

59th International Congress of Aviation and Space Medicine Bucharest, Romania

ABSTRACTS – ORAL PRESENTATIONS

OP 01

English: **GLOBAL RESPONSE TO PUBLIC HEALTH THREATS**

French: **RÉPONSE GLOBALE AUX MENACES DE SANTÉ PUBLIQUE**

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In trying to agglutinate the concept of Health (according to WHO's definition) and the „Global Village” in which we live, the Aerospace Medical community is continuously assessing the existing relationship and developing the appropriate recommendations.

In this context, the effects of aviation on the environment and the environmental matters potentially affecting operational safety are being considered for both natural and man-made disasters. As such, panellists will present and discuss diverse topics emphasizing the interrelationship, on a global basis, of the effects of aviation on the environment and of the environment on aviation.

Specifically the subjects of bioterrorism, prevention of the spread of disease by aviation, community efforts on the battle against AIDS and on volcanic eruptions affecting international aviation are considered to be significant and fully deserving the attention of the Aerospace Medical Community and therefore will be presented within the John Ernstring Panel.

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OP 02

English: **MEDICAL COUNTERMEASURES AND MEDICAL CAPABILITIES AGAINST BIOLOGICAL THREATS**

French: **LES CONTREMESURES ET LES CAPACITÉS MÉDICALES CONTRE LES MENACES BIOLOGIQUES**

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Nowadays, biological weapons and their use or proliferation by states or nonstate actors (biological threats) present a significant challenge to national and global security. The development and use of biological weapons involves the diversion of resources that are globally available. Despite the challenge of identifying and characterizing current and active biological threats, there is extensive documentation that suggests the nature of the threat continues to evolve. Considered the nuclear weapon of the poor, biological weapons could be developed in the absence of high technologies, being cheap in comparison with conventional weapons. To respond to such threats, NATO and EU countries have to develop medical capabilities for surveillance, early detection and identification of biological agents in the event of outbreaks of naturally or deliberately spread infectious diseases. Also the threatened countries need to establish medical countermeasures to prevent or minimize the consequences of an attack with biological weapons.

The military medical capabilities dedicated to such activities belong to the Military Medical Research Center and the Preventive Medicine Center, both subordinated to the Surgeon General Office. These two structures perform in disease outbreaks through mobile teams to collect and transport samples to the specialized laboratories. The military and civilian treatment facilities are used for the medical management of affected persons. In case of mass casualties the collaboration between military and civilian medical system is required, based on emergency plans developed under national regulations.

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OP 03

English: **THE INTERNATIONAL HEALTH REGULATIONS AND THE BIOLOGICAL WEAPONS CONVENTION - IMPORTANT INTERNATIONAL LEGAL INSTRUMENTS FOR COUNTERING BIOLOGICAL THREATS**

French: **LE RÈGLEMENT SANITAIRE INTERNATIONAL ET LA CONVENTION SUR LES ARMES BIOLOGIQUES - DES INSTRUMENTS JURIDIQUES INTERNATIONAUX IMPORTANTS POUR LUTTER CONTRE LES MENACES BIOLOGIQUES**

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In the globalized world, diseases can spread far and wide via international travel and trade. A health crisis in one country can impact livelihoods and economies in many parts of the world. Therefore regional and global alert and response mechanisms are crucial to ensure rapid access to technical advice and resources and to support national public health capacity. Recognizing the fundamental importance of enhancing international cooperation, assistance and exchange in biological sciences and technology for peaceful purposes, states all around the world agreed on the value of working together to promote capacity building in the fields of disease surveillance, detection, diagnosis and containment of infectious diseases. International organizations have a fundamental role to play in promoting military-to-military, military-to-civilian and interagency cooperation, coordination and synchronization for preparing, detecting and

responding to infectious disease outbreaks, whether natural, accidental or deliberate in nature.

In this context, there is a real and useful concordance between the efforts to strengthen the national core capacities for public health surveillance, reporting and response as defined by the World Health Organizations revised International Health Regulations (IHR (2005)), and implementing the national measures arising from the obligations under the Biological Weapons Convention (BWC) to deter, prevent or respond to biological threats or incidents. Also, assistance and collaboration between Member States to build and strengthen their public health systems, according to the IHR, are consistent with BWCs requirements to States Parties to support each other in the development of peaceful applications of biological sciences and technology.

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OP 04

English: **THE ICAO COOPERATIVE ARRANGEMENT FOR THE PREVENTION OF SPREAD OF COMMUNICABLE DISEASE THROUGH AIR TRAVEL (CAPSCA) PROJECT AND PREPAREDNESS PLANNING IN THE AVIATION SECTOR**

French: **LE PROJET DE L'OACI ,ARRANGEMENT COOPÉRATIF POUR PRÉVENIR LA TRANSMISSION DES MALADIES CONTAGIEUSES PAR LES VOYAGES AÉRIENES' ET LA PLANIFICATION DES PRÉPARATIFS DANS LE SECTEUR DE L'AVIATION**

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Introduction: The outbreaks of Severe Acute Respiratory Syndrome (SARS) in 2003, Avian Influenza in 2005 and, in 2009, the Influenza A (H1N1) pandemic have highlighted the need for coordinated action by the global aviation community to help prevent and manage the risk of spread, through air travel, of communicable diseases of serious public health concern. **Discussion:** Singapore has facilitated ICAOs efforts in planning for public health emergencies of international concern starting from the anti-SARS measures developed in response to the SARS outbreaks in 2003.

Subsequently, in 2006, the Cooperative Arrangement for the Prevention of Spread of Communicable disease through Air travel (CAPSCA) project was launched at the Singapore Aviation Academy in response to the prospect of a possible Avian Influenza pandemic. CAPSCA commenced in the Asia Pacific region, in 2006, and now also operates in Africa and the Americas. In 2011 it will commence work in the Middle East and Europe, making it a global project.

Conclusion: This paper will discuss the role of the CAPSCA project in aviation pandemic preparedness planning and implementation as well as some of the lessons learnt post Influenza A(H1N1).

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OP 05

English: **MANAGING HIV/AIDS IN A MIGRATORY POPULATION: IMPLICATIONS FOR GLOBAL HEALTH SECURITY**

French: **LA GESTION DU VIH/SIDA DANS UNE POPULATION MIGRATOIRE: IMPLICATIONS POUR SÉCURITÉ SANITAIRE GLOBALE**

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Introduction: Emerging diseases that transcend borders, represent major threats to human health and global health security. Infectious diseases, including HIV/AIDS, still account for over 1/3 of deaths world wide. Three critical forces contribute to the growing global health threat of HIV/AIDS, including population mobility and migration, epidemic patterns or subtypes, known as „Clades”, and reduction in government funding for treatment programs.

Process: This paper will describe a privately funded HIV/AIDS program that models the philosophy of infectious disease control and prevention, within the context of these forces. It employs strategies to reduce the transmission of HIV/AIDS, through medication compliance, treatment and education. The clinic is located in Ho Chi Minh City, Vietnam, a region that has one of the fastest growing HIV populations, world wide, with an estimated 340,000 new cases in the year 2007 alone, with only 1/3 of the infected population receiving treatment by the year 2010.

Results: Bickford-Land Clinic for mothers and children, is supported by 5 Loaves and 2 Fishes Foundation (501c3) and provides services to HIV+ infected Vietnamese children who are infected at birth and are orphaned by one or both parents. An infectious disease specialist, in collaboration with a local pediatric hospital and a U.S. HIV medical consultant provide free medical care, immunizations, lab work, viral medications, antibiotics and vitamins, that sustain life for 25 children and their families. Other resources include social services, dental care, and work training programs for moms, that significantly enhance their quality of life.

Conclusions: The framework for how the world predicts, plans, and manages important health challenges, like HIV/AIDS, has long term implications across economic, social, security and political levels, and needs to be a major theme on international agendas. As government funding sources dwindle, more nongovernment providers, as described above, will become the dominant source of funding and provision of medical care for important communicable diseases.

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OP 06

English: **ASH: AN AVIATION SAFETY HAZARD**

French: **CENDRE: UNE RISQUE DE SÉCURITÉ AÉRIENNE**

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In May 2011 the Grimsvotn volcano in Iceland erupted emitting a plume of ash and gases. Although the eruption was significant the effect on aviation was minimised by co-ordinated national and international efforts. Planning for future volcanic events is ongoing and being led by the International Civil Aviation Organization Volcanic Ash Task Force (IVATF). In addition to airworthiness aspects the IVATF is considering the potential aviation health effects of the emissions. Ground and satellite based observations and airborne sampling may be used to model and track emissions. The aeromedical relevance for flight crew, cabin crew and passengers of this type of natural event will be outlined, together with some of the public health considerations relevant for aeromedical practitioners.
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OP 07

English: **IS AN EJECTED AVIATOR ALSO A PSYCHOLOGICALLY TRAUMATIZED AVIATOR?**

French: **UN ÉJECTÉ EST-IL AUSSI UN TRAUMATISÉ PSYCHIQUE ?**

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Introduction: The goal of the ejection seat is to save the pilot's life. However, its use can lead to somatic damages which are the subject of several studies. We made the choice to focus on possible nonsomatic consequences with a retrospective study of ejection in French armed forces from 2005 to 2008. **METHOD:** General data was collected by an anonymous questionnaire added to the Peritraumatic Dissociative Experiences Questionnaire (PDEQ) and the Peritraumatic Distress Inventory (PDI).

Results: The data did not highlight mental trauma despite a predominance of temporal distortion and derealization criteria which can be the sign of acute stress. In our study we did not show any sign of protection from seniority in flying nor operational experience.

Conclusion: An ejected aviator is considered in initial medical care as potentially polytraumatized and will benefit from extensive medical screening to rule out possible organ damage. It should be the same for nonsomatic damage; we must offer this aviator an interview with a professional, such as the squadron flight surgeon, a psychiatrist or psychologist familiarized with aviation. After initial management, if non significant somatic or nonsomatic trauma are found, quick resumption of flight status is appropriate.

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OP 08

English: **PSYCHOTIC DISORDERS IN FLIGHT ATTENDANTS: AEROMEDICAL ISSUES**

French: **TROUBLES PSYCHOTIQUES CHEZ LE PERSONNEL NAVIGANT COMMERCIAL: IMPLICATIONS MÉDICO-AÉRONAUTIQUES**

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Introduction: Les troubles psychotiques sont caractérisés par une perte du sens des réalités, avec parfois éléments délirants. Ils peuvent être transitoires et aigus, récidivants ou chroniques. Heureusement rares lors de la pratique de la médecine aéronautique, ils posent le problème de leur dépistage précoce et de la compatibilité avec la profession de navigant. **Observations :** Nous présentons 4 cas de troubles psychotiques chez des personnels navigants commerciaux : 2 cas de bouffées délirantes aiguës, 1 cas de personnalité schizoïde, 1 cas de schizophrénie. Nous discutons des implications médico-aéronautiques.

Conclusion : Les troubles psychotiques constituent un problème difficile. Ils nécessitent l'avis de l'Autorité (Conseil médical de l'aéronautique civile, en France). Ils ne sont qu'exceptionnellement compatibles avec l'aptitude.

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OP 09

English: **NOISE PREVENTION PROGRAM FOR MECHANICS WORKING AT AIRPORTS**

French: **DÉMARCHE DE PRÉVENTION DU RISQUE BRUIT CHEZ DES MÉCANICIENS AVION EN ZONE AÉROPORTUAIRE**

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Les mécaniciens avions de piste font partie des professions les plus exposées au bruit en milieu aéronautique industriel; leur exposition est discontinue, atteignant un niveau moyen mesuré en Leq de 89 dB. Même si les avions de nouvelle génération ont un niveau de missions sonores nettement abaissé par rapport aux générations précédentes, la prévention contre le bruit repose principalement sur les mesures de protection individuelles. Or, si les mécaniciens disposent d'un choix et d'une disponibilité facilitée de protecteurs individuels contre le bruit (PCIB) sur leur lieu de travail, le constat est celui d'une protection insuffisante dans les situations quotidiennes d'exposition au bruit en piste. Afin de développer la conscience du risque individuel, l'auteur présente les différentes étapes d'une campagne de sensibilisation aux effets du bruit sur la santé : organisation d'un forum bruit à l'occasion de la journée nationale de l'audition, participation aux réunions déquipes avec notamment présentation d'un film réalisé en piste sur le lieu de travail, implication dans une campagne de renouvellement de bouchons auto-moulés. Cette action de formation du médecin du travail s'inscrit ainsi dans le cadre du déploiement de l'outil facteurs humains dans le domaine de prévention des risques en santé-sécurité au travail.

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OP 10

English: **AN ANALYSIS OF CARDIOVASCULAR DISABILITIES AMONG AIRCREW: IMPLICATIONS FOR AEROMEDICAL DISPOSAL AND PREVENTIVE HEALTH**

French: **UNE ANALYSE D'INCAPACITÉ CARDIOVASCULAIRE PARMI LE PERSONNEL NAVIGANT: IMPLICATIONS DANS LES DÉCISIONS AÉROMÉDICALES ET LA PRÉVENTION**

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Introduction: Cardiovascular disabilities are major cause for unfitness for flying duties both among civil and military aircrew. Cardiovascular disabilities are the second leading cause of morbidity among aircrew in the IAF. They are a matter of concern as it has been projected that by 2020 there would be a 111% increase in deaths due to cardiovascular diseases in India. This study was carried out to analyze the cardiovascular disabilities among aircrew.

Methods: Medical records of 104 aircrew with a total of 117 cardiovascular disabilities were analyzed. These medical records are held in both electronic and paper form at the Medical Dte. Variables that were collated for analysis were age at onset, flying stream, mode of onset, height & weight parameters, family history of cardiovascular disease, history of smoking and alcohol intake and treatment details.

Results: Of the 117 cardiovascular disabilities, the leading cardiovascular disability was hypertension (n=60) followed by Coronary Artery Disease (n=25). Overall, maximum cardiovascular disabilities were in the fighter aircrew followed by the helicopter aircrew. Overweight status, a family history of the disease and smoking were strong risk factors in developing cardiovascular disability. More than 90% of the aircrew with hypertension were asymptomatic at the time of detection and were detected during their Annual Medical Examination. The mean age at onset of hypertension was 37.7 years whereas it was early forties for CAD. Acute MI was the commonest presentation (chest pain) in the CAD group. Conduction defects were the cause for majority of the ECG abnormalities. No untoward cardiovascular events have been noted during the period of follow up of these aircrew with CAD.

Conclusion: The findings provide inputs for strengthening our preventive health programs, and evidence for the existing aeromedical disposal policies. Use of antihypertensives in military flying and aero medical disposal of aircrew with CAD are discussed.

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OP 11

English: **PHYSICAL EXAMINATION AND ELECTROCARDIOGRAPHIC FINDINGS IN YOUNG SUBJECTS- ARE THEY PREDICTIVE OF ECHOCARDIOGRAPHIC FINDINGS?**

French: **L'EXAMEN PHYSIQUE ET LES RÉSULTATS ÉLECTROCARDIOGRAPHIQUES CHEZ LES JEUNES SUJETS - PEUVENT-ILS PRÉDIRE LES RÉSULTATS ÉCHOCARDIOGRAPHIQUES?**

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Introduction: Screening for cardiovascular conditions in athletes or military recruits is considered an essential part of the screening process. Use of physical examination and electrocardiography (ECG) is universally employed in this screening process, whereas the use of echocardiography is more debatable due to its higher cost. Our aim was to test whether physical examination and ECG have the potential to identify conditions diagnosed by echocardiography.

Methods: Flight academy candidates are evaluated at the Israeli Air Force (IAF) Aero Medical Center before entry into the academy. This screening process includes physical examination and ECG in all subjects. If physical examination or ECG reveal abnormal findings, the subject is referred to echocardiography. In the absence of findings, universal echocardiography is performed following completion of a non-medical screening process. We evaluated all echocardiographic examinations performed in flight academy candidates in the years 1997-2010. The subjects who underwent echocardiographic evaluation were divided into 3 groups:

1) Those who were referred to echocardiography because of physical examination findings, 2) Those referred because of ECG findings, and 3) Those who underwent a routine test in the absence of either physical or ECG findings. We evaluated the total rate of findings and compared the rates of echocardiographic findings between the three groups.

Results: 7,777 flight academy candidates underwent echocardiography during 1997-2010. 2437 (31.3%) of the tests were performed because of physical findings, 1353 (17.4%) were performed because of ECG findings and 3987 (51.3%) of the tests were performed routinely. 535 (6.88%) of the tests had abnormal echocardiographic findings. The rate of abnormal tests was significantly higher in those referred because of physical findings (219, 9%) and abnormal ECG (115, 8.5%) compared with the routine echocardiography (201, 5.04%).

Conclusions: Physical examination and ECG findings may aid in the selection of subjects that may be more suitable to echocardiographic screening.

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OP 12

English: **HYPERTENSION AND ASSOCIATED RISK FACTORS IN MILITARY AERONAUTICAL PERSONNEL - AN 8-YEAR FOLLOW-UP STUDY**

French: **HYPERTENSION ET FACTEURS DE RISQUE ASSOCIÉS CHEZ LE PERSONNEL MILITAIRE AÉRONAUTIQUE - UNE ÉTUDE SUR 8 ANS**

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Introduction: Hypertension (HT), one of the most important factors for cardiovascular (CV) diseases, is not uncommon in young and middle-aged aircrew. Our study evaluated the prevalence of HT and evolution of the risk factors associated with established (EH) and white coat hypertension (WCH) in military aeronautical subjects during 8 years.

Design and methods: We have studied from aeronautical personnel 235 consecutive pts with HT, comparatively with a group of 115 subjects with normotension. After 8 years, 167 pts (71%) and, respectively 95 subjects (82.6%) remained in study. At follow-up a fasting blood sample was analyzed for total cholesterol, LDL and HDL cholesterol, triglycerides, glucose. We studied the independent risk factors associated with HT using multiple logistic regression analysis.

Results: The patient population was aged mean 42 ± 11 years. HT had a significant prevalence (17.3%). 32.9% of all HT pts had WCH, with at least one major risk factor. 67.8% of EH pts had one or more associated risk factors. In univariate analysis, the following parameters were significantly associated with HT: age, BMI, smoking, triglycerides/HDL ratio, cholesterol/HDL ratio, LDL/HDL ratio, fasting plasma glucose. In multiple linear regression analysis, BMI, total cholesterol, LDL and triglycerides/HDL ratio were found to be significant independent determinants of HT, both in EH and WCH group. At follow-up, 27.2% of WCH subjects evolved to EH. The diastolic dysfunction of left ventricle was noticed in 44.6% of EH group and in 14.5% of WCH group. Abnormal stress ECG showing a high pressional profile was present in 66.6% of WCH who developed EH.

Conclusions: 1) This study revealed a significant prevalence and an early onset of HT in military aeronautical personnel. 2) The majority of subjects significantly associated more independent CV risk factors. 3) Subjects with WCH presented at 8-year follow-up an unfavorable metabolic risk profile and one third developed EH.

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OP 13

English: **ATRIAL FIBRILLATION IN TWO JET PILOTS: CASE REPORT**

French: **FIBRILLATION AURICULAIRE CHEZ DEUX PILOTES D'AVION À RÉACTION: HISTOIRE DE CAS**

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Introduction: We present two atrial fibrillation (AF) cases incidentally detected in two jet pilots who came to our hospital for periodic medical examinations.

Materials and method: The first case was a 39 year old male RF-4E jet pilot who had a lone AF in his electrocardiography. Due to the risk of thrombus, a transesophageal echocardiography (TEE) was performed and revealed no abnormality. The applicant pilots arrhythmia was treated successfully with direct current cardioversion (DCC) and was converted to sinus rhythm. The second case was a 23 year old male jet pilot who had 6 times atrial fibrillation (AF) attacks. His arrhythmia converted to sinus rhythm 2 times by DCC, two times by pharmacological cardioversion and two times spontaneously. Physical examination, echocardiography and thyroid function tests revealed no abnormality. Intracardiac electrophysiology study and cardiac ablation procedure was performed but the arrhythmia could not have been treated successfully. Then the patient was treated with antiarrhythmic drugs.

Results: The first pilot with lone AF was provided with a healthy condition and returned to flying duties and the second pilot was permanently disqualified from the flying duties because of the frequent repetitions of the AF attacks.

