morton's Neuroma / Intermetatarsal Bursitis; Plantarflexed 1st Ray – with (functional) hallux limitus; Achilles Tendonitis. Resource management meant that it was necessary, initially to focus on rehabilitating those crew who were symptomatic as opposed to taking a preventative approach. Referring patients to external podiatry clinicians had historically proved to be a costly exercise since such clinicians lacked industry specific knowledge (uniform requirements, effect of altitude and occupational role etc) and were often prescribing orthotics that could not fit into shoes. Such orthotics were therefore not tolerated well and were not worn.

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Introduction	Obesity is a growing health problem in developed and developing countries. Prospective studies have shown that there is a link between overweight- obesity levels and morbi-mortality due to cardiovascular diseases. Obesity is strongly associated with cardiovascular risk factors such as hypertension, glucose intolerance, type 2 diabetes and dyslipidemia. Risk of coronary heart disease, ischemic stroke, type 2 diabetes and sleep apnea is elevated by increased body mass index. Current outbreak of obesity, followed by chronic diseases, requires both aeromedical communities to understand how to prevent and recognize the problem.
Methods	After screening pilots working at a commercial airliner (n = 3737) in June, 2016, pilots with BMIs over 27 received an informative email about chronic diseases and obesity as well as a meeting scheduled with a dietitian (n = 265). Pilots who attended dietitian consultation were reevaluated after 1 year. (n = 75). Prevalence of obesity (BMI > 30.00), hypertension, diabetes, and cardiovascular disease were questioned in observational and cross-sectional study, taking into account intervals recommended by World Health Organization. The data was collected retrospectively through health automation system and was grouped into two as before (June, 2016- June, 2017) and after (June, 2017- June, 2018) intervention. The statistical power of the sample was 13.7%. The confidence interval was taken as 95% of all tests performed ($\alpha = 5\%$). Obesity comparisons were calculated using Mann-Whitney U test. Comparisons of chronic diseases were made with McNemar test, paired sample t-test was used to compare weights of pilots who visited dietitian more than once. Data was analyzed with SPSS 20.
Results	Currently BMIs of all pilots (n = 4297) are; underweight 0.5%, normal weight 42.2%, overweight 49.1%, obese 5.8%, morbid obese 0.1%, undefined 2.3%, mean BMI: 25.62 SD: 2,746 (n = 4285). We didn't find a statistically significant difference in BMIs (Wilcoxon Signed Rank Test sig: 0.792, first BMI averaged 27.90, final BMI averaged 28.09, n = 75). We didn't see any significant changes in chronic illness rates. Pre- and post-intervention rates for cardiovascular diseases, hypertension and diabetes were respectively; McNemar p: 0.63 (17.3% -10.7), p: 1.0 (50.7% -52.0%), p: 1.0 (48- 49.3%). When we considered number of interviews with dietitian, we observed significant weight loss in pilots who was interviewed 2 or more times; paired sample t-test p: .000, mean weight loss of 5.8 kg (95% CI: 3.2-8.3, SD: 4.8)
Discussion	Although obesity and chronic disease rates are less than general population (obesity prevalence in Turkish society is 32.1%, in our study 5.9%), they still affect pilots negatively. Obesity is also considered as an important risk factor for development and progression of sleep apnea which is associated with daytime sleepiness, fatigue, cardiovascular events, accident-related mortality and morbidity. Preventive practices are crucial to prevent obesity from causing chronic diseases or accidents thus endangering flight safety. In light of these findings; it can be considered that obesity prevention practices can achieve meaningful success by finding ways to increase program participation and continuity in addition to dietitian support.