Conclusion: Arrhythmia takes an important part in disqualifying the aviators from flight duties due to the reason of cardiovascular diseases. It is very important not to overlook the asymptomatic AF due to the risk of thromboembolic diseases which may cause sudden incapacitation during flight.

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OP 14

English: **ATRIAL FIBRILLATION IN AIRCREW-WHEN IS ABLATION CONSIDERED?**

French: **FIBRILLATION AURICULAIRE CHEZ LE PERSONNEL NAVIGANT- QUAND CONSIDÉRER L'ABLATION?**

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Introduction: Aviation medicine is dedicated to ensure the fitness and health of aircrew for a full flying career. Cardiac arrhythmias are an ongoing problem. Atrial Fibrillation (AF) in trained aircrew requires extensive cardiovascular (CV) evaluation. The Military Flight Surgeon or Civilian Aviation Medicine Examiner (AME) must determine the CV evaluation, treatment, and fitness for flying duty. Recent use of ablation in recurring or persistent AF permitted return of aircrew to full duty without anticoagulation or restricted medications. This review was conducted to determine the incidence of AF in aircrew and prognosis.

Methods: The USA Aeromedical Epidemiology Data Register (AEDR) was searched for the ICD-9 code of 427.31 for aircrew with AF and other coexisting diagnoses at the time of most recent Flying Duty Medical Examination (FDME). Final disposition was evaluated to identify those aircrew with the diagnosis of AF that were permanently disqualified.

Results: Total number of aircrew in the AEDR is nearly 144,000 with approximately 685,000 FDME records. A total of 60 primary aircrew (0.04%) and 74 support personnel (0.05%) with the diagnosis of AF as of the most recent FDME were identified. Average age of onset was 37.9 years. Of the aircrew group, 19 (31.7%) were granted waivers and continued their career without recurrence. Forty one (68.3%) were disqualified at the time of onset of AF. Nine (15%) initially granted waivers were continued for average of 3.8 years and subsequently were disqualified. Three (3) aircrew received ablation and returned to full flying duty. Ablation for those aircrew without other cardiovascular risk factors could provide for return to full flying duty. Review of FAA, JAA, ICAO, and military regulations regarding ablation will be presented.

Conclusions: Aircrew with recurrent or persistent AF without underlying CV disease or co-morbid conditions could be considered for ablation to provide a full flying career in both the military and civilian sectors.

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OP 15

English: **COMPUTED TOMOGRAPHY CORONARY ANGIOGRAPHY: USEFUL TOOL IN THE ASSESSMENT OF CARDIOVASCULAR RISK IN PILOTS? - PART 2**

French: **ANGIOGRAPHIE DES CORONAIRES PAR TOMOGRAPHIE INFORMATISÉE: UNE MÉTHODE UTILE POUR L'ÉVALUATION DU RISQUE CARDIOVASCULAIRE CHEZ LES PILOTES? - PARTIE 2**

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Introduction: Multi-slice computed tomography coronary angiography (CTA) is a modern imaging technique used for the analysis of coronary artery disease. In this Part 2, the CTA technique will be analysed and put into relationship to standards of fitness to fly.

Methods: CTA has been outlined with three cases (Part 1). The CTA technique is analysed by reviewing the literature, especially for its prognostic significance, and its relationship to standards of fitness to fly (part 2).

Results: A meta-analysis evaluated the prognostic value of CTA in different patient groups classified according to CTA findings with a mean follow up period of 21 months. The cumulative major adverse cardiac events rate was 0.5% in patients with normal CTA, 3.5% in non-obstructive coronary artery disease (CAD) and 16% in obstructive CAD ($p=0.0001$). Other publications reveal similar results. In the presence of minor coronary lesions found by CTA, aspirin and statin therapy might be considered, which reduces the cardiovascular risk. Risk scores are commonly used for cardiovascular risk assessment. A 10-year risk of as intermediate. Considering the 1% rule for sudden incapacitation, a pilot presenting with an estimated intermediate risk is a candidate for CTA; if the CTA reveals only minor CAD, then he might be fit to fly. In pilots at risk, JAR regulation requires cardiovascular evaluation without further comments.

Conclusion: CTA is useful for cardiovascular risk stratification, especially in pilots with an intermediate risk. Minor coronary lesions found by CTA might have therapeutic consequences. The aeromedical requirements must not be rewritten.

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OP 16

English: **COMPUTED TOMOGRAPHY CORONARY ANGIOGRAPHY: USEFUL TOOL IN THE ASSESSMENT OF CARDIOVASCULAR RISK IN PILOTS? - PART 1**

French: **ANGIOGRAPHIE DES CORONAIRES PAR TOMOGRAPHIE INFORMATISÉE: UNE MÉTHODE UTILE POUR L'ÉVALUATION DU RISQUE CARDIOVASCULAIRE CHEZ LES PILOTES? - PARTIE 1**

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Introduction: Multi-slice computed tomography coronary angiography (CTA) is a modern imaging technique used for the analysis of coronary artery disease. The role of CTA in the evaluation of pilots has to be defined: 1) Is CTA useful for cardiovascular risk stratification? 2) If yes, when has it to be applied? 3) Which is the significance of minor coronary lesions found by CTA? 4) Must the medical requirements for pilots be rewritten? In order to answer these questions, first, three cases are presented, which outline some aspects of CTA in practical medicine (part 1), and second, the technique CTA will be analysed and put into relationship to standards of fitness to fly (part 2).

Cases: Case 1) A 56 years old board operator with several cardiovascular risk factors was sent for cardiologist examination (without CTA), which did not reveal additional abnormal findings. Lifestyle measures were recommended. Nine months later he died from a heart attack. Case 2) A combined CTA/ myocardial scintigraphy was undertaken in a 68 years old previous Swissair and active private pilot with intermediate cardiovascular risk. Some non-obstructive coronary lesions but no ischemia were found, coronary angiography confirmed these findings. The fitness to fly was evaluated. Case 3) A CTA of a 58 years old patient with a left bundle branch block showed a single non-obstructive coronary plaque. The consequences of this finding will be discussed.

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OP 17

English: **PROTECTION EVALUATION OF A NEW ANTI-G SUIT DEVELOPED FOR FEMALE PILOT**

French: **ÉVALUATION DE LA PROTECTION D'UN NOUVEL ANTI-G COSTUME DÉVELOPPÉ POUR LA FEMME PILOTE**

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Background: A new anti-G suit (KH-F) was developed only for female pilots. The purpose of this study was to assess the pressure transferring performance on the ground and +Gz protection on centrifuge afforded by KH-F.

Methods: Five female subjects wore KH-F and KH-M anti-G suits while five male subjects wore KH-M anti-G suits only. Their body surface pressure of abdomen, thighs and calves were measured when the suits were inflated to 15kPa, 25kPa and 35kPa respectively. Another five female subjects were exposed to a series of rapid-onset-rate (ROR) runs (1G/sec) on the centrifuge. Their relaxed tolerance was assessed with and without the use of KH-F anti-G suit.

Results: Abdomen surface pressure of female subjects with KH-F was higher than that of KH-M, equivalent to that of males with KH-M. Under three conditions, the body surface pressure at thigh and calf of females were consistent with those of males. The +Gz protection afforded by KH-F was 1.81 ± 0.13 G. No other problems were reported.

Conclusion: The fit of KH-F anti-G suit is favorable. The performance afforded by KH-F is satisfactory and can meet

the request of +Gz protection for the advanced training plane.

OP 18

English: **CASE STUDY: AIRLINE PILOT WITH RETINAL VEIN OCCLUSION AND RECOMMENDATIONS FOR FUNCTIONAL SIMULATOR ASSESSMENT**

French: **ÉTUDE DE CAS: UN PILOTE COMMERCIAL AVEC UNE OCCLUSION DE LA VEINE CENTRALE DE LA RÉTINE ET LES RECOMMANDATIONS POUR UNE ÉVALUATION FONCTIONNELLE EN SIMULATEUR**

R Chang

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Introduction: A review of USAF aviators between 1976-1991 identified seven cases of retinal vein occlusion. It occurs rarely in young people hence less frequently seen in the pilot population.

Case description: This 51-y/o airline pilot presented with sudden onset of visual disturbance towards the end of the flight and landed uneventfully. He was diagnosed with central retinal vein occlusion without significant risk factors. He improved subsequently with retinal laser treatment and was able to return to flying status after simulator assessment. The perspective of the pilot flight assessor is explored. The author will discuss visual exercises that simulate realistic scenarios and are achievable in a simulator environment, in order to determine a safe return to flying.

Recommendations: Guidelines for suggested exercises can be used to standardize simulator assessments for similar conditions such as central serous retinopathy and substandard vision in one eye.

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OP 19

English: **AEROMEDICAL DECISION MAKING IN VISUAL FIELD DEFECTS**

French: **DÉCISION AÉROMÉDICALE POUR LES CAS DE TROUBLES DU CHAMP VISUEL**

PD Navathe, DJ Fitzgerald, M Drane, MJ Dodson

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Visual field defects are a common finding in the general population worldwide, and are often seen in middle-aged aviators presenting for an aviation-related medical examination. Most cases that are related to glaucoma are detected as incidental findings, and are asymptomatic. The types of presentation vary with the extent and nature of the field defect and this has a significant impact on the aeromedical decision. More importantly, there are several new types of management that are being introduced, inclusive laser therapy, and the outcomes are such that many of these people are able to perform their activities of daily living adequately. One such case is presented wherein there was a field defect, and CASA was able to carry out ground-based and simulator-based assessments that resulted in recertification. A paradigm was devised as a result of this and other similar cases, and the paradigm is presented.

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OP 20

English: **OPTIC DISC EVALUATION WITH HEIDELBERG RETINA TOMOGRAPH III IN AERONAUTICAL PERSONNEL - 2 YEARS EXPERIENCE IN THE NATIONAL INSTITUTE OF AERONAUTICAL AND SPACE MEDICINE OF BUCHAREST**

French: **ÉVALUATION DU DISQUE OPTIQUE AVEC LE TOMOGRAPHE RÉTINIEN III HEIDELBERG CHEZ LE PERSONNEL AÉRONAUTIQUE - EXPÉRIENCE DE DEUX ANS À L'INSTITUT NATIONALE DE MÉDECINE AÉRONAUTIQUE ET SPATIALE DE BUCAREST**

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Optic disc analysis with HRT III has become one of the most used computerized image analysis of optic disc, due to its objectivity and reproducibility. In aeronautical ophthalmology we are interested in such analysis especially in cases of intraocular hypertension and glaucoma (either hypertensive or lowpressure). Due to regular ophthalmic examination in aeronautical personnel we have the chance to discover optic disc abnormalities early, in the preperimetric stage of the disease. Careful interpretation and correlation between HRT III parameters and other clinical data in such cases allow us to make a correct diagnosis, the most challenging being the cases with optic disc anatomical particularities. In our experience, HRT III analysis proved to be a valuable clinical tool for examination and follow-up of both military and civilian aeronautical personnel, helping us to prevent visual function deterioration by early diagnosis and right therapeutic decision.

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OP 21

English: **EVALUATION OF COLOUR ASSESSMENT AND DIAGNOSTIC TEST - A RETROSPECTIVE STUDY**

French: **APPRÉCIATION DES TESTS D'ÉVALUATION DES COULEURS ET DIAGNOSTIC - UNE ÉTUDE RÉTROSPECTIVE**

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Introduction: This paper describes our experience with CAD testing for colour assessment for civil pilot license, Class I, from 01 June 2010 to 31 May 2011.

Methods: During this period we tested 43 pilots who had made one or more errors on Ishihara color plates. Of these 35 were experienced pilots and 8 were applicants for initial pilot training. Out of 35 experienced pilots, 23 passed CAD

(65.7%) and 12 failed (34.3%).

Results: All 35 experienced pilots had waivers from various civil aviation authorities based on Lantern Test, Dvorine and Signal tests. Of the 12 who failed the CAD, 3 had FAA waivers, 1 CASA waiver, 1 from Jordan, 2 from South Africa and 5 had JAA waivers. The most common test on which waiver was based was the Farnsworth Lantern test (8/12). Of the initial applicants 4 passed CAD and 4 failed (50%).

Conclusion: The authors did not find any co-relation between number of errors on Ishihara and fail/pass on CAD. Most of the failed candidates were deutan deficient (14 - Deutan and 2 - Protan). The paper also highlights some interesting cases and pitfalls in color testing.

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OP 22

English: **CONSIDERATIONS OF KERATOCONUS AND NEW CORNEAL SURGERY**

French: **CONSIDÉRATIONS SUR KÉRATOCÔNE ET NOUVELLE CHIRURGIE DE LA CORNÉE**

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Introduction: Keratoconus is a pathological process of the eye which can significantly affect vision and can lead to permanent loss of a pilots license. The condition is more common in the Middle East. With the advent of newer corneal surgical techniques like corneal cross linking and corneal transplant, we will highlight two case studies, showing improvements in vision enough to reinstate class 1 medical certificates and will discuss the implications of such.

Methods: 2 cases studies of pilots with Keratoconus will be discussed regarding presentation, the extent of the condition, its effects on vision, treatment options, follow up and re-licensing issues post-corneal surgery.

Results: Both pilots were successful with restoration of good vision and stability enough for them to be re-licensed.

Conclusion: Newer techniques of corneal surgery and corneal cross linking are additional tools available for pilots who develop Keratoconus potentially allowing them to be re-licensed.

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OP 23

English: **NIGHT VISION DEVICE USE IN HELICOPTER AIRCREW: HUMAN FACTORS ASPECTS**

French: **DISPOSITIFS DE VISION NOCTURNE UTILISÉS PAR LES ÉQUIPAGES D'HELICOPTÈRE: LES FACTEURS HUMAINS.**

CC Stefanescu

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Introduction: Night Vision Devices (NVDs) have become an essential component of modern military aviation. They offer enhanced performance qualities compared to unaided night vision, more useful during the execution of missions at night, but at the same time their use contributes to some limitations that should be known and accepted (both technical and human factors related).

Materials and methods: We used a helicopter survey of pilots flying different types of NVD (military flight), amounting a total of 43 respondents.

Results: The surveys have been described and analyzed regarding various aspects of using NVDs, in terms of human factors problems facing the user (assessment of their benefit in terms of morphoscopic acuity for different distances, depth perception, their benefits in different phases of flight and in different flight conditions). The users are facing multiple problems: fatigue, spatial disorientation and the black hole illusion, the possibility of simulator training and the importance of a basic professional course as well as continuous training.

Conclusion: Flight safety concerns highlight concerns over NVD issues. Most important for quality skills is proper and continuous training.

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OP 24

English: **LATEST DEVELOPMENTS ON MANNED COMMERCIAL SPACE FLIGHT**

French: **RÉCENTS DÉVELOPPEMENTS CONCERNANT LES VOLS SPATIAUX COMMERCIAUX HABITÉS**

MJ Antunano

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This presentation will discuss the current status on manned commercial space vehicle developments, public and government sector involvement, and licensing/regulatory aspects of manned commercial space operations (suborbital and orbital) in USA. Companies actively involved in suborbital commercial space vehicle development include Scaled Composites (SpaceShipTwo and WhiteKnightTwo), XCOR Aerospace (Lynx), Blue Origin (New Shepard) and Armadillo Aerospace (Sub Orbital Space Transport or SOST). In the orbital vehicle sector the most active companies are Boeing (Crew Space Transportation or CST-100), Orbital Sciences Corporation (Cygnus), SpaceX (Falcon 9 and Dragon Capsule), Sierra Nevada Corporation (Dream Chaser), and Bigelow Aerospace (Sundancer, BA-330 and Space Station Alpha). Virgin Galactic will provide regular suborbital space flights to the general population. A partnership between Space Adventures and the Russian Space Agency provides the only feasible way for the general public to experience orbital space flights onboard the Soyuz spacecraft to the International Space Station. NASAs Commercial Orbital Transportation Services Program (COTS) provided funding to space companies to design and develop commercial cargo services to the ISS. Under COTS, SpaceX developed the Falcon 9 vehicle and the Dragon cargo capsule, and Orbital Sciences Corporation developed the Taurus II vehicle and the Cygnus capsule. NASAs

Commercial Crew Development Program (CCDev) is providing funding to several space companies to develop systems to send people to the ISS. Under CCDev Phase 2, Boeing is developing the Crew Space Transportation Vehicle (CST-100), SpaceX is developing the Dragon Capsule, and Blue Origin is developing the New Shepard vehicle. On the regulatory side, the U.S. Commercial Space Launch Amendments Act of 2004 (H.R. 5382) laid out the definition of a sub-orbital space passenger vehicle, clarified the process for licensing such vehicles, and allowed paying passengers to fly into space at their own risk. This Act authorizes the Federal Aviation Administration (FAA) to issue permits allowing commercial space vehicle operators to carry paying passengers into space.

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OP 25

English: **ESTABLISHING A MEDICAL PROGRAM TO SUPPORT COMMERCIAL HUMAN SPACEFLIGHT**

French: **ÉTABLIR UN PROGRAMME MÉDICAL POUR SUPPORTER LES VOLS SPATIAUX HUMAINS DE NATURE COMMERCIALE**

JM Vanderploeg

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Several challenges confront the aerospace medicine specialist in implementing a medical program to support private commercial human spaceflight including the diverse age range and medical status of passengers, global location, and lack of data on which to base selection criteria. Accomplishing the medical evaluation and clearance for a high volume of passengers will present another type of challenge. Also challenging for commercial spaceflight operations is the location of new spaceports in remote locations with minimal infrastructure and medical support. Providing for emergency medical response, transportation to definitive medical care facilities, communications, and on scene triage and medical care all need to be addressed in the medical programs supporting commercial spaceflight.

What enabling research studies are needed to support evidence-based rationale for accepting passengers on commercial suborbital spaceflights? To begin to answer this question Virgin Galactic conducted centrifuge training for their Founders in 2007 and 2008. Seventy-seven individuals completed centrifuge training. The age range of this group was 22 to 88 years. One-third of these individuals were taking medications. A diverse array of medical conditions was present in this group but the success rate to complete the full training protocol was 95%. The most commonly identified medical conditions in the Virgin Galactic Founders group included hypertension, cardiovascular disease, hyperlipidemia, diabetes, and spinal disorders. Despite the scope of medical conditions in this group the number of individuals in each category of disease was quite small. Consequently, making determinations of medical clearance for suborbital spaceflight for passengers based on these limited data remains problematic.

Virgin Galactic is designing a medical program that will use experienced aviation medical examiners in the countries of residence of the passengers to perform screening medical evaluations. The examiners will follow Virgin Galactic's protocol and a medical questionnaire, physical examination, and additional data will be entered into Virgin Galactic's online electronic medical record. Determination of medical acceptance to fly will be made by the Virgin Galactic medical staff.

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OP 26

English: **FLIGHT SURGEON TRAINING FOR COMMERCIAL SPACEFLIGHT SUPPORT: THE CHANGING PARADIGM**

French: **FORMATION DES MÉDECINS DU PERSONNEL NAVIGANT POUR SUPPORTER LES VOLS SPATIAUX COMMERCIAUX: UN CHANGEMENT DE PARADIGME**

RT Jennings, JM Vanderploeg

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Introduction: As NASA's Shuttle program ends and the U.S. space program commits to funding private companies for access to low-earth orbit, the opportunity for human commercial orbital flight will widen considerably. Multiple factors will complicate the provision of medical care for humans on commercial vehicles. Commercial human spaceflight activities require a new educational paradigm to train physicians who will support commercial spaceflight.

Methods: Current space medicine training programs in the U.S. are two years in duration, are primarily funded by the government, and are difficult for non-U.S. citizens to attend due to limitations in funding, training site access, and the regulatory constraints of U.S. medical education training and certification programs. The programs do not typically teach clinical skills nor provide emphasis on spaceflight factors (microgravity, radiation, isolation, acceleration) for individuals with medical problems. Point-of-injury care for launch and landing operations in isolated locations is also not included.

Results: UTMB in collaboration with industry and international partners is developing a space medicine training program to specifically address limitations in current commercial space medicine training to produce clinicians who can provide on-scene and in-flight commercial spaceflight medical support world-wide. The program will be 6-12 months in duration. Emphasis will be placed on the space environment, global medicine, clinical skills, integration with non-U.S. health care systems, point-of-injury medical care, space physiology, and mitigation of the effect of the space environment on individuals who are clinically compromised. Simulated training environments outside traditional government based-facilities will be used. The program will issue a certificate of special competency for those completing the program.

Conclusion: Current space medicine training has limited capability to train international spaceflight physicians that will be needed soon for commercial space flight support. A focused approach with training specific to this need is in the

process of development and will help fill this world-wide gap in medical education capability.

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OP 27

English: **RESEARCH PROJECTS IN THE FAA CENTER OF EXCELLENCE FOR COMMERCIAL SPACE TRANSPORTATION**

French: **PROJETS DE RECHERCHE POUR LE TRANSPORT SPATIAL COMMERCIAL DANS LE CENTRE D'EXCELLENCE DE LA FAA**

JM Vanderploeg, RT Jennings

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Data from the nearly 80 individuals in the Virgin Galactic Founders group evaluated for centrifuge testing show the most common medical conditions include hypertension, cardiovascular disease, hyperlipidemia, diabetes, and spinal disorders. However, number of individuals in each category of disease was quite small among those evaluated in 2007 and 2008. Consequently, making determinations about medical clearance for suborbital space flight based on these limited data is problematic. To address this gap in knowledge the University of Texas Medical Branch at Galveston proposed several research projects through the newly established Federal Aviation Administration Center of Excellence for Commercial Space Transportation (FAA COE-CST). The FAA COE-CST is a university-based consortium created to conduct research projects that will enable acquisition of the data necessary to make informed recommendations and decisions to enable safe commercial human space flight. There are four broad areas of research under this Center of Excellence: 1) space traffic management and launch operations, 2) launch vehicles, operations, technologies and payloads, 3) human spaceflight, 4) space transportation industry viability. The areas of research that are included in the human spaceflight section are aerospace physiology and medicine, habitability and environmental control and life support, human factors, human rating, and personnel training. The five approved research projects being conducted at UTMB, in partnership with other universities, NASA, and industry are:

1. medical database definition and design;
2. human system risk management and mitigation;
3. crew medical standards and passenger acceptance criteria, 4. centrifuge testing of individuals with specific medical conditions, 5. development and testing of wearable biomedical monitoring equipment. A status report on each of these projects will be presented. These FAA funded projects, and others to come over the next few years, will provide the supporting data to make commercial human space flight safe for a wide range of individuals, including research scientists and engineers who can tend their own experiments while experiencing suborbital spaceflight themselves.

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OP 28

English: **THE EVALUATION OF EXTERNAL CHEST COMPRESSIONS IN RELATION TO GENDER DURING SIMULATED MICROGRAVITY**

French: **L'ÉVALUATION DES COMPRESSIONS THORACIQUES EXTERNES LIÉES AUX SEXES SOUS ÉTAT DE MICROGRAVITÉ SIMULÉE**

M Kordi, N Correa, M Kloeckner, S Evetts, T Russomano

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Introduction: Currently, space missions tend to exceed six months, astronauts are physically average and space tourism is predicted to increase in the near future. These might enhance the probability of a cardiac arrest. This study aimed to evaluate the effectiveness of performing external chest compressions (ECC) using the Evetts-Russomano technique (ER) during microgravity simulation, and the relationship between gender and the outcome of the ECCs.

Methods: 8 male and 8 female subjects (18-30 yo) participated in this study. They performed ECC in accordance to AHA standards (2010) at 0G (Microgravity) and 1G (Control). Each volunteer performed 3 sets of 30 ECCs with 6 seconds rest in between. Microgravity was simulated by the means of a body suspension device. A modified manikin was used to record the depth and frequency of the ECCs. Heart rate was measured before and after each protocol. The Borg scale was used to rate subjects perceived intensity of work. Anthropometric measurements were also taken.

Results: The mean (\pm SD) of depth of the compressions during simulated 0G for males (45.07 ± 4.75 mm) was significantly higher than for females (30.37 ± 4.75 mm). All subjects were able to achieve the target ECC frequency. None of the females reached an average depth compression of AHA standards. The heart rate of males was significantly lower than female subjects. The Borg scale scores showed no significant difference between genders. A small to medium relationship was seen in females anthropometric measurements and their ability to perform the E-R technique. None was seen in the male subjects.

Conclusion: The results suggest that males can perform the E-R technique adequately independent of any anthropometric measurements. None of the female subjects managed to obtain compression depth in accordance to AHA standards. However, the results imply that their strength is the limiting factor to their performance.

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OP 29

English: **CYTOKINE EXPRESSION AND THE IMMUNE SYSTEM IN LOW GRAVITY ENVIRONMENTS**

French: **L'EXPRESSION DES CYTOKINES ET LE SYSTÈME IMMUNITAIRE DANS LES ENVIRONNEMENTS À BASSE GRAVITÉ**

A Sundaresan

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Introduction: The expression of cytokines is a powerful emerging tool in deducing physiological signatures to

environmental stresses. Of particular interest are pro-inflammatory cytokines. Chronic elevation of these could lead to pathophysiological changes harmful to various organ systems. The body's resistance to infection and stress is afforded by the immune system. This study profiles the expression of key pro inflammatory cytokines in peripheral blood after exposure to microgravity. This could pave the way for future advancement in screening personnel both before, during and after missions (space and aviation). Introduction of non invasive screening methods such as salivary detection of these cytokines will also be discussed.

Methods: Peripheral blood from 15 normal human donors was run through one ficoll gradient and lymphocytes were cultured in microgravity analog environments. Gene expression profiles for proinflammatory cytokines such as IL-6, IL-6 Receptor, IL-4, IL-4 Receptor, and others were assessed. "T" tests were run for levels of significance

Results: Low gravity environments seem to alter the expression of proinflammatory cytokines in relationship to their receptors. This could pose a serious problem either making the ligand too freely available or too insufficient for biological activity. Special mention of inverse relationships of the IL-6 and IL-4 ligands with respect to their receptors might pose challenges if chronically elevated. Additionally pre activators of the nitric oxide synthase pathway were also found to be significantly downregulated. Elevation of nitric oxide synthase leads to reduced inflammation. Hence the increase in the pre activators of the nitric oxide synthase pathway could be one causative mechanism for inflammation in low gravity. Hence elucidation of specific inflammatory pathways in stressful physiological environments should have increased clinical thrust.

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OP 30

English: **MAJOR CATEGORIES OF SPECIAL ISSUANCE MEDICAL CERTIFICATES IN THE UNITED STATES**

French: **CATÉGORIES MAJEURES DES CERTIFICATS MÉDICAUX À DÉLIVRANCE SPÉCIALE AUX ÉTATS-UNIS**

MA Berry

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In the United States, pilots must hold either a first, second, or third class medical certificate, thereby meeting medical standards published in U.S. Title 14 CFR, Part 67. Adherence to these Part 67 medical standards for pilots is one means of ensuring the safety of the U.S. National Airspace System. In 2010, the U.S. Federal Aviation Administration (FAA) received 370,850 applications for medical certificates of all classes. There were 189,359 first class, 74,139 second class, and 107,352 third class applications. Title 14 CFR, Part 67.401 gives the FAA Federal Air Surgeon the authority to grant Special Issuance of a medical certificate to a pilot who does not meet the medical standards, as long as there is no danger to public safety. In 2010, there were 33,546 Special Issuance medical certificates authorized, an increase of 3,000 over the previous calendar year. There were 12,859 first class, 6,616 second class, and 14,046 third class Special Issuance medical certificates authorized. Final denials of medical certificates accounted for less than 0.1% of the total applications received. The major categories of denial of medical certificates in descending order of magnitude were cardiovascular, medications, psychiatric, neurologic, sleep disorders, endocrine, and cancer. The major categories of Special Issuance medical certificates in descending order of magnitude were cardiovascular (arrhythmias, valvular disease, coronary artery disease), diabetes, sleep disorders, cancer, neurologic. As an illustration of the success of the medical certification system, current FAA safety data will be presented, as well as actual numbers of Special Issuance medical certificates issued in the major categories, with a discussion of the safety implications. FAA current experience with certification of pilots using Selective Serotonin Reuptake Inhibitors will also be presented.

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OP 31

English: **RETROSPECTIVE AND PROSPECTIVE STUDY OF CIVIL AVIATION MEDICAL EXAMINATION AND ASSESSMENT SYSTEM OF CAAC**

French: **ÉTUDE PROSPECTIVE ET RÉTROSPECTIVE DE L'EXAMEN MÉDICAL EN AVIATION CIVILE ET SYSTÈME D'ÉVALUATION DE LA CAAC**

S Li, L Gao

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Background: According to the data of China's civil aviation airmen medical certification software system, there are 73,557 medical certification holders in CAAC by November 3rd, 2010. As a party to ICAO, CAAC follows the medical requirements of Annex 1 and Annex 6 of ICAO. Based on practical situation in China, CAAC established a unique civil aviation medical examination and assessment system.

Objectives: This paper aimed to summarize the civil aviation medical examination and assessment system of CAAC, including the legal and regulatory system for civil medical examination, designated medical assessment organization management, AME training and appointment.

Discussion and conclusions: Concerning the rules and regulatory, CAAC published „Airman Medical Standards and Certification Rules" (CCAR-67FS) and „Designated Aviation Medical Examiner and Organization of Civil Aviation Flight Standards Management Rules" (CCAR-183FS). According to the relevant provisions of CCAR-183, 13 medical organizations were designated in CAAC. The Airmen Medical Examination and Assessment Division in our center is one of the designated medical organizations. In 2010, this division conducted 13,758 annual medical examinations, 119 medical assessment cases for Special Insurance, 147 medical examinations for aged 60 or more pilots. Furthermore, we set up the „Civil Aviation Medical Assessment Specialist Committee" in 2008. It received a total of 49 applications last year, including 46 cases for special issuances. CAAC developed AME training and designation system according to the

relevant provisions of AP-183FS-003. There are 173 AMEs in CAAC, including 45 Chief-AMEs. The training requirements for AME will be introduced in detail. Finally, this paper summarized the concept of „One system for” in CAAC, and put forward the recommendations to improve the unique system of civil medical examination and assessment in CAAC.

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OP 32

English: **FITNESS DECISION BY ALGORITHM: HAZARD OF INCOMPLETE INVESTIGATIONAL SPECIFICITY AND SENSITIVITY**

French: **DÉCISION D'APTITUDE PAR ALGORITHME: DANGER D'UNE SPÉCIFICITÉ ET D'UNE SENSIBILITÉ INCOMPLÈTE À L'INVESTIGATION**

M Joy

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In the United Kingdom, and elsewhere, management algorithms based on the JAA/EASA medical standards have been devised to formalise investigation and the subsequent determination of fitness. They reflect contemporary practice both in clinical and regulatory terms. Often expressed in the imperative they leave little or no scope for clinical discretion. Furthermore rigid application without full understanding of the shortcomings of investigative techniques can be hazardous as the following case demonstrates. The pilot was a 48 year old ATPL holder who had presented with atypical chest pain 5 years previously. He was found to have hypertension and hypercholesterolaemia. The coronary angiogram performed locally demonstrated emerging but non-obstructive disease in the left anterior descending coronary artery (LAD). He was made long term unfit. His chest pain returned in 2010 and further coronary angiography demonstrated ostial disease in the LAD compromising the first diagonal vessel (D1) and in the first obtuse branch of the circumflex artery (OM1). His dobutamine stress echocardiogram was normal but he underwent OM1 and LAD stenting with drug eluting stents, nevertheless. He underwent Pharmacological Stress Thallium MPI 4 months subsequently (which showed no abnormality) but as this was in breach of the requirement for investigation at 6 months following the index intervention, he was also reviewed with exercise electrocardiography (ECG). This was diagnostically abnormal but at a good workload. He also asymptomatic. After some discussion he was denied certification whilst his local cardiologist determined the next course of action. A further coronary angiogram demonstrated tight proximal in-stent stenoses in the both the LAD and OM1. There a number points from the regulatory point of view which will be discussed. These include frequency and timing of in-stent restenosis; the need to adhere to regulatory protocols; the limits of sensitivity of both dobutamine stress echocardiography and of Stress Thallium MPI. The appropriateness of intervention in the absence of either myocardial ischaemia and/or of symptoms, possibly driven by regulatory requirements, will be reviewed.

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OP 33

English: **LIVER TRANSPLANT IN A COMMERCIAL PILOT**

French: **TRANSPLANTATION HÉPATIQUE DANS UN PILOTE PROFESSIONNEL**

EJ Hutchison

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This case presentation reviews the steps taken to consider the fitness of a commercial pilot who wished to return to flying following a liver transplant. The key considerations, certificatory decision and subsequent progress will be discussed.

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OP 34

English: **IN-FLIGHT DEATH OF AIRLINE PILOT DUE TO BRUGADA SYNDROME**

French: **DÉCÈS EN VOL D'UN PILOTE DE LIGNE CAUSÉ PAR UN SYNDROME DE BRUGADA**

PJ Collins-Howgill

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The in-flight death of an airline pilot will be described. The aeromedical assessment of the pilot before the flight will be covered and the subsequent development of a certificatory policy and its implementation will be presented. The problem of creating regulatory policies for conditions which have only recently been discovered and not well understood will be discussed.

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OP 35

English: **HEALTH OF AVIATION GROUND PERSONNEL AS A SAFETY ASPECT**

French: **SANTÉ DU PERSONNEL AÉRONAUTIQUE AU SOL COMME FACTEUR DE SÉCURITÉ**

EA Cataman, NV Netebeiciuc, LN Sicanova, OS Carateeva, CI Manole

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Introduction: Medical fitness of the aviation ground personnel while performing their duties becomes a part of aviation safety. However the international regulation does not establish detailed criteria for that fitness. Medical examination of the ground workers is usually performed on a regular basis only under the national occupational health order. The aim of this study is to analyze the morbidity of aviation ground personnel as an important component of aviation safety.

Methods: The objectives of the study are the reports of medical examinations of 364 aviation ground workers that were performed during 2010. Being exposed to harmful working environment these employees undergo annual obligatory medical examination in accordance with national regulation. Four groups of ground personnel were considered: aviation security (N=107), technical maintenance staff (N=88), ramp vehicle drivers (N=139), and fire fighters (N=30).

Results: The study has revealed the following rate of morbidity: cardiovascular 22.8%, gastro-intestinal 16.21%, respiratory 14.56%, endocrinology 8.79%, urogenital 7.42%, musculoskeletal 6.04%, hearing loss 4.94%, neurological 3.02%. In 138 (37.9%) workers, no pathology was found. The data shows the prevalence of cardiovascular pathology among drivers to be 35.97%, and hearing loss in technicians 6.82% and drivers 8.63%.

Conclusion: Health condition of aviation ground personnel is important to their performance and for aviation safety. The regular medical examinations reveal in time benign and professional pathology, providing support to health maintenance and helping to reduce the negative impact on work performance of these aviation personnel.

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OP 36

English: **CERTIFICATION OF AIRCREW WITH PSYCHIATRIC DISORDERS**

French: **CERTIFICATION DU PERSONNEL NAVIGANT AVEC DES TROUBLES PSYCHIATRIQUES**

DJ Fitzgerald, PD Navathe

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Psychiatric illness has traditionally been a disqualifying condition for aeromedical certification. In the last two decades, there has been relaxation of medical standards in some countries such as Australia and the United States to allow aviators with well-controlled conditions such as Major Depression to return to flying once stabilized. Other diagnoses such as psychotic disorders and others remain a bar to flying. The Civil Aviation Safety Authority in Australia has led the world in the certification of depressive illnesses and has recently published guidelines on the requirements for certification of individuals with a history of Attention Deficit/Hyperactivity Disorder (ADHD). This presentation will outline Australia's upto-date experience with certifying aviators with mental illness and will outline CASA's experience and position on certification of the conditions of Depressive Illness, Bipolar Affective Disorder and Attention Deficit/Hyperactivity Disorder.

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OP 37

English: **PILOT FATIGUE: THE ROLE OF COMMUTING**

French: **FATIGUE DES PILOTES - LE RÔLE DU TRAJET DOMICILE-TRAVAIL**

DJ Schroeder

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Introduction: The 2009 Colgan accident was a factor that led Congress to direct the FAA to develop new regulations regarding pilot flight and duty times. In addition to implementing the Notice of Proposed Rule-Making in September 2010, the FAA followed Congressional direction and funded the National Academy of Sciences to conduct a study on the effects of commuting on pilot fatigue. An interim report was published - Issues in Commuting and Pilot Fatigue; the final report is under review and scheduled for release in July.

Methods: The study committee was asked to define commuting in the context of pilot alertness and fatigue, discuss the relationship between the available science on alertness, fatigue, sleep, and other factors on performance and safety, discuss the policy, economic, and regulatory issues that affect pilot commuting, and outline potential next steps, including regulatory or administrative actions, or further research.

Results: The interim report demonstrated the multiple interactive sources that contribute to fatigue; duration of time slept prior to work, duration of time awake prior to work, quality or restfulness of sleep prior to work, and the biological time at which commuting occurs relative to the start of work. The final report will include a review of NTSB reports on aviation accidents to identify available information related to the contribution of commuting to flight crew fatigue; a review of the comments related to commuting submitted in response to the NPRM; a review of available information on relevant airline policies and practices in the international arena; and an analysis of data requested from airlines on pilot residence (approximated by zip code) and duty location (domicile or base) to enable an approximation of commuting distance and time.

Conclusions: The final report contains conclusions and recommendations regarding the role of commuting in pilot fatigue.

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OP 38

English: **STUDY ON JOB BURNOUT AND RELATED FACTORS IN MILITARY PILOTS**

French: **ÉTUDE SUR L'ÉPUISEMENT PROFESSIONNEL ET FACTEURS CONNEXES DANS LES PILOTES MILITAIRES**

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Background: According to Maslach, burnout is a prolonged response to chronic emotional and interpersonal stressors on the job, and is defined by three dimensions of exhaustion (EX), cynicism (CY), and professional inefficacy (PE). Job burnout and related factors are important in military aviators.

Methods: A battery which consisted of Maslach Burnout Inventory-General Survey (MBI-GS), Revised Eysenck Personality Questionnaire-Short Scale for Chinese (EPQ-RSC), Hardy Personality Questionnaire(HPQ), Aviation safety

Locus of control (ASLOC), Job Stress Questionnaire (JSQ), was conducted in 88 military pilots, including 44 helicopter trainees (HT,22-23years old), 25 helicopter pilots (HP,24-41years old), 19 fighter pilots (FP,26-34years old).

Results: All items of MBI-GS were retained with an alpha of 0.710. EX and CY are positively correlated (P(Pcorrelated (POne way ANOVA indicated that scores of EX and CY among three groups (HT, HP and FP) are significantly different from each other (Pgroup are significant higher than HT and FP through LSD-t analysis (PScore of EX is positively correlated with Neuroticism score of EPQ-RSC (PEPQ-RSC (Pboth Total score of ASLOC)

Conclusions: MBI-GS is an acceptable tool which can be used in research on job burnout in military aviators. ASLOC indicated that pilots with low level of feeling control on safety are prone to job burnout. Aviation is a high risk occupation.

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OP 39

English: **BALANCE TESTING AND DERIVING A SAFE INTERVAL TO RETURN TO ACTUAL FLIGHT AFTER SIMULATOR TRAINING**

French: **TEST D'ÉQUILIBRE ET DÉCISION D'UN INTERVAL SÉCURITAIRE POUR LE RETOUR AU VOL APRÈS FORMATION EN SIMULATEUR**

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Introduction: Simulator Sickness (SS) is a form of motion sickness induced by experiencing simulated flight without the corresponding visual and/or kinesthetic cues of actual flight. Because of the possibility of SS and induced spatial disorientation, various periods of recovery before actively flying have been required. Subjective questionnaires and objective testing have been studied to formulate the recommended period of no flight.

Methods: A survey of current recommendations for grounding and past studies of SS will be presented. The reliability and reproducibility of balance testing and automated posturography will be reviewed. We will present new data from a severe, Coriolis-inducing, head movement study in a high performance, wide field-of-view, centrifuge-based, tactical flight simulator. Eight (8) highly experienced aerobatic pilots performed a sharpened Romberg test before and after daily, 12 minute exposures to the prescribed, standardized, head movements of up to 900 deflection.