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Introduction

Mammalian uterine microgravity maintains homeostasis (Serova LV.1987) protecting from altering Atmospheric, Environmental and Space stresses, with concomitant metabolic and energy requirements, of extra-embryonic motor activity (Turpaev TM 1998). Human 'intrauterine moulding'(a water-immersed state), intrinsic prenatal neuromuscular development initiates 'finding its feet'; and with optimal 'whole-body vascularization', is susceptible to extrinsic uterine space limitations and amniotic fluid pressures (Dunn P. 1974). During prenatal neurogenesis Cerebellar granular layers, show progressive thickening of cerebellar folia (Yamaguchi K 1992), decreasing by 34th gestational week and disappearing by the 11th postnatal month (Abrahām H. 2001) with postural adaptations following birth and infancy.

The upward force exerted by the floor and self-awareness in all bipedal stances and movements (Sharma JD. ECAM 2017), from near fetal and squatting positions, to overhead stretches, weightlifting, and air borne differential shifts in the weights of body-parts, inspire Gliding, Water and Aero-Sports, further exaggerated by powered avionic and aerospace supports.

Applications and Discussion

The primordial need to leap into the Air from on-land or from Water against the forces of gravity has been a basic Life process with strong Foot-launches in amphibians, and humans attempts at flying with or without wings. The Evolution of Functional erect postures and gait on Earth, develop through optimization of centralized spino-cerebral force-tension, and toe-to-head alignments (Sharma JD 2013); e.g. an efficient eggbeater kick, with a complex combination of hip rotations and knee and ankle flexions in Water Sports (Stirn I 2014). While hydrostatic buoyancy is an Under-load, counteracting the effects of gravity, the horizontal wall push-off and vertical on-land squat jumps require a streamlined proximo-distal joints organization (Guignard B.2017). Concomitantly Squatting increases the filling process of the heart by intrinsic baro-receptor responses to pulse pressure changes, latencies with the Valsalva maneuver on resuming the erect posture (Sharpey-Schafer EP 1956), and gravitational loading (Negishi K 2017).

Complex classification systems, with external activity monitors (up to 36) have been used, but a tri-axial accelerometer, with sensors placed on the ankles, right thigh, and waist and better algorithymic interpretations in free living environments (Emma Fortune. 2014), can be extended to space-relevant training modalities. Exposures to high-G on the human centrifuge using seatback angles of 13-75 degrees, and pelvis elevated with knees on chest (fetal position) have been used (Voge VM. 1977) with Visual field reductions (Gillingham KK.1977),

Ancient Gyroscopes were developed for finding Astronomical, positions and motions in Space and Time. Body positioning for a perceptual upright in Centrifuges and Multi-axial Gyro-Simulators like the Twin Bike system, for assessment of tolerances and training are being optimized for safe functional needs in gravity-defying Extreme Sports, and extended to Space Tourism. Conjugating human engineering, with fetal positions, portends, training for postural adaptations in extreme and aerospace environments and allay Postural Deficiency Syndrome in Astronauts (Sharma JD.ASAM-NZ. 2017).

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Introduction	Transmission of infections during air travel is not very uncommon. Majority of the infections are related with travelling within the confined place, use of common toilet facilities, unhygienic practice. These conditions are most prevailing during long haul Flights. This study was planned to study common infections that affect Aircrew during Air travel.
Methods	Total 521 Aircrew were included in the study including Captains, First officers and Flight attendants. Study group was composed of 214 Male Pilots and 307 Female Flight attendants. Aircrew were physically and medically examined and the candidates that were physically fit were incorporated in the study for the period of 16 months. Aircrew were observed every month for any onset of disease and their Health status was recorded in documents.
Results	The data revealed that Flight attendants were more affected with the travel related infections as compared to Pilots. The reported infections in order of frequency are Urinary tract infection, Skin infections typically boils, Flu, Cough and Typhoid. 30 reported Urinary tract infection, 30 reported boils typically over Chin, Forehead and cheek areas. 28 reported Cough and Flu. 5 cases came out positive with Typhoid. The incident of infections was rare among Pilots.
Discussion and Learning Objective	The most common infection identified were Urinary tract infections, Skin infection, Flu, Cough and Typhoid. These infections are spread because of close confined space and use of common toilet facilities by both the passengers and Aircrew. Aircrew is at high risk to develop such infections due to heavy exposure to the same environment daily. Hence, prompt measures should be taken to control the most common infections found in the crew that will ensure their health status.

Carla Pontes, MD

HiFly Medical Department; Mirpuri Foundation; Universidade Nova de Lisboa

Email: cpontes@hifly.aero**Introduction**

The cancer incidence and prevalence is expected to surge globally in the next 20 years. Improvements of early detection and cancer treatments have led to an increased prevalence of cancer survivors. Nearly any treatment can cause late effects. Several studies addressed the impact of symptoms on the ability of cancer survivors to resume or maintain work. Many targeted drugs are still quite new and evidence about the chronicity of symptoms is still lacking. However, rare, serious and unusual side effects have already been described. This may represent a new challenge for pilots returning to work after cancer.

Methods

A systematic search of peer-reviewed was performed, on topics related to cancer survivorship, targeted therapies and pilots' medical assessment.

Results and Discussion

The number of new cancer cases per year is expected to rise to 23.6 million by 2030. Cancer has a major impact on society across the world; it is among the leading causes of death worldwide and with the decline of the overall death rate, the number of cancer survivors has increased. Almost half of the adult cancer survivors is younger than 65 years. Despite progresses in cancer treatment, survivors have to live with adverse effects that negatively affect their capacity to maintain a professional activity. An increasing number of survivors of cancer return-to-work following treatment which represents a major challenge for some professions, specially those who need a specific and regulation-based fit for work medical assessment, like commercial pilots. Late effects can occur months or years after cancer treatment and many cancer survivors have a high risk of developing long-term side effects. Late side effects from standard chemotherapy drugs can be chronic. Tumor-targeted therapies are one of the focus of drug development in oncology these days. Aimed at boosting the anti-tumoral response in cancer patients, this personalized approach can lead to serious side effects including severe autoimmune disorders. Pilot's medical fitness has to guarantee a sufficient level of safety; however this may be difficult to achieve due to late secondary effects that may arise after the return to flying. Oncology follow-up reports provided to the licensing authority should include more information that the disease status and free-from-disease interval. A detailed description of the secondary effects profile should be included and the adoption of a multidisciplinary approach by the licensing authorities is strongly advised and needed to patient and aviation safety.

Conclusion

Research on the effect of cancer treatment on work ability is still scarce. Although the innovative and game changer targeted therapy drugs don't have the common chemotherapy toxicity profile, they can still cause disabling side effects. More evidence is needed about long-term organ damage changes or immune system severe deregulation. When it comes to cancer survivors, risk assessment of in-flight sudden incapacitation must encompass a wider perspective and consider late and severe effects of novel therapies.

Carla Pontes, MD

HiFly Medical Department; Mirpuri Foundation; Universidade Nova de Lisboa

Email: cpontes@hifly.aero**Introduction**

Airline industry is a known source of economic and social benefits and there has been an increasing public pressure on its social and environmental responsibility. Several social and environmental sustainability initiatives have been recently adopted such as banning plastics on board. However, complementary and non-conflicting legislation is needed and may be one of the most relevant tools.

Methods

A systematic search of peer-reviewed and grey literature and key sources such as government and airline companies' websites was performed. European Commission and other international institutions available information served to assess current policies and goals. Several interviews were conducted with key stakeholders of the public and private sector.

Results and Discussion

The problem of plastic pollution is growing exponentially every year and it is recognized as one of the major challenges for planetary health. Growing evidence about the environmental hazards and impact on human health make reasons to act clear. Airline industry growth has impacted on the environment and there is an increasing public pressure on recognizing their responsibilities toward society. Several corporate social responsibility approaches regarding the environment have been adopted by the airline industry, namely recycling on board and educational programs focusing on environmental issues.

In Europe, following the EU Directive 2015/720 and to achieve a sustained reduction in plastic usage, several countries have introduced measures ranging from bans and levies to private sector agreements.