Results: Return to flight recommendations vary among agencies. Objective tests show little correlation with subjective symptoms of minor motion aftereffects and overt SS. In our experiment, the sharpened Romberg balance test was significantly improved at the 4th day of exposure to severe Coriolis forces, and the improvement was retained upon retesting 2 weeks later. Improvement in Romberg performance within the trial was excluded. No motion after-effects were reported the morning after exposure by any subject.

Conclusions: Return to flight recommendations may be derived partly from subjective and objective data. Further research is needed to elucidate subtle after-effects that may compromise flight safety. Recommendations should be specific to anticipated type of mission, number of crew potentially affected by persistent SS, and flight conditions. Address for communication: AvMedSafe, 677 NW Melinda Ave, Portland, OR, USA, 97210,

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OP 40

English: **HEART RATE VARIABILITY DURING SEMICIRCULAR CANAL STIMULATION AS A PREDICTOR FOR MOTION SICKNESS**

French: **VARIABILITÉ DE LA FRÉQUENCE CARDIAQUE AU COURS D'UNE STIMULATION DU CANAL SEMICIRCULAIRE COMME ÉLÉMENT PRÉDICTIF DU MAL DE TRANSPORT**

A Macovei, D Vlad, D Popescu

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Introduction: Heart rate variability (HRV) has been used to explore autonomic balance with various results. Some anatomical evidence regarding vestibuleautonomic pathway exists, but physiological correlates are yet poorly understood. Previous autonomic balance influenced by vestibular system studies have focused mainly on otolith organs. All together there is little evidence between semicircular canals and autonomic correlates. We will try to establish such a correlate and discuss the possible relationship with motion sickness (MS).

Method: 50 volunteers, 20 being certified flying personnel, were admitted for studies. Previous history MS was excluded. All subjects were tested for any vestibular or neurological problems (clinical, EEG, posturography). All were exposed to a rotational profile in complete darkness, clockwise, at subthreshold, overthreshold and high speed yaw rotation. All subjects were instructed to minimize head movements. No restrictions were enforced. ECG was recorded, RR measured by hand and input into an analysis software. Both time domain and frequency domain analysis were used. MS score was recorded by interview after the test.

Results: In time domain analysis 38 subjects (13 pilots) showed low HRV with RMSSD under 25 ms and pNN50% under 8 while 12 (7 pilots) subjects showed high variability with RMMSSD over 35 ms and pNN50% above 20. Cross analysis pilots vs non pilots showed no significant difference. Interval analysis was performed. We found two significant patterns of high frequency (HF) component with the overthreshold and high speed intervals of the profile, displayed by the subjects who had displayed motion sickness like symptoms. Detailed comparison of HRV during profiles and by population group will be presented. Error sources will be discussed.

Conclusion: Rotational stimuli may also trigger an autonomic response, but is hard to make a general rule. Two patterns of HRV might be used as a predictor of MS.

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OP 41

English: **THE IMPROVEMENT OF PERFORMANCE BY YELLING MANEUVER AFTER VESTIBULAR DISTURBANCE**

French: **L'AMÉLIORATION DE LA PERFORMANCE PAR LA MANOEUVRE YELLING APRÈS UNE PERTURBATION VESTIBULAIRE**

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Introduction: The Yelling maneuver is to yell loudly 3 times with tensing abdominal muscles. Our previous studies have shown it can activate the brain cortex and facilitate the recovery from spatial disorientation scenario. This study is to investigate its effect on operation quantitatively right after exposing to Coriolis illusion.

Methods: Sixteen student pilots and 4 pilots voluntarily joined this study. They were randomly assigned to ride the Vertigon 3 times following the instructions played by an audio tape in the cockpit. Meanwhile, Coriolis illusion was induced by doing some cockpit tasks requires tilting the head. The first trial was to yell while Coriolis illusion onset. The second trial was not to yell instead. The third trial was deaf by wearing an earmuff plus ear plugs but yelling informed by a vibration signal. Right after the vertigo episode, they were asked to perform a coordination turn. The deviation from the flight path was graded by a built-in digital counter (the less score means the better performance).

Results: The subjects performance was significantly improved by yelling maneuver (227.75 ± 37.01 ; 354.20 ± 46.72 , Pmuch better with hearing than no hearing while yelling (227.75 ± 37.01 ; 304.65 ± 43.38 , Pbetter with yelling than without yelling (304.65 ± 43.38 ; 354.20 ± 46.72).

Conclusion: Yelling maneuver is a learning technique. It may activate the cerebral cortex and modify the vestibular input which is related to auditory sensation.

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OP 42

English: **NORMOBARIC HYPOXIA TRAINING OF PILOTS: A CRITICAL REVIEW**

French: **LA FORMATION EN HYPOXIE NORMOBARE POUR LES PILOTES : UN REVUE CRITIQUE**

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Introduction: Hypoxia awareness training is in the process of revision world-wide. Current convention is that normobaric hypoxia training can deliver most of the benefits of chamber training without the risks of hypobaria. Different organizations and nations are now using USA reduced oxygen breathing devices (ROBD) and Australian GO2Altitude® hypoxicator systems for normobaric hypoxia, aiming to replace or complement chamber training. Two major questions remain to be addressed: a) Risks associated with the use of these hypoxicators b) Which methodology provides the best chance of remembering and/or recording individual hypoxia symptoms, providing the greatest educational impact. This paper focuses only on the first.

Methods: A review of commercially available hypoxicators and systems for normobaric hypoxia education and training was completed paying particular attention to the risks associated with their use and their management. **RESULTS:** Technology now allows computerized pre-programmed delivery of low oxygen concentrations for altitude simulation. Purpose-designed cognitive performance tests record physiological parameters and deteriorating cognitive function. Cognitive function performance deficits may also be demonstrated using off-the-shelf flight simulator software. It appears that the level of risk varies between systems. Risk mitigation in some devices appear to miss safety levels normally applied to medical devices with similar complexity and risks posed.

Discussion: New emerging normobaric hypoxia training technologies are now leaving research labs and are starting to be used for military and civil aircrew training. With this expansion, new training systems will be used by staff who may not fully appreciate associated hazards. It is time to consider standardization of proper risk management for all the methodologies and equipment being reviewed.

Conclusion: Standardized risk management needs to be applied to all commercially available devices producing normobaric hypoxia.

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OP 43

English: **BIOIMPEDANCE CARDIAC OUTPUT MONITORING AS A PREDICTOR FOR HYPOXIA RESISTANCE**

French: **SURVEILLANCE DU DÉBIT CARDIAQUE PAR BIOIMPÉDANCE, UN FACTEUR PRÉDICTIF DE RÉSISTANCE A L'HYPOXIE**

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Introduction: Noninvasive monitoring of cardiac output during hypobaric hypoxia is very important for estimating individual variability of hypoxic stress response and for establishing new guidelines for hypoxia resistance tests.

Method: A sample of 100 pilots and paratroopers was selected. We used the ECG, BIOIMPEDANCE, PULSEOXOMETRY modules of the BIOPAC system which gave us significant information regarding adaptive response to hypoxic stress. Chamber flights were taken between 8.30-12.20 a.m. in similar conditions of rest and alimentary regime. Simulated flight tests lasted for 15 minutes. Ascension was made at 40m/s up to an altitude of 5500m, with temperature and humidity within comfort limits. On minute 7 a physical stress test was performed consisting in running on a treadmill for 20s with a 2 m/s speed. Descent was made at 30 m/s speed.

Results: Bioimpedance values correlated with ultrasound data ($r=0.85$, $p=0.05$). Histogram data shows a constancy of stroke volume during the test. Correlation plots shows physiological hypoxia compensation mainly due to heart rate,

with the notable exception of first adaptation at 5500 m. ($R=0.97-0.99$, p less than 0.001). As far as smokers vs nonsmokers go, no significant difference was found regarding cardiac output ($p=0.3$) but a fairly significant difference was found ($F=8,86$ $p=0.05$) regarding oxygen saturation values. **Conclusion:** Impedance cardiography is precise enough in regard to more invasive methods. Good concordance between CO measured by IC and Doppler was surprising for us. There is a possibility for separate representation of stroke volume vs heart rate to establish more guidelines for hypoxia resistance.

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OP 44

English: **EFFECT OF HYPEROXIC HYPOBARIA ON ARTERIAL BLOOD GASES, PH, SERUM ELECTROLYTES & PLASMA RENIN ACTIVITY SIMULATING COCKPIT CONDITIONS IN AN IAF AIRCRAFT DURING LONG DURATION FLYING**

French: **L'EFFET DE L'HYPEROXIE HYPOBARE SUR LES GAZ ARTÉRIELS, LE PH, LES ÉLECTROLYTES SÉRIQUES ET L'ACTIVITÉ RÉNINE PLASMATIQUE SIMULANT LES CONDITIONS DE LA CABINE DE PILOTAGE D'UN AVION DE L'ARMÉE DE L'AIR INDIENNE DURANT DES VOLS DE LONGUE DISTANCE**

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Background and objectives: Arterial desaturation and disturbances of body water volume regulation in animal/human models are reported, in peer-reviewed physiological literature, during exposure to non-hypoxic hypobaria. The present study examined changes in arterial blood gases, pH, serum electrolytes and plasma renin activity during five hour exposure of human volunteers to nonhypoxic hypobaria during their exposure to 15,000, simulating cockpit conditions in an IAF aircraft during long duration flying. **METHOD:** The study was conducted in two parts and comprised of exposure of 15 and 13 human volunteers, respectively in Study-I and Study-II, to hypobaria. During the above exposures, subjects breathed air-ox mixture to prevent hypoxia. In both studies, initial measurement was made at ground level while breathing ambient air. The subsequent measurement was made, at the end of 5 hour exposure to hyperoxic hypobaria, from the blood samples drawn at 15,000 when the subjects were still breathing air-ox mixture in Study- I. On the other hand, in Study-II, the second measurement was made from blood samples drawn after descent of subjects to ground level and while breathing ambient air. It was expected that a diffusion defect and subsequent desaturation would persist for some time and manifest as reduced arterial oxygen tension even after descent from altitude. Data were analysed with a Student's paired t test.

Results: In Study- I, arterial oxygen tension increased from its value in normobaria of 96 ± 8 mmHg to 175 ± 35 mmHg in hypobaria, The increase was statistically significant ($t = -6.237$; $p = 0.0002$) and was attributed to a higher concentration of oxygen delivered from the regulator. Changes in arterial CO₂ tension, pH, and serum electrolytes were not significant, statistically. In Study- II, no significant variation was observed in any of the above mentioned variables.

Conclusion: Exposure of human subjects to non-hypoxic hypobaria for a few hours does not cause any variation in ABG, Ph, electrolytes & PRA.

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OP 45

English: **OXIDATIVE STRESS INDUCED BY REAL CONDITIONS OF HIGH ALTITUDE HYPOXIA ON MILITARY AVIATION FLIGHT PERSONNEL**

French: **LE STRESS OXIDATIF INDUIT PAR DES CONDITIONS RÉELLES D'HYPOXIE EN HAUTE ALTITUDE CHEZ LE PERSONNEL NAVIGANT MILITAIRE**

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Introduction: Several environmental challenges are faced during high altitude exposure, including a low oxygen (O₂) partial pressure, temperature shifts, increased ultraviolet radiation, all of these leading to physiological stress. The reduced barometric pressure at altitude affects the so-called „O₂ cascade”, diminishing the ability of O₂ to diffuse from the atmospheric air to blood and tissues, inducing hypoxia. In these hypobaric hypoxia conditions, the antioxidant body defense systems seem to be overwhelmed by the enhanced production of oxygen and nitrogen-based reactive species, such as superoxide (O₂⁻), hydrogen peroxide (H₂O₂), hydroxyl radical (OH⁻) and peroxynitrite (ONOO⁻), increasing oxidative stress.

Methods: During March - September 2010 period, the first phase of this study was conducted on 120 subjects, exposed to hypoxia test at 5500m in OKG bar room within INMAS endowment. The study group was composed of experienced aviation flight personnel. The control group consisted of 28 candidates for pilots that carried out their first test of hypoxia and 32 paratroopers candidates without any experience. The second phase of this study has been done during January - May 2011. There were 32 male volunteers paratroopers exposed to a real altitude of 3900m. Data were collected at baseline sea level (SL) before parachuting and immediately after landing to sea level (RSL).

Results: Significant changes in arterial oxygen saturation (97.5 ± 0.8 ; $95.56 \pm 0.3\%$, pvs RSL) of lipid peroxidation pLDL (0.039 ± 0.06 ; 0.239 ± 0.04), as well as protein oxidation (SH protein groups 0.2343 ± 0.01 ; 0.1722 ± 0.01) and advanced oxidation of the proteins (AOPP 0.07056 ± 0.04 ; 1.0558 ± 0.115) have been noticed.

Conclusion: Our results suggest that in high altitude-hypoxic stress conditions, the burden of plasma oxidative stress and oxidative damage increases during the time spent at altitude.

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OP 46

English: **ALTITUDE CHAMBER RELATED HYPOXIC SYNCOPE**

French: **SYNCOPE HYPOXIQUE DANS UNE CHAMBRE HYPOBARE**

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Introduction: Hypoxic syncope is a known adverse effect related to high altitude exposure. The reported prevalence is different among authors and it is 0.4% in subjects undergoing simulated altitude exposure in our low pressure chamber. Although different mechanisms may explain the high altitude related syncope, hypoxia is the most accepted cause and parasympathetic activation is the most likely pathophysiological mechanism.

Cases: We present eight cases of syncope in airmen exposed to simulated high altitude in a hypobaric chamber. Six subjects suffered symptomatic bradycardia or syncope. One subject was affected by bilateral carotid paraganglioma and had episodes of syncope before and after monolateral and bilateral carotid body excision. Finally, one subject had syncope 90 seconds after having restored the oxygen supply. Most of our subjects suffered of symptomatic bradycardia or syncope at the end of hypoxia or just when the oxygen supply was restored suggesting that hypoxia could be reasonably a major cause of syncope. One of our subject had delayed syncope after receiving pure oxygen at the end of the hypoxia consistent with an oxygen-induced cerebral vasoconstriction (oxygen paradox) instead of a direct effect of hypoxia itself.

Conclusion: Syncope is a relatively frequent adverse effect of simulated high altitude exposure in hypobaric chambers. Different mechanisms may be involved including a direct hypoxic effect and an oxygen induced cerebral vasoconstriction.

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OP 47

English: **AERODONTALGIA: MYTH OR REALITY IN 2010?**

French: **AÉRODONTALGIES: MYTHE OU RÉALITÉ EN 2010?**

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Introduction: The physiopathology and the frequency of aerodontalgia remain uncertain. These facts motivated an epidemiological study in France (during Summer 2010).

Methodology: An anonymous questionnaire was proposed to aircrew members (AM) during 1 month in 15 sites (4 aeromedical centres, 10 military units and 1 occupational health service of an airline company). 1139 questionnaires were collected among 1475 distributed. The mean age of the population is 37 years with 20% of women. All aeronautical duties are represented (674 civilians and 465 military), with a majority coming from commercial air transport (540 AM).

Results: 74 aerodontalgia are found. The assessed frequency is 6.53% in civil aviation and 6.45% in military aviation, with variations depending on the duty: from 2% (student pilots) to 11.3% (fighter pilots). The pain occurs more in descent (47.3%) than in rise (28.4%) or in cruise (24.3%). 4 times out of 5, aerodontalgia appears below 8 000m (26 250ft). The intensity is highly variable (without any clear relationship with the frequency of flights, acceleration or speed of the aircraft). The pain duration exceeds 1 minute in 2/3 of the cases and affects more upper jawbone (52.7%) than lower jawbone (43.3%), with radiation of pain to the sinuses or ears in 36.5% of cases. The frequency of dental check-up is the same between AM with or without aerodontalgia. 3 times out of 5, a previous problem exists on the responsible tooth. 10 AM report an impact on safety (0.9% of the population and 13.5% of aerodontalgia cases).

Conclusion: We suggest several rules to reduce the occurrence of aerodontalgia from these results and from our knowledge about this pathology. Aircrew, doctors and dentists must be aware of this issue.

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OP 48

English: **NECK AND BACK PAIN IN MILITARY AVIATION: AN INTERNATIONAL SURVEY AND REVIEW OF CURRENT RESEARCH**

French: **DOULEUR AU COU ET AU DOS DANS L'AVIATION MILITAIRE: UN SONDAGE INTERNATIONAL ET UNE REVUE DE LA RECHERCHE ACTUELLE**

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Introduction: Neck pain is a common complaint of aircrew, whether civilian or military, helicopter or fast-jet, pilot or loadmaster. Neck pain can range from acutely incapacitating to chronic and distracting, with a broad range of possible etiologic factors. Much research points toward increased headsupported mass (HSM) as a contributing factor, but other factors are significant as well. Where there are common aircraft and aircrew equipment among nations, developing a common understanding of etiological factors should lead to efficiencies in research programs as well as operational solutions.

Methods: Between 2004 and 2010, a standardized survey was administered to various aircrew populations in the US, UK, and Canada, to determine the prevalence and characteristics of aviation-related neck pain. The survey was administered to rotary-wing and fixed-wing aircrew from Army, Air Force and Navy populations, and included frontand rear-crewmembers.

Results: Over 1500 surveys have been analyzed to date; 55% of respondents reported having suffered neck pain related to flight. Significant predictors of neck pain included total NVG flight hours and the average number of NVG hours per mission. Regression analyses revealed an initial sharp increase in neck pain reporting with accumulated NVG hours.

Discussion: These results highlight that aircrew neck pain is an international aeromedical challenge. The potential effects of neck pain on aviation safety, combat effectiveness, and aircrew health are considerable. To this end, a workshop, „Acute and Chronic Neck Injury Exercise Countermeasures,” was held in 2010, with the intent of formulating research collaborations aimed at reducing the neck pain/injury problem in aviation. The presentations from that workshop will be highlighted, and an update provided on an international study of neck exercise efficacy in US Navy and US Army aircrew.

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OP 49

English: **NECK AND BACK PAIN IN CYPRUS AIR FORCE HELICOPTER PILOTS**

French: **DOULEUR AU COU ET AU DOS CHEZ LES PILOTES D' HÉLICOPTÈRE DE L'ARMÉE DE L'AIR DE CHYPRE**

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Introduction: Helicopter flying has long been associated with neck and back pain. Determining the prevalence of these complaints in Cyprus Air Force helicopter pilots and possible contributory and alleviating factors may contribute to the more effective management of these conditions.

Methods: A prevalence study was carried out, involving the administration of a semi-structured questionnaire to all (60) active duty helicopter pilots of the Cyprus Air Force. The questionnaire concerned flight-related and individual risk factors, pilot perceptions and disability. Regressions were used to estimate relative risk (RR).

Results: The reported 3-month prevalence of neck and back pain was 46% and 74% respectively. Forty-seven (92%) of the pilots blamed flying a helicopter for their musculoskeletal complaints. A history of recent pain in a closely related anatomical region (RR=2.9, 95% CI=1.51-5.51, P=0.001*) was a significant risk factor for neck pain, while helicopter type, the use of NVG, and muscle strength training showed a non-significant associated trend, the latter towards a decreased risk. In the case of backache, fitness training and muscle strength training were significant risk reduction factors (RR=0.4, 95% CI=0.23-0.81, P=0.01* and RR=0.5, 95% CI=0.28-0.95, P=0.03* respectively), while helicopter type, the use of NVG and BMI more than 25.1, showed a nonsignificant associated trend. Pain interference with flying duties was reported by 30% and 44% of neck and back pain cases respectively.

Conclusions: Neck and back pain are common among helicopter pilots, and certain factors have been identified as requiring management in order to achieve risk reduction.

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OP 50

English: **SPONDYLARTHROPATHIES: AEROMEDICAL CONCERNS**

French: **SPONDYLARTHROPATHIES ET APTITUDE AÉRONAUTIQUE**

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Introduction: Spondylarthropathies are occasionally diagnosed in aircrew members who are at the middle of their career. The aeromedical examiner needs to collect clinically relevant information for the fitness assessment and flight certification.

Methods: Regarding military and civil flight personnel examined in the main French aeromedical center and the department of aviation medicine in Percy military hospital, we discuss the information contributing to make the final decision (course of the disease, physical examination, treatment).