The new legislation proposed by the European Commission (EC) and moving away from single-use plastics will pose several challenges to the airline industry. The existence of alternatives for onboard use in terms of storage and hygiene, specially for longer flights, maybe one of the major bottlenecks.

The European animal health legislation obliges airlines to treat all catering waste arriving from outside EU borders as high-risk and incinerate it or bury it; other non-European countries have similar approaches. Other government level initiatives may also affect the aviation sector in the near future, like European Commission' Strategy for Plastics in a Circular Economy 2018-2030.

Tackling one of the major challenges will require less conflicting regulations and innovative approaches and action. Key stakeholders' involvement will play a major role in the decision-making process as they seek to turn the tide on plastic. United Nations Environment has recently drawn up a roadmap based on the experiences of 60 countries around the globe, that can help governments to achieve long-term impacts and better address the problem of plastics in the environment.

Conclusion

Over the last decade an increasing number of national and local governments have developed and implemented policies and measures to reduce plastic waste. Governments and the private sector will play critical roles in tackling environmental challenges. By working together with the Airline industry, governments can support the development and promotion of sustainable alternatives and non-conflicting legislation.

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Introduction

A distinction between emotion and cognition is apparent in the study of the human factor in aviation, where cognitive and psychological features attributed to the pilot and flight crew were historically studied separately. In reality though, the human factor in aviation is a complex and multidimensional construct, incorporating different levels of analysis. At the core of this complexity, cognitive and psychological variables occur in dynamic interaction.

Methods

The 100 most fatal civil aviation accidents were subjected to data driven content analysis searching for recurrent cognitive and emotional/psychological themes. Results from content analysis were subjected to multidimensional scaling (MDS with ALSCAL), with an aim to explore a two-dimensional graphical representation of co-occurring psychological and cognitive variables in the accidents on a non-metric map. Further clarification of the underlying construct of the possible interaction matrix was attempted using a multidimensional scaling trigonometric solution (MDS-T).

Results

Psychological Effect: Any individual characteristic, internal state or environment effect that can have an effect on cognitive performance (e.g. personality traits, mental health variables, crew dynamics, personal life factors, operational and cultural effects). Cognitive Error: A subject's innate or situational vulnerability to error. A cognitive error is the result of a neurocognitive mechanism gone wrong and is linked to the human brain by account of cognitive functionality (e.g. attention, memory, language, perception, decision making). Five conceptual clusters were identified: individual pilot characteristics, sociotechnical cockpit performance, organizational/operational effect, training, level of involvement and decision making-overestimation. Single source psychological human factors were present in a few cases regarding psychopathology and murder suicide. A determinate act by the pilot directly related to the accident cause and not to an error is what differentiated qualitatively these cases. On the other hand, almost in every case where a neurocognitive error was identified, at least one psychological variable pertaining to the same accident emerged.

Discussion

A failure to differentiate between human error and human factor is an innate handicap in virtually all current human factor models. Indeed, a paradox regarding the human risk factor in aviation is that it has been thoroughly described but not yet adequately defined. Whereas emotional and cognitive attributes are apparently distinct in some behaviors, in the majority of cases the existing integration of emotion and cognition is blurry. The same holds for complex behaviours in the cockpit, where even the pilot himself cannot assert a level of metacognitive supervision in what exactly he feels or thinks while flying. In the end, if we are to understand how complex behaviours are carried out in pilot's brain, an understanding of the interactions of the two is indispensable. A significant number of fatal aviation accidents could have been prevented if the underlying factors had been controlled. Under this prism it is argued that accident causation has circumstantial relation to the actions required for the mitigation of the human risk factor. On the contrary, an always present "psychological effect" in the spatiotemporal attributes of the accident can and must be assessed and mitigated. The neuropsychological approach towards the need to review current assessment procedures and create new reliable tools could be a method of choice, as it is directly related to the nature of the human risk factor itself.

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Introduction

Gravity is not available to separate fluids from gases during spaceflight. This fundamental fact of physics limits the use of certain medical equipment and procedures like anesthetic vaporizers and intravenous (IV) fluids in microgravity. The process to administer IV fluids and medications in microgravity requires a technique to mitigate the lack of gravity. While a pressure bag can be utilized to allow the delivery of IV fluid, it does not solve the problem of an excessive amount of air in the IV tubing to be dispensed to the patient. Terrestrial air filters are available for IV fluids, but they are not designed to handle the large amount of air that may be delivered in microgravity. Additional procedures and/or equipment is needed to remove or separate air from IV fluid during spaceflight.

Methods and Result

An air trap was developed for use with IV fluid tubing in microgravity using CAD software and printed using a nylon 12 polyamide powder on a EOS Selective Laser Sintering 3D printer. The device is an inline air trap utilizing a 150 micron membrane filter around a central, hollow pillar allowing venting of air. Fluid is accelerated centrifugally around the hollow core, forcing the less dense air into contact with the filter. It has been tested terrestrially by measuring quantity of air in large boluses and small bubbles successfully filtered. The air trap was tested in different positions with respect to gravity to evaluate for microgravity suitability. Results were compared against commercially available inline air eliminating filters.

Discussion

IV fluid administration is an often underappreciated and a necessary basic requirement for medical treatment. Given the unique nature of microgravity fluid dynamics an air trap was developed to allow the successful administration of IV fluid and medication during spaceflight. The device has limited upmass as it can be 3D printed on orbit. The air trap should be tested in microgravity before transitioning to operational use.

Learning Objective

Describe the challenges of IV fluid administration in microgravity and current solutions available to minimize inadvertent transfusion of air.

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Introduction	Taking up education at the aviation university requires obtaining a positive certificate of the Aero-Medical Committee and passing the entrance examinations. These are the basic conditions that a student candidate needs to meet because the profession of a pilot is associated with acting in extreme situations that generate stress. Therefore, apart from health considerations, it is important to assess the predispositions necessary to perform aerial tasks in extreme situations.
The aim of the study	The aim was to check whether the choice of styles of coping with stress during the physical education exam has an impact on the motivation of the candidates for the pilot profession.
Material and method	The study selected $n = 60$ candidates aged $x = 19$, seeking to study at the Faculty of Aviation and Space Science. To assess the motivation of achievements and styles of coping with stress, the following were applied: ▪ The motivation question of achievement – (Maria Widerszal-Bazyl), ▪ The Coping Inventory for Stressful – (Norman S. Endler & James D. A. Parker).
Results	The obtained data was subjected to statistical analysis with the “Statistica” program. Obtained results indicate a statistically significant positive correlation between the motivation of achievements, and the following styles of coping with stress: ▪ task style ($p = 0.001$), ▪ emotional style ($p = 0.04$), ▪ avoiding style ($p = 0.029$), ▪ replacement activities ($p = 0.05$).
Conclusion	The research shows that the achievements motivation as a personality dimension influences styles of coping with stress. In addition, it is worth noting that as the motivation of achievements increased, subjects applied more and more effective styles of coping with stress (task style). It should be emphasized that high achievements motivation is conducive to effective problem-solving. However, the literature shows that the motivation of achievements begins to take shape during childhood and in the initial period of school education.
Learning objectives	1) Was Richard Lazarus the first one to introduce term “stress” to medicine and psychology? 2) Does stress have a biological background? 3) Is oxidative stress an effect of a longterm negative factors that affect a person

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Introduction

Aeromedical training should be a part of the education of all aviation personnel. Nevertheless, aeromedical training in Czech Republic is mandatory only for the military pilots. This presentation provides information about training methods of the Department of flight safety of the Institute of aviation medicine Prague.

Content

Several main methods of aeromedical training in our institution are described briefly: High altitude training in hypobaric and rapid decompression chambers. Spatial disorientation training, gravitational physiology and finally basic training in usage of night vision devices. Listed methods are described and photographic material is supplied. Training in IAM Prague is at very high level, serving national but also foreign clients. IAM is holder of USAF certificate of recognition, which guarantees quality and compatibility at international level.