Results: The natural course of the disease, with exacerbations and remissions, and the limitations of motion are important factors to consider. The arthritic process may be developed on the spine, the sacroiliac and large peripheral joints. Long hours in a cramped cockpit as well as the possibility of ejection from high-performance aircraft could be intolerable for military aviators with this disease. Furthermore, patients may develop systemic symptoms such as uveitis, inflammatory bowel disease, pulmonary fibrosis, or aortic insufficiency that are a cause of concerns for the aeromedical experts. The symptoms of this chronic disease are limited or delayed by treatment modalities including anti-inflammatory drugs or sulfasalazine, but at the cost of potential adverse effects including gastric irritation and hemorrhage. New treatments (TNF inhibitors, methotrexate) are also efficient, but require close evaluations for fitness assessment (sensitivity to infections, administration mode).

Conclusion: As long as the disease is at early stage and causes only mild symptoms, it is now often possible to continue a career in aviation. However, the systemic complications and the tolerance of the treatment need close evaluation for the aeromedical experts.

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OP 51

English: **STUDY ON BONE MINERAL DENSITY IN THE ROMANIAN AERONAUTICAL PERSONNEL**

French: **ÉTUDE SUR LA DENSITÉ MINÉRALE OSSEUSE DU PERSONNEL AÉRONAUTIQUE ROUMAIN**

M Boar, S Perlea, D Popescu

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Introduction: Until now, globally, there is very little data on changes in aeronautical personnel bone mass. Most studies were done in cosmonauts where the gravitational force decrease and the drastic reduction in mechanical load determine a severe imbalance between bone formation and resorption, with rapid development of osteoporosis. Clinical trials conducted so far on this type of aeronautical personnel revealed that bone mass reduction exceeds 1% per month

for the bones that support body weight, this being one of the major barriers to long term space operations.

Objectives: The working hypothesis from which we started was that if osteoporosis has been highlighted in cosmonauts, it is also possible that other categories of aeronautical personnel would develop similar effects in bone mass. Considering this, the target of the study was to highlight the frequency of the metabolic bone disorders in aeronautical personnel in particular situations.

Materials and methods: Two comparative study groups were set up, which included 158 subjects, one composed of aeronautical personnel in observation about flight health capacity and another composed of no aeronautical personnel. The study was conducted at the National Institute of Aerospace Medicine in Bucharest, between 2006-2009, on the basis of selection and exclusion criteria in order that the groups be approximately similar. Monitoring and evidence sheets were prepared for both groups as a research tool with a large number of items. The two groups were subjected to specific tests to determine the bone mineral density and bone turnover.

Results and conclusions: The results confirm the working hypothesis and responded to the proposed research objectives, establishing correlations between risk factors and their limit values. Thus, a statistically significant difference between the two groups has been noticed, in terms of decreasing bone mineral density in aeronautical personnel.

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OP 52

English: **2006-2011 FIVE YEARS OF SPATIAL DISORIENTATION TRAINING IN ROMANIA**

French: **2006-2011 CINQ ANNÉES DE FORMATION EN DÉSORIENTATION SPATIALE EN ROUMANIE**

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Introduction: Spatial disorientation was a new issue in Romania when the first spatial disorientation trainer and demonstrator was opened. Both doctors and crew had to adapt to the new environment. Five years later we present our take on the phenomena.

Methods: A review of the material and human component of the spatial disorientation training. We have used the airplane profile for five years and the helicopter profile for two years. A list of the illusions demonstrated will be given, along with our modifications to it vs. the factory profile.

Results: 176 training sessions were made for 117 supersonic pilots. 50 sessions for 41 subsonic pilots. 54 sessions for 54 transport pilots. 164 sessions (95 with the helicopter profile and 69 with the airplane profile) for 91 helicopter pilots. 52 sessions for 52 aviation students. The impression and conclusions for each group will be presented.

Conclusion: A number of mishaps have since occurred in the Romanian Air Force. The SD specialists were consulted in two cases, one in which SD was possibly involved. Final investigation report showed no SD involvement for any of the cases. Therefore we consider the training to be successful.

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OP 53

English: **RESPIRATORY-GAS EQUILIBRIUM DURING DISORIENTATION IN MICROGRAVITY AND HYPOBARIA: A REAPPRAISAL**

French: **L'ÉQUILIBRE DES GAZ RESPIRATOIRES PENDANT LA DÉSORIENTATION EN MICROGRAVITÉ ET HYPOBARIE- UNE RÉÉVALUATION**

JD Sharma

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Introduction: Retaining postural equanimity in altered environments of torque and acceleration invoke the whole body responses rooted in evolution for adaptive functionality in microgravity and hypobaria. The vestibular-cochlear apparatus within the perilymph and endolymph responds simultaneously and instantaneously to miniscule changes of its blood-gas supply, for homeostasis.

Reviewed methods: a) CO₂ exposure influences after-potentials of nonsynaptic excitation between the statocyst and visual pathways in lower animals like in *Hermisenda* (Alkon 1978) and during hypoxia in other ocean balancers in the organ of Corti (Lawrence 1952). With counter-current flows in the parabronchii of the rigid avian lung, a near perfect PCO₂ equality between alveolar gas and blood occurs; similar to re-breathing equilibrium of CO₂ (Meyer 76). b) Hypercapnia in humans, changes endolymph pO₂ and the Endocochlear Potentials with exposure to 5 and 10% CO₂ and changes in carbonic anhydrase (Prazma 1979); local vasodilatory adaptations (Hultcrantz E 1978); and an overall systemic baroreceptor-CO₂ response (Prisk 2000). The slope of the CO₂ response is retained with lower air density as a larger dead space to ventilatory volume (Borel 1998). The lower VE at altitude is due to CO₂ elimination being relatively less at altitude, with a retention or increase in PET CO₂ with reduction in inspired gas density compared to normobaric hypoxia; reducing the work of breathing or alveolar dead-space. c) Mathematical modeling shows CO₂ diffuses the fastest to attain equilibration and with Simulink, the activity of the respiratory controller, senses the CO₂ stimulus independently, while keeping the other (O₂) stimulus constant (Thamrin 2008). **Conclusions:** Hypobaria and altitude chamber training (Self 2011), can show the levels of efficiency with oxygen as an indicator of energy expenditure, and CO₂ output as the gain by conservation. When simultaneous measurement of the hypoxic point tallies well with the hypercapnic point of equilibrium it becomes a highly significant parameter of functional efficiency in future short haul suborbital and long haul space-flights.

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OP 54

English: **AIR MEDICAL TRANSPORT OF PATIENTS FOLLOWING ACUTE MYOCARDIAL INFARCTION**

French: **ÉVACUATION MÉDICALE AÉRIENNE DES PATIENTS APRÈS UN INFARCTUS AIGU DU MYOCARDE**

E Ish Tov, E Deviri, O Deviri, A Henig Hadar

Affiliation of first author: Airmed, Hod Hasharon, NA, Israel

Introduction: This study describes our experience regarding air medical transport of patients following acute myocardial infarction (AMI).

Methods: Retrospective study of 126 patients undergoing air medical transport after AMI between Jan. 1 2000 to Sep. 31 2008 by AIRMED. Average age was 60.7 y (range 33-90).

Results: Average flight duration was 6.59 hours (range 0.58-27.50). 37 patients (29.3%) were transported to another hospital for further treatment, 25 of them by air ambulance and 89 patients (80.7%) were transported home by commercial flight. 44 (34.9%) patients underwent PCI or CABG before transport. During the years 2007-2008 more patients (48% and 66% respectively) underwent PCI or CABG before transport and fewer (11%) were transported by air ambulance. Eleven patients (Gr.1) were transported within 1-4 days after AMI— all of them for treatment and 10 of them by air ambulance. None of those patients underwent PCI or CABG prior transport. The condition of none of those patients deteriorated during the flight. 95 patients (Gr.2) were transported between 5-14 days after AMI-- 26 (27%) for treatment, 15 (16%) by air ambulance. Of those patients one patient died unexpectedly one hour after landing. 20 patients (Gr. 3) were transported between 15-30 days after AMI; all of them home on an uneventful commercial flight.

Conclusions: These data suggest that the rate of patients requiring urgent transport for further treatment after AMI in air ambulance decreases in the last two years. Urgent transportation for treatment after AMI by air ambulance is feasible. Transportation by commercial flight should be considered after hospital discharge even 5 days after AMI with in flight medical care.

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OP 55

English: **INTERNATIONAL TRANSFER OF CRITICAL CARE PATIENTS: 12 YEARS EXPERIENCE**

French: **ÉVACUATION INTERNATIONALE DE PATIENTS SOUS SOINS INTENSIFS: UNE REVUE DE 12 ANS**

YG Caine

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Introduction: Transportation of the critical care patient is a difficult and complicated mission; usually it is a local, short distance mission that is done with a dedicated air ambulance (rotary or fixed wing). International missions are longer and more complicated and are almost always done with a fixed wing dedicated air ambulance.

Methods: in this retrospective study we reviewed 1667 patients that were transported by AIRMED between 1 Jan 1998 to 31 Dec 2009.

Results: During the last 12 years we have transferred 205 critical care patients; 121 were transferred with dedicated air ambulances, with an average flight time of 2.5Hr (range 35Min to 9Hr). 84 were transferred on board scheduled commercial flights, average flight time 7.2Hr (range 1.5Hr. to 17Hr). Of those, 7 were transferred on combined missions (dedicated air ambulances and scheduled commercial flights). There was one fatality during transfer (patient was brain dead before the flight), and there were no medical complications.

Discussion: In this presentation we shall present the two groups, (air ambulance vs scheduled commercial flights), and analyze the differences between them. We will discuss the meaning of the differences and the advantage and disadvantage of both types of transfer.

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OP 56

English: **AIR MEDICAL TRANSPORT OF PATIENTS FOLLOWING SPINAL CORD INJURY**

French: **ÉVACUATION MÉDICALE AÉRIENNE DE PATIENTS APRÈS UN ACCIDENT DE LA MOELLE ÉPINIÈRE**

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Background: This study describes our experience regarding air medical transport of patients following spinal cord injury.

Methods: Retrospective study of 39 air medical transportations of 30 patients (21 males and 9 females) after spinal cord injury between Jan. 1 2000 to Dec. 31 2009 by AIRMED. Average age was 30.5 years (range 16-80).

Results: Time interval between injury and transportation varied from one day to 5.5 yrs. Average flight duration was 8.2 hours (range 1.67 to 26.75). Twelve flights were following cervical spinal cord injury and 27 following dorsal and lumbar spinal cord injury.

Of cervical spinal cord injury flights, 6 were for treatment (1 by helicopter, 1 by a combined air ambulance and a commercial flight, and 4 by a commercial flight. All pts were transported on a stretcher, two were ventilated). Six flights were for repatriation or completion of rehabilitation (all on commercial flight, 5 on stretcher and 1 on a seat). Of the dorsal and lumbar spinal cord injury flights, 19 were for treatment (4 by air ambulance, 2 combined air ambulance and a commercial flight, and 13 commercial flight. All were transported on a stretcher). Eight flights were for repatriation (all by commercial flights; in 1 a stretcher was used). All flights were completed without any complications and in none of the flights did the patient's condition deteriorate.

Conclusions: Spinal cord injury patients can be safely transported by air at any stage following the injury to any range despite of the complexity of the injury and the complexity of the flight.

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OP 57

English: **HYPERVENTILATION REVISITED**

French: **HYPERVENTILATION REVISITÉE**

M Bagshaw

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The physiology of hyperventilation is well understood by practitioners of aviation medicine. The symptoms and signs are common to hypoxia, and military aircrew are taught to respond to such symptoms with the appropriate emergency oxygen drill.

Hyperventilation is a normal human response to stress and anxiety and can become self-perpetuating, leading to chronic symptoms and signs. A questionnaire study by Karavadis and Lehrer (ASEM, May 2009) reported a significant prevalence of unrecognised hyperventilation amongst airline pilots. A number of safety and accident reports describe symptoms and signs of hyperventilation in crew members which they ascribe to toxic fume inhalation. The pathophysiology of hyperventilation will be discussed in relation to a number of recent incidents and accidents. Means of improving the understanding of aviation medicine amongst the civilian flight crew population will be explored.

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OP 58

English: **PERNICIOUS ANEMIA: AEROMEDICAL CONSIDERATIONS**

French: **L'ANÉMIE PERNICIEUSE: LES CONSIDÉRATIONS AÉROMÉDICALES**

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The etiology of vitamin B12 deficiency can be due to diet, malabsorption, inflammatory bowel disease, or a lack of intrinsic factor (pernicious anemia or PA). Vitamin B12 is an essential vitamin mostly coming from foods of animal origin. Normally the vitamin bonds to intrinsic factor with the complex being absorbed in the ileum. If there is insufficient intrinsic factor, a megaloblastic anemia with megaloblastic cells in the marrow will develop which is the hallmark of this disease. Eventually gastrointestinal symptoms will occur as well as significant neurological signs and symptoms including paresthesias, dysequilibrium, cerebral dysfunction, and neuropsychological changes. In some cases, neurological dysfunction is irreversible. The treatment for PA is cobalamin. It is particularly important to differentiate PA from folate deficiency because the latter does not cause pathological changes to the nervous system. This paper will review the symptoms, diagnosis, treatment, and prognosis of PA with particular emphasis upon aeromedical considerations and aeromedical disposition.

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OP 59

English: **PREDICTIVE FACTORS IN SUCCESS OF TRIAL OF HYPOBARIC CHAMBER IN COHORT WITH ALLERGIC RHINITIS**

French: **LES FACTEURS PRÉDICTIFS DU SUCCÈS D'UN TEST EN CHAMBRE HYPOBARE POUR UNE COHORTE SOUFFRANT DE RHINOSINUSITE**

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Introduction: Allergic rhinitis is a very common condition with a prevalence of 44% amongst Singaporean school children. This condition may present with Eustachian tube dysfunction and may lead to barotrauma and/or otalgia when flying at altitude with the risk of sudden incapacitation in-flight. The Republic of Singapore Air Force Aeromedical Centre screens this condition amongst pilot and aircrew applicants via history taking, physical examination as well as a trial of altitude chamber when the condition is deemed moderate in severity. The aim of this study is to establish the predictive factors for barotrauma and/or otalgia during a trial of altitude chamber.

Methods: We used a retrospective chart review of pilot and aircrew applicants undergoing altitude chamber assessment from Jan 2003 to Jun 2005. All subjects underwent a standard profile with altitude exposure up to 10,000 feet. The factors include: symptom of rhinorrhea (including duration and frequency) nasal congestion, airflow obstruction, deviated nasal septum, size and colour of inferior turbinate, tympanic membrane mobility on Valsalva manoeuvre. Presence of haemotympanum or otalgia with hyperemic tympanic membrane was considered failure of trial of hypobaric chamber.

Results: 151 subjects were identified. The failure rate was 15.9% (24/151). Very poor mobility of tympanic membrane was found to be a good predictor while presence of nasal congestion was a negative predictor.

Conclusion: Our study showed that very poor mobility of tympanic membrane was a predictor for barotrauma at altitude. Hence, it is important that assessment of tympanic membrane mobility be performed routinely for pilots and aircrew. This applies not only to screening for eustachian tube dysfunction associated with allergic rhinitis, but also extended to trained pilot and aircrew who have recovered from acute sinusitis.

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ABSTRACTS – POSTERS

P 01

English: **SOMNOLOGY AND FLIGHT SAFETY: AEROMEDICAL IMPLICATIONS**

French: **LA MÉDECINE DU SOMMEIL ET LA SÉCURITÉ AÉRIENNE: IMPLICATIONS DANS L'EXPERTISE AÉROMÉDICALE**

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Introduction: Many working and environmental conditions lead to fatigue, affecting people in a multiplicity of ways. Individual responses to fatigue are significantly different but everyone knows that fatigue affects memory, attention to detail, communication ability, and decision making. Fatigue has been, and continues to be, a contributing factor in several aviation accidents. **Methods:** One of the more difficult challenges in sleep medicine is the determination of fitness to fly for aviators with sleep disorders. Our goal was to assess whether, in aeromedical license requirements, fatigue was treated uniformly and associated with specific measures in order to preserve flying aptitude. We could not obtain coherent information about fatigue from current aeromedical guidelines. This paper presents also the author's efforts to promote the implementation of a fatigue risk management system (FRMS) in Romania.

Results: In a variety of studies, fatigued individuals consistently underreported how tired they really were, as measured by physiologic parameters. A tired individual truly does not realize the extent of actual impairment. When an aviator is diagnosed with a sleep disorder that can result in sleepiness, a discussion of flying aptitude is always in order. We present our diagnostic and treatment algorithm in sleep apnea.

Conclusion: No one is immune from fatigue. Screening for sleepiness and for sleep apnea among aviators needs to be seriously evaluated with some urgency. Yet, in our society, establishing widespread preventive measures to combat fatigue is often a very difficult goal to achieve. Individuals, as well as organizations, often ignore the problem until an accident occurs.

P 02

English: **SHIFTING SCHEDULES AS A CAUSE OF FATIGUE FOR JORDANIAN AIR TRAFFIC CONTROLLERS**

French: **CHANGEMENTS HORAIRE COMME CAUSE DE FATIGUE POUR LES CONTRÔLEURS DU TRAFIC AÉRIEN EN JORDANIE**

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Introduction: Fatigue among ATCs originates from various sources e.g., physical fatigue, shift schedule and Emotional stress. Fatigue related to shift work is two-fold: 1) ATCs working at night are at the nadir of their circadian rhythms, which results in fatigue, sleepiness and performance decrements. 2) Shift schedules often create sleep debt. Shift work has the potential to disrupt the circadian rhythms of the body and sometimes impair work performance, raising concerns for safe operation of air traffic control systems. Many studies observed that ATCs reported more sleepiness during the night shift, compared to day or evening shifts.

Methods: This is a retrospective study that was conducted during a period from August 2007 to May 2011 by reviewing and analyzing the records of flight surgeons, AMEs and the psychiatry clinics of Jordan Civil Aviation Regulatory Commission (CARC).

Results: A total number of 150 persons of our selected group aged 31-50 years with mean age of 41 years, who are working at night, evaluated physically and psychiatrically and found that 24% (n=36) had mild to moderate sleepiness and fatigue.

Conclusion: Fatigue, sleepiness, circadian trough, sleep deprivation, low traffic load, and low lighting levels were all identified as factors contributing to decreased performance and vigilance at night. Studies indicate that the performance decrements on various tests related to air traffic control tasks are particularly pronounced at the end of the night shift. Some potential countermeasures should be discussed. They include ways to increase alertness during the night shifts, topics for training programs for ATCs, means of reducing sleep loss, suggestions for rescheduling shifts to reduce sleep loss and fatigue.

P 03

English: **FEAR OF FLYING AFTER SUBARACHNOID HEMORRHAGE AND TEMPORAL INTRACEREBRAL HAEMATOMA DUE TO RUPTURE OF MIDDLE CEREBRAL ARTERY ANEURYSM: A CASE REPORT**

French: **LA PEUR DE VOLER APRÈS UNE HÉMORRAGIE SOUS- ARACHNOÏDIENNE ET UN HÉMATOME TEMPORAL INTRACÉRÉBRAL CAUSÉE PAR LA RUPTURE D'UN ANÉVRISME DE L,ARTÈRE CÉRÉBRALE MOYENNE- HISTOIRE D'UN CAS**

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Introduction: Fear of flying can be a symptom that may be a product of an acute or posttraumatic stress disorder, a generalized or phobic anxiety disorder or part of some other major or minor psychiatric condition. We describe a patient who reported fear of flying as part of an Anxiety Disorder due to subarachnoid hemorrhage (SAH) and temporal intracerebral haematoma after a rupture of middle cerebral artery aneurysm (Hunt and Hess Scale: 1; Fisher Scale: 4).

Methods: Neurosurgical intervention was performed 3 days after admission and consisted of pterional approach and temporal intracerebral haematoma evacuation, dissection and clipping of the aneurysm. The patients condition stabilized over the next several days and he was dismissed as neurologically intact on hospital day 9. Over the next months he developed panic attacks, irritability, restlessness, impaired concentration, and restless unsatisfying sleep. His job always required weekly flights for out-of-town meetings but suddenly he began being deathly afraid of flying. These symptoms interfered with work functioning and social life. He began treatment with Escitalopram (20 mg/day for one year) combined with Cognitive Behavioral Therapy (12 sessions). After 4 months of treatment, the patient was free of panic attacks and phobic avoidance.