Learning objectives

Poster informs about current aeromedical training situation in Czech Republic.

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Introduction

Aviation sports sets special challenges for both the sports science and aviation medicine support issues. Glider flying is a widespread part of the aviation sports. Physiologically gliding is mainly low-level aerobic endurance oriented sports, but less is known of the crucial psychological needs before, during and after the flying contest. However, there have been published some scientific publications on the performance related experiences and individualized approaches in other sports on the sports medicine and psychology journals. This paper presents and discusses the design of the Finnish top sport glider pilots' psychological training follow-up for the upcoming Glider World Championships (GWC). Due to the obvious marginal interest and knowledge in the aviation medicine literature, one main aim of this presentation is to illuminate the study design and gather essential expertise information for the follow-up elaboration.

Method

Within 2,5 years the glider pilot team takes part in pre-GWC psychophysiological training intervention, which includes the next, non-invasive components: physical fitness featuring endurance (max VO₂ by submaximal bicycle ergometer, submaximal squats in 1 min by own body weight, abdominal crunches in 1 min, max hand grip and BMI), heartbeat variability (HRV-measurements during the potential "high load"-phase in the smaller flying contests and leisure time) to achieve understanding the individual stress level and behavior, and the psychologic performance coaching period (includes Individualized Emotion Profiling, IEP and Emotional Self Regulation, EMR, training). Due to the nature of the glider flying, good endurance level is supposed to guarantee sufficient enough physiological basics during the long flying contest, and IEP/EMR skills to help more flexible to copy with tactically highly demanding, sometimes even surprising daily pre- and in-flight routines.

Result

Glider flying in-flight tasks demand only moderate cardiorespiratory endurance, and the pilots fulfill this clearly. Due to the sitting posture in the cockpit and long flying legs, the muscular endurance and BMI, however, could be a little better, to prevent obvious sitting-related local muscular fatiguing. It shows preliminary, that even smaller flight-related arrangements might have a stressor effect, but data is still insufficient. So far the IEP/EMR techniques relevance/benefit cannot be discussed.

Discussion and learning objectives

Explicit "performance enhancement" approaches on psychologic support are so far quite a new topic on the aviation sports, even the issue has been recognized as general since the beginning of the aviation medicine. The final conclusion of the intervention success is fully possible not until the GWC, and thus any supporting scientific feedback for the study continuum is most preferable.

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Background	Work-related musculoskeletal problems (MSKPs) are a worldwide prevalent issue that affects employees in a wide variety of occupations, causing disability and increased health-care cost. Cabin-crew members are much more prone to the development of MSKPs, due to the strenuous physical and psychological demands of their work.
Aim	The purpose of this study was to determine the prevalence of work-related MSKPs in PIA cabin-crew, and to identify the common psychosocial and mechanical risk-factor exposures of cabin-crew who reported these MSKPs. The study was also aimed at finding out the economic burden posed by MSKPs in terms of decreased work performance, work absentee, and financial compensation paid; and to determine the most frequent causes of in-flight injuries.
Methodology	This was a cross-sectional descriptive study of 40 cabin-crew members who were chosen by using random sampling technique. The site chosen was PTC (PIA training centre, Karachi). This study was conducted over one month from 2nd - 30th May 2014. A questionnaire was used to collect data on the participants' demographic characteristics, job history, prevalence of musculoskeletal problems and work-related risk factors. Data obtained from the survey was summarized using various statistical measures; frequency counts, mean, standard deviation, percentages, pie charts and bar charts.
Result	A total of 40 participants (18 males, 22 females) with mean age, 39.2 ± 11.5 years and age range, 22 - 59 years were included in the study as a result of random sampling. The prevalence rate of work-related musculoskeletal disorders was 65%. Backache was the most prevalent (42.5%). Majority (two-third) of the participating cabin-crew members were found to have suffered from work-related MSKPs. Job stress, monotonous nature of job, frequent exposure to turbulence, bending and sudden lifting of heavy-weighted items were the significantly common risk factors among the crew who suffered from MSKP symptoms. The incidence of in-flight injuries was found to be 47.5%. 'Turbulence' and 'pushing trolleys' were found to be the most common causes of in-flight injuries.
Conclusion	It is needed to design ergonomic interventional programmes for reducing the risks of work-related MSKPs among cabin-crew. The findings of this study highlighted the health problems faced by PIA cabin-crew and is also expected to improve productivity in the aviation sector if employers could minimize the ergonomic challenges of poor work design, improve the level of social support at work, and engulf awareness among cabin crew regarding preventive safety measures & the need of seeking medical help in case of need, rather than opting for self-medication or delaying medical intervention in the hope of spontaneous resolution of the problem. However, further studies should be conducted using a longitudinal design to take care of the limited information provided by participants during the cross sectional survey which was mainly subjective.