Conclusions: Relatively little attention has been paid to emotional outcome after subarachnoid hemorrhage, even though anxiety is a significant and lasting problem for approximately 40% of survivors of SAH. We think that measures

taken to prevent or treat such anxiety among survivors of SAH may serve to significantly improve functional outcome.

P 04

English: **ELECTROENCEPHALOGRAPHY METHOD UTILITY FOR EVALUATION OF PERSONALITY TRAITS IN PILOTS**

French: **L'UTILITÉ DE L'ÉLECTRO-ENCÉFALOGRAPHIE POUR L'ÉVALUATION DES TRAITS DE PERSONNALITÉ CHEZ LES PILOTES**

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Introduction: Psychological evaluation of applicants for aviation schools requires a good investigation of certain stable structural and behavioral characteristics accompanied by elimination of the environmental effects. The psychological test objectivity is an essential aspect of aeronautical selection. Besides the objectivity criteria (etalons construction, application and interpretation of the tests), a large interest exists in correlation between psychological and physiological data. Our aim is, for this phase of research, to investigate the possibility to use some electroencephalographic (EEG) indicators among psychological examination.

Method: The research includes 50 applicants who passed psychological evaluation for Air Force Academy. EEG was recorded through measures in 20 electrodes. We analyzed the spectral power of cerebral waves for 50 seconds of repose. EEG and personality data were correlated. These two sets of data were obtained during two distinct investigations.

Results: The associations between EEG spectral power and personality traits were shown by correlation analysis. Thus, alpha wave characteristics, measured in frontal and occipital areas are associated with assertiveness and negativism; beta waves correlate with a certain degree of activism, independency, need for intellectual stimulation and risk taking; theta waves, which are presented in few cases, are linked to emotional balance.

Conclusions: Electroencephalographic measures are useful in objectifying of psychological traits. A bi-dimensional analysis, psycho-physiological, is more likely to produce a good selection of the candidates and to increase the prediction capacity of test selection toward future scholar and professional adaptations.

P 05

English: **NOTES ABOUT THE RELATION BETWEEN CHRONIC FATIGUE AND CABIN CREW**

French: **OBSERVATIONS SUR LA FATIGUE CHRONIQUE CHEZ LE PERSONNEL DE CABINE .**

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Introduction: En aviation, la fatigue chronique est associée à un programme chargé par des heures de vol, au manque du sommeil et aux sollicitations d'adaptation du corps dû à la déviation du rythme circadien ou biologique . J'ai analysé la fréquence du syndrome de la fatigue chronique , l'évaluation du niveau, la relation avec l'anxiété et aussi l'efficacité des méthodes de prévention spécifiques.

Méthode: D'un nombre de 845 stewards examinés en 2010 avec la présence de fatigue et après l'élimination des causes somatiques et psychiatriques, il en est resté 35. On a appliqué Chalder Fatigue Questionnaire (CFQ), Échelle de HAMILTON pour l'anxiété (HAM-A), un interview clinique et conseil .

Résultats: L'âge moyen: 32,5 ans. Les résultats pour CFQ 11 items ont été: ligne de référence-35,9; 1 mois-27; 2 mois - 21,6; 3 mois -16. La fatigue physique (les premiers 7 items CFQ): ligne de référence -23,05; 1 mois- 18; 2 mois -14; 3 mois - 10, 6. La fatigue psychique (items 8-11 CFQ): ligne de référence -12,8; 1 mois -9; 2 mois -7,8; 3 mois- 5,4. L'évaluation HAM-A a mis en évidence la ligne de référence d'anxiété modérée (22, 6 points) et à 3 mois anxiété légère (6, 9 points). On a fait des corrélations entre les items cognitifs de l'échelle d'évaluation et les items de la fatigue chronique.

Conclusion: L'étude met en évidence l'apparition de la fatigue du personnel de cabine même pour des vols court et moyen-courrier. Avec l'augmentation des sollicitations, on doit prévoir le développement de procédures de récupération adéquate. L'intensité des symptômes a été moyenne. La majorité a affirmé une durée.

P 06

English: **RESISTANCE ASSESMENT TO HYPOBARIC - HYPOXIC STRESS ACCORDING TO ERYTHROCYTE SEDIMENTATION RATE VALUES**

French: **ÉVALUATION DE LA RÉSISTANCE AU STRESS HYPOXIQUE - HYPOBARE SELON LES VALEUR DE LA VITESSE DE SÉDIMENTATION DES ÉRYTHROCYTES**

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Introduction: This work is the second part of a study in which we aimed to evaluate the influence of elevated values of erythrocyte sedimentation rate (ESR) regarding resistance and adaptive response of subjects exposed to hypoxia.

Methods: Sixty-seven subjects (12 candidates, 41 pilots and 14 instructors) were exposed to a simulated flight (15 minutes to 5500 m without oxygen). Simultaneous ECG and oxygen saturation (SO₂) readings were performed. ESR was performed prior to exposure.

Results: In the first part of the study, we demonstrated that there are significant correlations between the two methods (ECG and pulse oximetry) to assess the resistance to hypoxia and that those subjects with high ESR have poor adaptation. Expanding the study to a larger number of pilots confirmed these results.

Conclusions: Simultaneous monitoring of parameters during exposure to hypoxia, allows a better understanding of the subjects' adaptation profile. Increased ESR may be used as a predictor for low resistance to hypoxia. It may be necessary the evaluation of flight ability depending on the existence of normal values of ESR.

P 07

English: **COMPARISON OF HUMAN PHYSIOLOGICAL RESPONSE TO HYPOXIA GENERATED IN**

HYPOBARIC CHAMBER AND USING REDUCED OXYGEN BREATHING DEVICE (ROBD)

French: **COMPARAISON DE LA RÉPONSE PHYSIOLOGIQUE HUMAINE À L'HYPOXIE GÉNÉRÉE PAR UNE CHAMBRE HYPOBARE ET À L'HYPOXIE GÉNÉRÉE PAR L'UTILISATION D'UN APPAREIL RESPIRATOIRE EN SITUATION NORMOBARE**

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Introduction: Hypoxia is one of the most serious potential risk factors associated with flying. It has a direct negative impact on human performance and can lead to permanent impairment of health or death of both crew and passengers. Apart from a theoretical lecture, realistic practical demonstration of individual hypoxia symptoms is highly important especially for pilots.

Methods: A group of 25 male members of the Czech Air Force aged between 24 and 47 years was observed. Three types of hypoxic load were used: hypobaric hypoxia at 21 000 and 25 000 feet level and normobaric hypoxia induced by reduced oxygen breathing device (ROBD). The maximal oxygen reduction of the ROBD corresponds to simulated altitude 21 300 ft using high altitude adapter. A set of physiological data comprising of ECG, heart rate (HR) and oxygen saturation of capillary haemoglobin (%SpO₂) was acquired for every subject. HR and %SpO₂ physiological response time sequences for both height levels were correlated with those for ROBD load.

Results: Evaluation of the obtained physiological data changes in response to three different types of hypoxic load confirmed the identical quality of human physiological responses (statistically significant correspondence of HR and % SpO₂ values) to hypobaric hypoxia in simulated altitude of 21 000 ft (6 500 m) and normobaric hypoxia by breathing oxygen reduced air using generator HZP 123. The changes of observed physiological data during 25 000 ft altitude load demonstrated statistically significant difference in comparison to ROBD method. **Conclusion:** Using ROBD is an adequate testing and demonstration alternative to equivalent altitude of hypobaric hypoxia chamber examination. This method is prepared as a testing and demonstration algorithm for routine use in IAM Prague.

P 08

English: **CHANGES OF THE VISUAL FIELD UNDER HYPOXIA AND HYPOBARISM CONDITIONS**

French: **LES CHANGEMENTS DU CHAMP VISUEL DANS LES CONDITIONS D'HYPOXIE HYPOBARE**

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Introduction: The medical problems of the pilots are unique. They are forced to adapt to unexpected changes, so unexpected that sometimes the start of the action of compensatory mechanisms has almost no chance to take place. Since the beginnings of aviation, altitude hypoxia represented a risk factor, risk still existent nowadays, of hypoxia and depressurizing of airplane cockpit involved in many aircraft incidents. Training under hypoxia and hypobarism conditions became a compulsory element in training the military pilots (not civilian pilots). The variations of the air pressure, through its two important components (the value of the baric pressure and the partial pressure of the oxygen), causes changes in the amount of oxygen, of gases solubility in tumors and cells, and disorders of tissue perfusion. The quantity of oxygen necessary for the tissues becomes acute. The retina cells are part of the central nervous system and so they are very sensitive at the diminution of oxygens partial pressure. Under hypoxia and hypobarism conditions, there are some functional changes, changes that can be emphasized using different methods of investigation. Among these is visual field examination.

Method: A group of 40 subjects (aeronautic personnel) were observed; a group kept under hypoxia and hypobarism conditions; equivalent to a 5500 meters altitude. These were subjected to a visual field examination before and after the exposure and measuring oxygen saturation before, during and after the exposure.

Results: Exposure to hypoxia and hypobarism conditions causes changes in the visual field.

Conclusions: The work has as target to emphasize in what percentage the hypoxia and hypobarism imply changes in the visual field. This study emphasizes the importance of training the aeronautic personnel in special conditions as a necessity to increase flight safety.

P 09

English: **BROOKS IS NOW A PLACE FOR HISTORIANS TO RECOUNT: A NEW CHAPTER UNFOLDS TO NARRATE**

French: **BROOKS EST MAINTENANT UN ENDROIT QUE LES HISTORIENS VONT RACCONTER: UN NOUVEAU CHAPITRE SE DÉPLOIE POUR LA NARRATION**

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Introduction: What seemed so very far in the future that September day in 2005--an announcement by the Base Realignment and Closure (BRAC) Commission to close Brooks Air Force Base (BCB), Texas, and relocate the United States Air Force School of Aerospace Medicine (USAFSAM) to Wright-Patterson Air Force Base (WPAFB), Ohio is now fact. For more than 50 years the USAFSAM mission was located on BCB, and now it has come to a close, and a new chapter for USAFSAM has opened. For the past 6 years mission requirements were collected and functional mission synergies embodied into new workforce strategies. Accountable inventory spreadsheets were drawn and redrawn multiple times to answer for tens of thousands of items to be moved or transferred for reutilization. A new mega-facility was planned, fitted-out, and staffed at WPAFB. Start-up procedures for the School in Ohio have encountered a few challenges, but those were expected. To our valued international partners, transition to WPAFB will be transparent. More opportunities than heretofore available will make your aeromedical training a most-valued experience in your career development. USAFSAMs international program includes all offered courses as well as, where effective, exporting courses to sponsoring countries, bringing the classroom to the homeland country.

Methods and results: This presentation will review historical documents, offer observations related to logistics and

personnel actions, and tender commentary regarding closure processes and inauguration of the new facilities. Furthermore, insight will be offered relative to the complexity and magnitude of this BRAC-directed relocation and what international partners can expect from this change in venue.

Conclusions: The day has come to render complete the declaration to close and move Brooks. The new USAFSAM complex at WPAFB offers the World-Wide Team-Aerospace a resource to achieve the highest goals of educational and experiential quality and safety, all while fostering life-time, cooperative international relationships.

P 10

English: **HAEMODYNAMIC PARAMETER CHANGES ASSESSED BY IMPEDANCE CARDIOGRAPHY DURING RESPIRATORY ANTIGRAVITY MANEUVERS**

French: **CHANGEMENTS DE PARAMÈTRES HÉMODYNAMIQUES ÉVALUÉS PAR CARDIOGRAPHIE PAR IMPÉDANCE PENDANT LES MANŒUVRES RESPIRATOIRES ANTI-GRAVITÉ**

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Introduction: The respiratory antigavity maneuver (RAM) is a modified version of the classic Valsalva maneuver (VM). A modified version (in relation to clinically used VM) is done by a different expiring time and pressure of forceful exhalation. The time of RAM performance is significantly shorter, while the pressure of forceful exhalation is substantially higher than during VM. The aim of the study was comparative assessment of changes in haemodynamic parameters during RAM and VM.

Method: Ten healthy pilots were examined. Haemodynamic parameters were recorded by impedance cardiography in sitting position (Baseline), during VM and RAM. Heart rate (HR), systolic, diastolic and mean blood pressure (sBP, dBP, MBP), stroke volume (SV), cardiac output (CO) and expiratory pressure were measured. Assessment of technical propriety of RAM execution was based also on the haemodynamic parameters changes.

Results: Mean values of parameters baseline, VM and RAM were adequately: HR-78.7, 96.1, 95.6bpm; sBP-121.0, 116.2, 116.5mmHg; dBP-79.0, 83.3, 76.0mmHg; mBP-93.2, 94.6, 88.6mmHg; SV- 88.2, 76.7, 91.2ml; CO-68.9, 71.9, 86.4 l/min.

Conclusions: 1) Trend of haemodynamic parameters changes during RAM is similar to VM. 2) Incorrect performance of isolated RAM induced a. important fluctuations of BP; b. the highest rise of BP in $\frac{3}{4}$ time of RAM execution; and c. lower expiratory pressure. 3) Correct performance of isolated RAM induced a. low variability of BP; b. higher sBP on the beginning of RAM; c. the highest BP in the last hundredth of a second of remaining expiratory tension; and d. higher expiratory pressure. 4) The ICG monitoring during AGSM seemed to be valuable method in assessing of the technical correctness of its performance.

P 11

English: **PHYSIOLOGICAL CHARACTERISTICS OF THE PARACHUTIST USING HEART RATE VARIABILITY**

French: **LES CARACTÉRISTIQUES PHYSIOLOGIQUES DU PARACHUTISTE EN UTILISANT LA VARIABILITÉ DE LA FRÉQUENCE CARDIAQUE**

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Introduction: The aim of the research was to characterise the cardiac physiological reactions during parachute jumps according to jumps phases and personal experiences. Study group consists of 28 men, including 11 parachute instructors (I), 12 students attending the static line course (SL) and 12 students trained in the accelerated freefall (AFF).

Methods: Physical environmental indices and chosen physiological parameters were registered during parachuting jumping using the VENTUS System made by MIAM, included: ECG, heart rate variability (HRV), acceleration, altitude and atmospheric pressure. The comparative analysis was carried out between independent variables (groups: I, SL, AFF; kind of jumps and phase of jumping) and dependent variables (HR, HRV temporal, HRV frequency).

Results: Average values of HR were significantly higher for students in comparison to instructors ($p < 0.05$). With the learning process heart rate in subsequent jumps decreases for students, but differences are not significant. The biggest average values LF/HF was found in FAA students, indirect in SL and lowest in I. Average normalized values LF were lower for instructors compared to students. Normalized LF was significantly higher in the first jumps in comparison to last ones. After landing there were no differences of LF/HR and LF in subgroups.

Conclusion: Higher values of HR, LF and LF/HF were found for students compared to instructors. With the learning process LF and LF/HF in subsequent jumps decreases. Obtained data indicated the higher tension of the sympathetic system and the higher physiological cost during parachuting jumping for students.

P 12

English: **THE EFFECTS OF TRAINING WITH SPECIAL AVIATION GYMNASTIC DEVICES ON +GZ TOLERANCE**

French: **L'INFLUENCE DE L'EXERCICE AVEC LES OUTILS GYMNASTIQUES SPÉCIAUX POUR AVIATEURS SUR LA TOLÉRANCE AU FACTEUR DE CHARGE +GZ**

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Introduction: The beneficial impact of physical training on +Gz tolerance is well established in the literature. As part of physical training cadets of Polish Air Force Academy undergo special aviation gymnastic devices (SAGD) training aimed to increase spatial disorientation resistance through increased vestibular system adaptation. The purpose of the study was to investigate whether a SAGD training has any effect on +Gz tolerance.

Methods: Subjects were N=16 male young pilots (age M=19.7, SD=1.3 yr, body mass M=70.8, SD=5.2 kg, body height M=1.79, SD=0.05 m), who performed 2 months special training on SAGD in Polish Air Force Academy. Program

consisted of 20 training units. Each unit included 6 series of alternated quasi-static and dynamic exercises separated by relaxing exercises. Duration of each exercise session was 7 minutes, relaxing exercises - 5 minutes. +Gz tolerance level was determined on the centrifuge twice - before and after 2 months SAGD training according to gradual onset rate (GOR) of 0.1 G/s program. Assessed value was the time of run. Results were analyzed using paired Student's t test)
Results: GOR time increased from M=63, SD=75 s to M=69, SD=7 s. Differences are statistically significant.
Conclusions: The results suggest that special training with using SAGD could influence G-tolerance. Further studies are planned to evaluate impact of SAGD training on +Gz tolerance.

P 13

English: **ERGONOMICAL RESEARCH ON THE COLOR BREADTH OF PILOTS: OBSERVATION ON LIQUID CRYSTAL DISPLAY**

French:

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Objective: To experiment on pilots' memory span of color when observing the display, and according to the experimental data summarize the rules and characteristics of pilots' memorizing color, as well as the order of pilots' color sensitiveness.

Methods: PC-based programming experiments on pilots' memory span of color when observing liquid crystal display.

Results: The memorized colors per capita of the 58 pilots are 6, and the order of pilot's color sensitiveness in the Munsell color hue ring is red, yellowred, yellow, green, blue, blue-green, green-yellow, purple-blue, purple, redpurple.

Conclusion: The results show that pilots in the observation of liquid crystal displays in the black background can accept a maximum of six colors in the Munsell color hue ring with the color-sensitive order of red, yellow, orange, blue, green, purple.

P 14

English: **EJECTION EXPERIENCE 1990-2010, SERBIAN AIR FORCE**

French: **LA REVUE DES ÉJECTIONS ENTRE 1990 -2010 DANS L'ARMÉE DE L'AIR SERBE**

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Introduction: Ejection injuries are a problem for the Air Force. Present risk for injuries is still too high, approximately 30-50 %. This study is an effort to determine factors responsible and contributing for injuries in Serbian Air Force (SAF) in last two decades.

Methods: All ejection cases in (SAF) between 1990 and 2010 were analyzed. Collected data were: type of aircraft, generation of ejection seat, pilots' age, pilot experience, causes of ejection, aeronautical parameters, the condition of aircraft control and types of injuries. For ease of comparison, the U.S. Air Force safety regulation was used for definition of major injuries: hospitalization for 5 d or more, loss of consciousness for over 5 min, fracture of bone, dislocation of joint, injury to any internal organ, any third-degree burn, or second degree burn over 5% of body surface area.

Results: There have been 52 ejections (51 pilots and 1 mechanic) on 44 airplanes. Ages of ejected pilots range from 22 to 46 yr, average 32 yr. Major injuries were present in 25 (49%) pilots. Of all ejected pilots, 9.61% had fractures of thoracic spine, 11.53% fractures of legs, and 3.48% fractures of arms. Of all major injuries, fractures of thoracic spine were 38.46%.

Conclusion: Preventive measures must be promoted. MRI scan must be included in standard selection procedure and procedure after ejection. Physical conditioning has to raise. Training on ejection trainer has to be accomplished.

P 15

English: **REPEATABILITY OF ANTIGRAVITY MANEUVERS IN THE CENTRIFUGE TESTS: PRELIMINARY REPORT**

French: **REPRODUCTIBILITÉ DES MANOEUVRES ANTIGRAVITÉ DANS LES ESSAIS AU CENTRIFUGE. RAPPORT PRÉLIMINAIRE**

LH Kopka, EK Zawadzka-Bartczak

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Introduction: It is known that antigavity maneuvers increase acceleration tolerance by about +2 to +4 Gz, The protective benefits of the AGSM are only as great as the effectiveness of its performance. The study aimed at answering the following questions: 1) Is the technique of respiratory antigavity maneuvers (RAM) performed by experienced pilots at identical +Gz values during tests in the human centrifuge (GOR and ROR)? 2) Does training of antigavity maneuvers under stationary conditions exert an effect on breathing technique in the control centrifuge tests?

Methods: Five clinically healthy pilots of F-16 aircrafts were included into the study. The pilots aged between 31 and 39 (mean: 35.8 years). Tolerance of acceleration in the human centrifuge was determined prior to and after a 2-months training RAM in all pilots positioned as in armchair (supporting the back only). +Gz values at which the pilots started RAM, number of such maneuvers under the said +Gz values, mean duration of each maneuver and maximal tolerance of acceleration were determined.

Results. +Gz values at the start of RAM, frequency of its execution to the time of certain +Gz value achievement and duration of a single maneuver were not the same in both test in the centrifuge, i.e. prior to and after the training.