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US Army aeromedical policy on obstructive sleep apnea (OSA) predates several important consensus guidelines and important new research findings on the condition by at least six years and as much as 10 years. To that end, US Army policy was compared with relevant US Air Force and US Navy policy by creating a matrix across six components common to all available policies including aeromedical concerns, screening, diagnosis, treatment, waiver and follow-up. This matrix was supplemented with current US Federal Aviation Administration (FAA) policy as well as consensus policy by the American College of Physicians (ACP) and the American Association of Sleep Medicine (AASM) regarding OSA management. Using this matrix as a starting point a systematic literature review was conducted targeting evidence for each of the six components as it related to aviation, or the transportation industry at large. This process synthesized the relevant policies, data from the Defense Medical Epidemiology Database, and research from the systematic literature review. Using this understanding new guidelines were developed which bring the Army into line with other US Department of Defense (DoD) policies and best practices with regard to OSA in the transportation environment. These were refined cooperatively with the Army sleep medicine consultant to the Army Surgeon General prior to submission to the Aeromedical Activity at Ft. Rucker, AL for vetting and publication in the next iteration of the Army Aeromedical Policy Letters.

The result is an evidence-based streamlined policy for the management of OSA in the military operational environment which incorporates new research and developments in the field while preserving safety in flight.

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Introduction	The European Aviation Safety Agency requires the National Aviation Authorities of member states to perform periodic audit inspections of its AMEs. This presentation will outline how the UK CAA has organised its audit programme and the method used whilst performing audit inspections.
Methods	The UK CAA AME demographics will be presented, including Class of AME, experience and their location. The current frequency and number of audits performed will be discussed, including 'for cause' audits. The protocol of the audit will be described which includes an observed medical examination and a medical records review. The outcome of audits and any required actions from the audit will be considered. The use of audit software and templates will be covered.
Results	The number of findings and observations will be shown together with the most common non-compliance findings. The percentage of suspensions and AMEs placed on notice will be given as well as the outcome of the AMEs placed on notice.
Discussion	The experience of the current audit programme and how it could be improved will be discussed.
Learning Objectives	The purpose of this presentation is to share experience to stimulate discussion of aeromedical best practice in this area.

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The so-called '1% rule' has been widely adopted as the acceptable threshold of annual medical incapacitation risk for professional aircrew. The derivation of this 'rule', as set out by the International Civil Aviation Organisation 6 may contain an error, caused by conflation of the maximum occurrence of in-flight medical incapacitation, expressed in terms of flying hours, and pilots' prospective per annum risk of medical incapacitation, expressed in terms of calendar hours. Since flight time limitation regulations in many jurisdictions have an annual limit on pilot flying hours of approximately 10% of a calendar year, a clear distinction must be made between flying hours and calendar hours. Clarification of the rule derivation leads to a 10% rule, and suggests that aeromedical decisions based on the 1% rule are more restrictive (more likely to ground a pilot) than the derivation intends.

Thank You for Attending
& Safe Travels Home!