Conclusions: +Gz values at which pilots start to execute respiratory antigavity maneuvers are different. In case of identical +Gz values, frequency and mean duration of a single maneuver are not identical. Training RAM and prolonged tension of the lower limbs muscles under stationary conditions exerts an effect on the technique of these maneuvers and maximal tolerance of +Gz.

P 16

English: **SYNCOPE AS THE INAUGURAL MANIFESTATION OF AORTIC STENOSIS IN A 62 YEARSOLD CIVIL AVIATOR**

French: **UNE SYNCOPE COMME SYMPTÔME INITIAL D'UNE STÉNOSE AORTIQUE CHEZ UN PILOTE CIVIL ÂGÉ DE 72 ANS**

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Introduction: Up to one third of persons suffering syncope are improperly labeled as having epilepsy, an erroneous diagnosis that can bear severe implications. We report on a case of a civilian pilot in whom a diagnosis of aortic stenosis with syncope as inaugural symptom was mistaken for epilepsy.

Observation: A 62 years old professional pilot collapsed with a short period of unconsciousness, four minutes before taking off. Physical examination only noted Grade 2 High BP. 2D, TM and Doppler echocardiography revealed LVH, an aortic valve stenosis (Mean gradient = 30mmHg, valve area = 1.0 cm². The Doppler ultrasound of carotid arteries showed an atheromatous overload localized on the common proximal carotid without hemodynamically significant stenosis. Elevated total and LDL cholesterol, lipids, and uric acid levels were observed.

Discussion: In the workout of syncope, one should attempt to determine the underlying cause or mechanism. For several months this aviator was unduly and unsuccessfully given carbamazepine treatment. The syncope he suffered from could instead admit two explanations: a decreased cardiac output because of AS and atheromatous plates, localized on two sides of the common carotid proximal.

P 17

English: **EFFECTS OF CEREBRAL FATIGUE IN STRESS ON MEAN BLOOD VELOCITY AND ORTHOSTATIC TOLERANCE DURING CONSECUTIVE PERFORMANCE TASKS OF HIGH PERFORMANCE FIGHTER PILOTS**

French: **EFFETS DE FATIGUE CÉRÉBRALE DU STRESS SUR LA VÉLOCITÉ SANGUINE MOYENNE ET TOLÉRANCE ORTHOSTATIQUE LORS DE TÂCHES DE PERFORMANCE CONSÉCUTIFS EN PILOTES DE CHASSE DE HAUTE PERFORMANCE**

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Background: The decrement of orthostatic tolerance is associated with dysfunction of cardio-cerebral function. However, these dysfunctions can easily be induced by cerebral fatigue in stress and cause the decrement of cerebral mean blood velocity (Vm). It is hypothesized that there is a correlation between orthostatic tolerance and cerebral Vm. The objective was to provide the evidence and methods for identification of pilots cardiocerebral function.

Materials and methods: This was an observational comparative study conducted at the IAM, AF, Beijing, China. The subjects were 45 male pilots (average age 27.6±2.5 y/o, range 25-32years). Cerebral mean blood velocity(Vm) in the anterior cerebral artery (ACA), middle cerebral artery (MCA) and posterior cerebral artery (PCA) was tested in consecutive performance tasks during 5 h by transcranial Doppler ultrasonography. Cerebral fatigue in stress (CFS) induced by consecutive performance tasks was evaluated with Stanford sleepiness scales (SSS). The parameters of blood pressure (related to orthostatic tolerance), Vm, neurobehavioral ability index (NAI), EEG power index ² (PI²), heart rate variability (HRV) and scores of SSS were compared individually. The main outcome measures were 1) cognitive performance tests, 2) checking of orthostatic tolerance, 3) mean blood velocity (Vm), 4) subjective evaluation of Stanford Sleepiness Scales (SSS), and 5) examination of cardio-cerebral function (Neurobehavioral ability index(NAI).

Results: When performing consecutive performance tasks, Vm in the PCA declined significantly earlier than that in the ACA and MCA after the fourth hour (t=9.254, 11.918, Ptolerance and Vm in the ACA, MCA and PCA declined simultaneously (t=9.314, 11.654, 15.120, 20.545, Pproved by examination of PI², HRV, NAI and SSS.

Conclusions: In the last course of CFS, orthostatic tolerance and Vm in the ACA, MCA and PCA declined synchronously. PSS and poor orthostatic tolerance can easily be induced by CFS.

P 18

English: **FIBER-OPTIC SENSOR EMBEDDED INSIDE PILOT'S SEAT FOR CONTACTLESS MONITORING RESPIRATION AND CARDIAC ACTIVITY**

French: **CAPTEUR À FIBRE OPTIQUE EMBARQUÉ À L'INTÉRIEUR DE SIÈGE DU PILOTE POUR SURVEILLANCE SANS CONTACT RESPIRATOIRE ET CARDIAQUE**

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Introduction: The monitoring of the heart rate and breathing activity in pilots in the course of their work can provide valuable information on their psychophysiological condition. However, specialist equipment used in a hospital environment as well as generally available devices for home-care monitoring require physical connection with the monitored person. This can prove to be uncomfortable and affect the regular progress of work.

Methods: With the intention to meet the problems highlighted above, the authors have constructed a sensor that allows for monitoring the vibrations of human body evoked by living activities, i.e. breathing and cardiac rhythm, through the pilots suit without getting in contact with the skin. The measuring part of the device is a Bragg grating (FBG) inscribed into a singlemode optical fiber, and attached to the inside surface of a pneumatic cushion with epoxy adhesive. Deformations of the cushion, involving deformations of the FBG, are proportional to the vibrations of the body leaning on the cushion.

Results: A simple design of the sensor enables it to be easily implemented in pilots seats for monitoring the mental and physical condition of pilots. The laboratory experiments on the fiber-optic sensor attached to a flight simulator seat were carried out during simulator training on seven healthy persons of both sexes, aged 26 to 39 years, weighing 64 to

105 kg, and 176 to 190 cm tall. No significant differences in the quality of the received signal were observed in connection with the age, weight or height.

Conclusion: Laboratory studies have shown that adequate processing and analysis of the signals coming from the sensor allow for extracting information on breathing and cardiac rhythm. The sensor allows for obtaining dynamic strains on the sensing FBG in the range of 100-150 microstrain caused by breathing and approximately 10 microstrain (peak-to-peak) induced by heartbeat, which are fully measurable by today's interrogation systems.

P 19

English: **ASYMPTOMATIC AERONAUTICAL PERSONNEL REQUIRING PREVENTIVE MEASURES ACCORDING TO EUROPEAN SOCIETY OF CARDIOLOGY RECOMMENDATIONS (SCORE RISK)**

French: **PERSONNEL AÉRONAUTIQUE ASYMPTOMATIQUE NÉCESSITANT DES MESURES DE PRÉVENTION SELON LES RECOMMANDATIONS ESC (TABLE DES RISQUES)**

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Introduction: Cardiovascular diseases (CVD) will always be a major concern for aeronautical disposition and aircrew standards because CVD are a major health problem throughout the world and involve possible suddenly incapacitating presentations. The priority concern of European Society of Cardiology (ESC) resulted in publishing of the guidelines on CVD prevention, including risk charts (SCORE risk) permitting the evaluation of individual global CV risk on longterm.

Aim: To evaluate the proportion of asymptomatic aeronautical personnel meeting the ESC criteria for preventive measures, namely the risk of fatal CV death in 10 years (currently or extrapolated to age 55).

Methods: We studied 150 subjects randomly selected from aeronautical personnel presented at their periodical medical examinations. They were assessed for CV risk factors, comparatively with 100 subjects with the same age but no risk factors. Patients with established coronary artery disease were excluded. Using the risk charts for high-risk European populations provided by ESC, subjects were classified according to their risk, both currently and projected at age 55.

Results: Studied subjects were divided in 2 groups: below age 40 and over age 40. There was a male predominance in both groups. Smoking status was present in 36.7% and respectively 63.5% of subjects. Hypertension was noticed in 9.2%, and respectively 19% of subjects. Hypercholesterolemia was present in 17.2%, and respectively 38% of subjects. The percentages of subjects who should be targeted for preventive interventions according to ESC guidelines were significant in study group II: 2.1% for current risk e 5% and 26.9% for projected risk e 5% at age 55.

Conclusions: The percentage of asymptomatic aeronautical personnel whose current risk of fatal CVD in 10 years appeared to be low, with no subject under age 40 reaching the level e 5% and only 2.1% subjects over age 40.

However, assuming no change over time, more than 25% among subjects over age 40 would be at high risk by age 55.

P 20

English: **PROTECTION FOR MYOCARDIAL HYPOXIA - NEW PERSPECTIVES**

French: **PROTECTION CONTRE L'HYPOXIE DU MYOCARDE - NOUVELLES PERSPECTIVES**

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Introduction: The monograph is a bibliographical review of endogenous mechanisms for protecting the myocardium with an objective of also describing exogenous methods.

Methods: We retrospectively reviewed bibliographical records and compared these with new medical technology.

Results: First, we must differentiate between ischemic and hypoxic myocardium. Then there are consequences of oxygen deprivation, the provisioning of oxygen, the myocardial supply of energy, and the myocardial consequences to oxygen deprivation. The heart protection against ischemic/reperfusion damage is one of the most important goals of experimental and clinical research in cardiology. Adaptation for chronic hypoxia also increases the heart tolerance through all the main harmful consequences of the sharp deprivation of oxygen, including an infarct of the myocardium, contractile dysfunction and ventricular arrhythmias. Although many factors have been proposed, the detailed mechanism of this long term protection is unknown. Other mechanisms are being studied, including angiogenesis and cells trunk transplant. Finally, other pharmacological mechanisms are discussed that may increase the supply or reduce the demand for myocardium oxygen (being useful for ischemia) or that it alters the myocardium cellular metabolism (useful for ischemia and for hypoxia).

Conclusion: It is theoretically possible to decrease the effects of hypoxic hypoxia on the myocardium.

P 21

English: **NAUSEA FROM 3D DISPLAY: STEREOSCOPIC DISPLAYS FROM TACTICS TO PRACTICE**

French: **HAUT LE COEUR PROVOQUÉ PAR UTILISATION 3D: LA REPRÉSENTATION STÉRÉOSCOPIQUE DE LA TACTIQUE À LA PRATIQUE**

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Introduction: Stereoscopic displays have, since their creation in 1838, enlightened human imagination in goal of creating the ultimate virtual involvement. No wonder that military technology focuses on this subject and nowadays is followed closely by mainstream industry.

Methods: A literature review of the main medical problems associated with 3D displays, filtered through personal experience with spatial disorientation, NVG, flight simulators and commercial 3d devices.

Discussion: A brief introduction to the physiology of 3D viewing will be given. A history of stereoptical devices will be given, along with the problems that plagued them. Significant differences between optical (accommodation-vergence conflict, depth of focus), technological (resolution, refresh rates, flicker), and psychological problems (involvement, object consistencies) will be given, compared with common causes of visual induced motion sickness. Military experience with simulator sickness will be reviewed. A review of current commercially available technology types will

be given regarding medical aspects.

Conclusion: 3D displays are not bad for health per se, but will still create discomfort and this greatly limits their operational use.

P 22

English: **CONSIDERATIONS ON THE EFFECTS OF THE ELECTROMAGNETIC FIELD ON THE VESTIBULOCOCHLEAR SYSTEM OF AERONAUTICAL PERSONNEL**

French: **CONSIDÉRATIONS DES EFFETS DU CHAMP ELECTROMAGNÉTIQUE SUR LE SYSTÈME VESTIBULOCOCHLÉAIRE DU PERSONNEL AÉRONAUTIQUE**

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Introduction: The authors analyze the electromagnetic field's biological effects on the complex structures that comprise the vestibulocochlear system (the inner ear). This paper focuses on the aeronautical personnel who operate machines that function through producing and manipulating electromagnetic fields (pilots, air traffic controllers, flight engineers, from military and civilian field).

Method: The authors present the methods used to investigate the interaction between the electromagnetic field and the human biological tissue.

Results: This paper analyzes mainly the possible effects of the electromagnetic radiations on the cochleo-vestibular functions (the cochlear neurological chemistry), on the active mechanism of contraction of the outer hair cells and on the inner ear fluids that generate the endolymphatic potential (80mV). All of these effects can be produced because electromagnetic radiations cause an ischemia in the territory of labyrinthine artery, which is branch of inferior anterior cerebellar artery. Finally, we present some examples of clinical cases with cochleo-vestibular phenomena, cases that can be attributed to occupational exposure to electromagnetic radiations based on clinical and paraclinical investigations.

Conclusions: International data available so far are, unfortunately, insufficient to evaluate more precisely the level of exposure at electromagnetic radiations at which could appear the ischemic phenomenon inside labyrinthine artery territories, but certainly research should continue in order to improve the quality of life and working conditions for aeronautical staff as well as for other categories of personnel.

P 23

English: **COMPARATIVE STUDY OF DYNAMIC BALANCE IN FALLERS AND NON FALLERS USING DYNAMIC POSTUROGRAPHY**

French: **ÉTUDE COMPARATIVE DES TROUBLES D'ÉQUILIBRE EN UTILISANT LA POSTUROLOGIE DYNAMIQUE**

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Introduction: There is no equivalent examination to Static and Dynamic Posturography which complements the battery of tests already available to identify a fault in the equilibrium system. We investigated postural control in patients who presented with gradual onset chronic postural instability carrying a possible risk of falling.

Method: The objective of this study was to identify the best dynamic posturography parameters for separating fallers from non fallers.

Results: Our results confirm that deterioration of upright stance increases with age, particularly if the subject complains of instability. The translation test and the sinusoidal test are two tests that supply pertinent parameters for assessment of the subject's dynamic equilibrium performance, and in particular have a quantifiable index of the risk of falling.

Conclusions: Early detection of potential fallers followed by appropriate rehabilitation and recommendation about fall prevention should substantially reduce the burden related to falls while improving the quality of life. Subsequently, we will use the findings from this comparative study to develop a test protocol for evaluating the risk of falls in patients with chronic postural instability.

P 24

English: **HEARING AIDS HISTORY: FROM THE SHELL TO THE COCHLEAR IMPLANT**

French: **HISTOIRE DE L'AIDE AUDITIVE: DU COQUILLAGE À L'IMPLANT COCHLÉAIRE**

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Introduction: Since antiquity hearing loss is a common sensory impairment. It was always an important problem for human communication. Actually in the world there are seventy million people with hearing loss to varying degrees. According to the World Health Organization one child in every thousand is born deaf. Since antiquity man has searched to correct this deafness. Long ago, man tried to fly, but safe flight requires good hearing. Here we present the history of acoustic hearing aids.

Methods and results: We explore the different ways and steps of hearing correction through the ages: the hand, the shell, the ear trumpet, an analogic aids, the numeric aids, the middle ear implant and the cochlear implant. We study which aids are actually possible for pilots' use.

Conclusion: Since the year 2000 it is possible for a pilot with important hearing loss to use some of these modern means of correction with waiver. It is a new opportunity and progress for a pilot.

P 25

English: **TUBOMANOMETRY: NEW METHOD FOR ANALYSIS OF THE FUNCTIONAL STATUS OF THE EUSTACHIAN TUBE AMONG PILOTS**

French: **LA TUBOMANOMÉTRIE : NOUVELLE MÉTHODE POUR L'ANALYSE FONCTIONNELLE DE LA TROMPE DEUSTACHE CHEZ LES PILOTES**

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Introduction : Satisfactory tubal function is essential for flight. Functional study of the Eustachian tube is not simple to achieve in pilots examinations. Tympanometry is a static measure of middle ear pressure but gives no information on real tubal function. Tubomanometry is a new clinical exploration and objective method that measures the active transport of gas from the rhinopharynx to the tympanic cavity.

Method: We conducted 2 studies in 90 pilots (i.e., 180 ears) aged 16 to 66 years, Class 1 & 2 initial or renewal examination to study the reliability of this method. We compared different maneuvers to open the tube and their interpretation with this procedure.

Results: The different methods used to demonstrate reliability varies from 74 to 90% results objectifying the opening of the Eustachian tube. Best results are obtained with a method called „forced successive Valsalva” which will be explained.

Conclusions: In most cases, this procedure is able to demonstrate the opening of the fibro-cartilaginous Eustachian tube. It is non-invasive and easy to perform and provides dynamic images of the velum palatine function, gas circulation in the Eustachian tube and in the middle ear. This is a very interesting method that helps us in our exams but still needs to be improved to have best results and thus avoids the hypobaric chamber test.

P 26

English: **EEG SPECTRAL POWER ANALYSIS AS AN INDICATOR OF COGNITIVE PERFORMANCES IN CANDIDATES FOR MILITARY PILOTS**

French: **ANALYSE SPECTRALE DE PUISSANCE DE L’EEG COMME INDICATEUR DE PERFORMANCES COGNITIVES CHEZ LES CANDIDATS PILOTES MILITAIRES**

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Introduction: Several neuropsychological studies suggested a connection between the electrical activity of the brain (reflected by electroencephalogram) and some cognitive psychological traits. In our research we investigated if the results obtained with the psychological test correlate with EEG spectral power pattern.

Method: In our study we included 50 military pilots candidates at the Air Force Academy. We evaluated spontaneous electrical activity on the EEG by measuring the spectral power of theta, alpha and beta waves in the standardized 10-20 electrodes system. Then we correlated the EEG data with the results of psychological cognitive and multitasking dynamic tests. The two types of investigation (neurophysiological and psychological) were performed independently from one another.

Results: The analysis of the results suggests certain association pattern between spectral EEG power and performance in the psychological tests. The spectral power of alpha waves in the frontal and occipital derivations correlates with the number of resolved items, beta spectral power with the reaction time, while theta spectral power seems to be associated with the number of errors.

Conclusions: Spectral EEG analysis could be an important tool in the evaluation of operational abilities that are tested in the psychological examination for selection of the military pilots candidates.

P 27

English: **OUR EXPERIENCE IN AB-INITIO SELECTION AND TRAINING OF OPERATORS OF UNMANNED AERIAL VEHICLES**

French: **NOTRE EXPERIENSE DANS LA SELECTION INICIALE ET LA ¼DUCATION DES OPERATEURS DES « DRONES »**

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Introduction: Purpose of this report is to be presented our initial experience in the area of aeromedical and psychological selection and expertise of operators of unmanned aerial vehicles (UAV).

Methods: The applicated basic criteria for selection of candidates have been announced. In comparison with the pilots in cockpit we have used higher requirements to the 3-D-space perception, attention, 2-hand fine coordination and personal flexibility. The medical standards have been similar to them for air traffic controllers. Besides we have actively participated in the forming of crews for practical training. Simultaneously we have conducted a theoretical course of Human factor.

Results: The outcomes from the initial aeromedical and psychological selection have been presented. The program of the conducted course of Human factor has presented as well. Because of lack of preliminary aviation experience the majority of the students faced difficulties in their training.

Conclusions: 1. The applicated by us medical and psychological standards have been suitable and even can be used for each operator speciality in the ab-initio selection. 2. The lack of preliminary aviation experience and of earlier motivation is a serious obstacle for the professional training of operators of UAV.

P 28

English: **TESTING FOR ALCOHOL AND OTHER PSYCHOACTIVE SUBSTANCES IN AIRCRAFT PILOTS**

French: **CONSOMMATION D’ALCOOL ET D’AUTRES SUBSTANCES PSYCHOACTIVES CHEZ LES PILOTES D’AVION**

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Introduction: Harmful alcohol consumption represents a significant problem for public healthcare and for the society. In Slovenia, more than 20% of adult men engage in risky alcohol consumption, while approximately 10 to 15% exhibit a syndrome of alcohol dependence. Alcohol weakens all human functions necessary to operate an aircraft: it decreases

judgement, alters the mood, increases confidence, and impairs the ability of quick assessment and reaction. The reaction time increases for visual, acoustic and tactile stimuli.

Methods: The Centre of Aviation Medicine carries out preventive physical examinations of aviators, including testing for alcohol and other psychoactive substances. Pursuant to OPS 1.085(d)(1)/FLT 1.5.8, we also test for drugs in blood and urine. As we were interested in aviators attitudes to alcohol consumption, we carried out a survey using the AUDIT questionnaire.

Results: The 100 surveyed pilots were in average 42.6 years old and had been employed in aviation for 14.5 years. 91% reported occasional consumption of alcohol. 25% responded avoiding alcohol 12 hours before their flight. 44% consumed up to 2 units of alcohol in one sitting, while 17% tended to drink from 1 or 3 units. 17% consumed alcohol once a month, 65% two to four times monthly, 48% consumed 2 units per week, 23% consumed 1 unit per week, and 21% 3 units per week.

Conclusion: The pilots we surveyed exhibited appropriate awareness regarding alcohol consumption and were found not to consume alcohol on the day of their flight or, at the least, in the 12 hours preceding it. Every physical examination we carry out includes testing for alcohol and/or other psychoactive substances, and we have not encountered a case of abuse in the past 10 years. Regular educational activities and rigorous testing procedures enable us to achieve a high degree of awareness and safety.

P 29

English: **DECISION-MAKING DIFFICULTIES IN OPHTHALMOLOGY: NORMAL, OCULAR HYPERTENSION (OHT) OR GLAUCOMA?**

French: **LES DIFFICULTÉS DÉCISIONNELLES DE L'EXPERTISE D'OPHTALMOLOGIQUE: NORMAL, HYPERTENSION OCULAIRE (HTO) OU GLAUCOME?**

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Introduction: Intraocular pressure (IOP) represents a balance between intraocular fluid pressure and elasticity of eye wall, being until recently the main parameter used to diagnose and monitor the progression of glaucoma. Ocular hypertension (OHT) represents a raised IOP without glaucomatous optic disc changes or visual field defects. In Europe, OHT is affecting approximately 5% of the population above 40 years old and in USA 7%. The statistics show that 1 in 10 individuals will develop glaucomatous changes in the next five years. Making the decision of aptitude for waiver in such cases can be difficult, as well as implementing and extending the therapy for OHT. It is very important to understand the mechanism of action of risk factors for progression of OHT into glaucoma or the progression of glaucoma once diagnosed.

Methods: The authors make a retrospective analysis of 4 cases: military personnel, waiver and non-waiver, focusing on the need for special investigations (gonioscopy, computerized perimetry, pachimetry, optic coherence tomography) and individual decision making for every patient, taking into consideration the specific medical requirements.

Conclusions: 1. The most useful parameters in evaluating the risk of conversion of OHT into glaucoma are: high IOP, high cup-disc ratio, central corneal thickness. Measurement of central cornea has to become a standard for patients at risk. 2. Patients with low risk conversion profile do not need any treatment. Monitoring for evidence of progression is reasonable if the patient can be well observed and there is access to a nerve fiber layer analysis (HRT). 3. Patients with moderate and high conversion risk need to receive immediate treatment, without waiting for disease progression.

P 30

English: **A ONE YEAR LONGITUDINAL STUDY OF THE DUAL TASK ABILITY OF 60 YEAR OLD CHINESE CIVIL AIRLINE PILOTS**

French: **UNE ÉTUDE LONGITUDINALE D'UN AN SUR LA CAPACITÉ À FAIRE DOUBLE TÂCHE CHEZ LES PILOTES DE LIGNE CHINOIS DE 60 ANS**

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Introduction: It is known that cognitive assessment is important to pilots, but there are few studies that have examined the age-related decline in dual task of 60-aged civil airline pilots, especially from a longitudinal perspective. In the current study, we examined the status of dual task ability and their follow up results after one year in order to investigate the dynamic changes of cognitive function in a group of above 60-aged civil airline pilots in China.

Methods: Fifty-two 60-aged airline pilots were tested using computers, including mental arithmetic of 4-figure consecutive addition and computer simulated flying attitude control tasks, and a dual task which was composed of the above two tasks. To explore the age effect, we compared these 60-aged pilots group with three other age groups of airline pilots: 30-39 age group (N=45), 40-49 age group (N= 57) and 50-59 age group (N=45). Furthermore, twentyfour 60-aged pilots have been tested after one year in order to observe their dynamic changes using T test analysis.

Results: There were significant age group effects in every task index (PDunnet t-t analysis, we found that 60-aged airline pilots only have a significant difference with 30-39 age group (Pdifference with 51-60 age group (P>0.05) and 41-50 age group (P>0.05). It meant that the pilots above 60-aged do not have any decay compared with the pilot group above 40 age. The longitudinal results showed no significant decline in dual task indices after one year (P>0.05).

Conclusion: Age group comparison and longitudinal findings support the results that there are no significant differences between 60-age pilots and before 60-age group. Additionally, it gave evidence for retirement policy about airline pilots.

P 31

English: **SEAT VIBRATION IN MILITARY HELICOPTERS IN SERVICE WITH CYPRUS AIR FORCE: CHARACTERIZATION, AND EXPOSURE ASSESSMENT**

French: **VIBRATION DES SIEGES DES HÉLICOPTÈRES EN SERVICE DANS L'ARMÉE DE L'AIR DE**

CHYPRE: CARACTÉRISATION ET ÉVALUATION D' EXPOSITION

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Introduction: There have been increasing reports of annoyance, fatigue, and even back pain during the operation of military helicopters, where persistent multi-axis vibration occurs. This study characterizes and assesses the vibration transmitted to the pilot and co-pilot on board these aircraft, emphasizing the higher frequency components associated with RF and BPF.

Methods: Multi-axis accelerations were measured at the occupied seating surfaces onboard the three different types of helicopters in service with Cyprus Air Force (Gazelle SA-342, Bell-206, and Mi-35). The effects of the vibration were assessed in accordance with current international guidelines (ISO 2631-1:1997).

Results: The three types of helicopters had quite different vibration characteristics in terms of frequency profile. Vibration exposure was above perception threshold for all three types of helicopters, slightly uncomfortable for SA-342 and Bell-206 pilots and co-pilots and quite uncomfortable for their Mi-35 counterparts. The Mi-35 PO seems to be worse affected. Exposure A(8) in all cases was below the warning level for risk to health, but in the case of Mi-35 VDV was above warning level. In general Mi-35 seems most stressful in terms of vibrations followed by Bell-206.

Conclusions: Although the individual contribution of vibration exposure may not be very high, it is additive to that of simultaneous exposure to prolonged sitting in awkward postures as is the case in helicopter pilots. Psychophysical metrics could provide a tool for optimizing mitigation strategies, but the current international vibration standard may not provide optimum assessment methods for evaluating higher frequency operational exposures.

P 32

English: **EFFECT OF FOOT BOARD SUPPORT & DURATION ON REGULARITY STATISTIC & FRACTAL HEART RATE VARIABILITY (HRV) DURING PASSIVE HEAD UP TILT**

French: **L'EFFET D'UN APPUI-PIED ET SA DURÉE D'UTILISATION SUR LA RÉGULARITÉ STATISTIQUE ET LA NATURE FRACTALE DE LA VARIABILITÉ DE LA FRÉQUENCE CARDIAQUE DURANT L'INCLINAISON PASSIVE AVEC TÊTE ÉLEVÉE**

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Introduction: In view of reported association of regularity and nonlinear HRV indices with novel physiological modulators [Merati et al. IEEE Trans Biomed Eng. 2006; 53: 43-52] and ability of fractal exponent to differentiate those susceptible to Postural Orthostatic Tachycardia amongst cases of Chronic Fatigue Syndrome (CFS) [Yamamoto et al. Exp Biol Med (Maywood), 2003; 228: 167-74], the present study examined the effect of footboard support on regularity statistic and fractal HRV indices during initial 20 minutes & subsequent 25 minutes of orthostatic stress simulated as passive head up tilt (HUT), using two widely accepted support devices (footboard support and saddle suspension). It was to address to the issue of ideal duration of and support during HUT.

Methods: Sample Entropy (SampEn), spectral exponents ² derived from linear regression of log (Power) on log (frequency) of HRV spectra and \pm from Detrended Fluctuation Analysis (DFA) were calculated in 13 healthy humans (ages- 22-37 yrs) during 45 minutes of HUT with the two support devices. The results were analyzed using two way ANOVA with Least Significant Difference (LSD) test for individual comparisons.

Results: Both SampEn and spectral exponents (measured as ² or \pm 1DFA) changed significantly (main effect of tilt, $F=22.50$; $p=2.14E-07$ for SampEn, $F=43.23$; $p=5.47E-08$ for ² and $F=76.65$; $p=2.16E-11$ for \pm 1DFA) during tilted posture. Changes were comparable in the first 20 minutes and subsequent 25 minutes ($p=0.217$, 0.738 & 0.217 for SampEn, ² & \pm 1DFA, respectively). Availability of foot board support did not have any effect on these changes (interaction effects- $F=0.34$; $p=0.794$ for SampEn, $F=1.09$; $p=0.368$ for ² and $F=1.90$; $p=0.150$ for DFA \pm 1). There was no change in \pm 2DFA.

Conclusion: The availability of a footboard support and/or duration of tilt results into comparable perturbations in regularity and fractality of heart rate dynamics.

P 33

English: **MEDICAL RELEVANCE OF THE REACTIVE CHANGES THAT OCCURRED IN FLYING PERSONNEL'S PERIPHERAL BLOOD SMEARS (PBS)**

French: **PERTINENCE MÉDICALE DES CHANGEMENTS RÉACTIFS SURVENUS DANS LES FROTTIS DE SANG PÉRIPHÉRIQUE DU PERSONNEL AÉRONAUTIQUE**

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Objective: We started a large clinical and paraclinical prospective study in January 2010 in NIASM in order to establish the professional adaptive changes which may occur on flying personnel. This research represents the next step in a previous laboratory research which we developed in NIASM between 1994 and 2003.

Material and method: There were studied at the microscope about 2000 PBS of flying personnel which attended the periodical medical expertise during 2010. We noticed that around 58% of them presented various types of reactive changes.

Results: Automatic hematology analyzer showed normal or minimal abnormal results from our subjects (moderate increase of eosinophils, neutrophils and monocytes). Still we observed the following changes when we studied BS: 1) moderate eosinophilia - in H 25% of cases; 2) moderate basophilia - in H 39% of cases; 3) changes of the neutrophils - in H 11% of cases (including neutrophils with over segmented nucleus and non-segmented neutrophils); 4) changes of the lymphocytes in H 63% of cases; these changes were the presence of reactive lymphocytes, lympho - plasma cells; LGL („large granular lymphocytes"); 5) moderate monocytosis; 6) neutrophils with apoptotic nucleus in H18% of cases. In some cases we noticed that erythrocytes (19%) and thrombocytes (31%) had associated morphological

changes. It has been studied a witness group of 366 PBS, obtained from non-flying personnel. In 256 (69.94%) cases from these PBS there have been noticed different changes.

Conclusion: This paper presents laboratory results focused on hematological morphology. They justify the study of some significant clinical and paraclinical (hematological and biochemical) changes - with possible high significance - in flying personnel which is subject to the medical expertise in NIASM.

P 34

English: **THE PREVALENCE OF DIFFERENT ETIOPATHOGENIC BACTERIA ISOLATED FROM CONJUNCTIVAE SECRETIONS - EPIDEMIOLOGICAL ASPECTS REGARDING AERONAUTICAL PERSONNEL**

French: **LA PRÉVALENCE DES DIFFÉRENTES BACTÉRIES ÉTIOPATHOGÉNIQUES ISOLÉES DANS LES SÉCRÉTIONS CONJONCTIVALES - ASPECTS ÉPIDÉMIOLOGIQUES CONCERNANT LE PERSONNEL AÉRONAUTIQUE**

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Objective: Ocular infections represent a frequent cause of a bacteriological exam, especially those that are conjunctivae infections, with different clinical manifestations such as various secretions. The purpose of this paper is to study the pathogenic agents which are implicated in their aetiology.

Material and method: In the microbiology department of the Clinical Laboratory from INMAS, 254 conjunctivae secretions were performed during 2009 - 2010. 172 of these were positive for infections with various microorganisms, which represents 67.72% of the total conjunctivae secretions.

Results: From the 176 isolated germs, 162 were Gram positive and 14 were Gram negative. The Gram positive agents were: Staphylococcus haemolyticus (25%), Staphylococcus epidermidis (47%) and Staphylococcus aureus (11%) and less of other coagulase negative staphylococci and Streptococcus pneumoniae. Gram negative microbiological agents, fewer in number, were represented by: Haemophilus spp. 11 strains, Pseudomonas, Morganella, Klebsiella oxytoca.

Conclusions: The most frequent cause of conjunctivae infections is represented by staphylococci (90% from the total detected etiological agents), followed at some distance by Gram-negative germs, streptococci, etc. This prevalence is important in order to establish the epidemiological aspects of these infections among aeronautical personnel.

P 35

English: **AGE DIFFERENCES IN BODY COMPOSITION OF CHINESE CIVIL AIRLINE PILOTS**

French: **DIFFÉRENCES D'ÂGE DANS LA COMPOSITION CORPORELLE DES PILOTS CIVILE CHINOIS**

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Introduction: Obesity is one of the greatest challenges facing global health experts today. Body composition is an important index related to obesity. But there are few studies to examine the age difference of body composition, especially in civil airline pilots. The purpose of the current study was to identify age differences in body composition in civil airline pilots in China.

Methods: 115 Chinese civil airline pilots aged 28-63 were participants in the current study. These pilots were divided into four age groups: 20-29 age group (N=245), 30-39 age group (N=176), 40-49 age group (N=153) and 50-59 age group (N=16). Whole-body and segmental body composition were measured using an 8-contact electrode bioimpedance analysis (BIA) system. The indexes included Fatfree Mass (FFM), Whole-body fat mass (FM), trunk fat mass", arm fat mass (ArmFM), leg fat mass (LegFM).

Results: There were no age differences in FFM, but there were significant age group effects in whole-body composition: The 20-29 age group is significantly less heavy than other older groups and the 50-59 age group is heavier than other younger group, respectively 12.83kg, 14.78kg, 15.72kg and 17.20kg. After further analysis, we did not find any age differences in the index of ArmFM and LegFM, but there are significant differences in the trunk fat mass.

Conclusion: Age group comparison in the population of Chinese civil airline pilots showed the results that there are no age differences in the indexes of fat-free mass but there are age differences in the whole-body fat mass. Furthermore, the fat mass difference just occurred in the indexes of trunk fat mass, which reflect that the abdominal fat is the big problem of obesity in pilots. The current study also gave evidence that we should examine the pilots body composition in health.

P 36

English: **THE RISK OF DEVELOPING OSTEOPOROSIS IN AERONAUTICAL PERSONNEL**

French: **LE RISQUE D'APPARITION DE L'OSTÉOPOROSE CHEZ LE PERSONNEL NAVIGANT**

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Introduction: The World Health Organization has defined osteoporosis as one of the most common diseases in modern times. According to statistics, the incidence rates of osteoporosis continue to increase, and consequently, this affects the patients' health, leading to a high rate of mortality and huge costs associated to the medical treatment for the prevention of related complications during a long inactive period. Ever since the beginning of space flights, it has been observed that during space missions, due to imponderability, astronauts have experienced physical changes in muscular and bone development, such as strong muscular atrophy and rapid occurrence of osteoporosis. As such, medical researchers have become interested in studying the mechanism behind the production of these disorders in order to take the necessary steps to prevent harmful consequences.

Methods: The present study represents an analytical, experimental, and prospective approach to the case of osteoporosis and it is directed at both the military and the civil aeronautical personnel. I intend to examine a database of

50 aeronautical members according to their age, sex, flight category (pilots flying modern supersonic aircraft, helicopters, long courier aircrafts as well as flight attendants) and a database of 50 non-aeronautical individuals.

Results: The present study is currently underway, but the experimental results clearly confirm the initial hypothesis: long-haul flights lead to a decrease in bone density.

Conclusion: As a consequence of these results, we need to determine some methods for the investigation of the aeronautical personnel and identify those modifications which occur in osteoporosis in its early hours. I consider it very important to put into effect a helpful therapeutic programme for the treatment of those already affected by osteoporosis. I intend to set up some training programmes for the aeronautical personnel with a view to preventing the occurrence of osteoporosis.

P 37

English: **THE EFFECT OF SELECTIVE COOLING ON SUBJECTIVE PERCEPTION OF PSYCHOPHYSICAL CONDITION IN HOT CONDITIONS**

French: **L'EFFET DU REFROIDISSEMENT SÉLECTIF SUR LA PERCEPTION SUBJECTIVE DE LA CONDITION PSYCHOPHYSIQUE DANS DES CONDITIONS CHAUDES**

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Introduction: The aim of the study was to determine the extent to which selective cooling of a limited body area modifies the subjective sensation of heat (thermal comfort) and the subjective assessment of physical exertion.

Methods: The study enrolled 12 men (23 ± 2 yrs, BMI- $25\pm 1,5$) who were not-heatacclimated. The subjects were dressed in a summer battledress. The course of the study included: 30min adaptation to the thermoneutral conditions ($T_a=21\pm 1^\circ$ C, RH= $30\pm 1\%$) and then 90min exposure to the impact of combined temperature (climatic chamber: $T_a=40\pm 1^\circ$ C, RH= $30\pm 1\%$) and physical exercise conditions (cycloergometer, 30% VO_{2max} - three 20min repetitions alternating with 5 min rest). During this 90min exposure the subjects expressed their subjective opinions about: 1) the state of thermal comfort in relation to the whole body based on a 7-point Bedford Scale and 2) the exertion based on the Borg Test. The test was repeated twice: on the first day without cooling (control); on the second day with the use of the cooling cushion (nape area of 180cm², propylene glycol at a temperature of 16-17°C). Physiological indicators were monitored during the entire test: heart rate (HR); systolic and diastolic blood pressure (SBP, DBP); body temperature (T_c), total sweat loss was determined based on body weight measurement.

Results: Compared to control conditions the use of the cooling cushion improved both the subjective assessment of thermal comfort (in relation to the entire body) and subjective perception of exertion (cooling lowered HR by 7 ± 2 beats/min (psignificant differences in body temperature were not observed. In control conditions the total loss of sweat amounted to 0.91 ± 0.12 kg on average. Similar values were recorded during cooling: $0.78\pm 0,23$ kg (NS) on average.

Conclusions: Cooling of a small nape area (180 cm²) applied under thermal load has a beneficial effect on perception of thermal comfort and exertion level.

P 38

English: **RESPIRATORY SYSTEM DISEASES ENCOUNTERED IN MILITARY PILOTS AND THEIR EFFECTS ON FLYING STATUS**

French: **MALADIES DU SYSTÈME RESPIRATOIRE RETROUVÉES CHEZ LES PILOTES MILITAIRES ET LEURS EFFETS SUR L'APTITUDE AU VOL**

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Introduction: Respiratory system healthiness is essential for aviation because of the risky conditions due to high altitude, low atmospheric pressure and flight dynamics. The body tolerance against these conditions decreases when a respiratory disease accompanies and some risks appear in terms of flight safety. In this study, respiratory disease rates of military pilots were evaluated.

Materials and methods: We have evaluated 1033 military pilot records who applied for five yearly aircrew periodic medical examinations. Within these examinations some diagnostic methods like respiratory function tests are used in order to diagnose respiratory diseases. We have reviewed the records of 2007-2009 years period.

Results: Twenty-two (2.12%) out of 1033 pilots had respiratory system diseases. These were calcified sequel in lung (n=4), blunting of costodiaphragmatic angle (n=3), COPD (n=2), lung nodule (n=2), small airways obstruction (n=2), tuberculosis pleurisy (n=2), pleural thickening (n=1), pleural calcification (n=1), bronchial asthma (n=1), bronchiectasis (n=1), spastic bronchitis (n=1), apical emphysema (n=1). 7 of these 22 pilots had been disqualified from flying for COPD, tuberculosis pleurisy, bronchial asthma, bronchiectasis and apical emphysema. During this period totally 74 pilots had been disqualified from flying and 9.45% (n:7) of them had respiratory system diseases.

Conclusion: Respiratory system diseases make up about 9.45% of all disqualification reasons from flying of military pilots. Because of the aviation's environmental challenges like hypoxia, pulmonary barotrauma, acceleration atelectasis and incapacitation, pilots require respiratory system fitness. Also periodic medical examinations are essential to ensure maintenance of aircrew health and fitness for aviation duties.

P 39

English: **HEALTH - RELATED QUALITY OF LIFE IN AERONAUTICAL PERSONNEL WITH GASTROESOPHAGEAL REFLUX DESEASE**

French: **LA QUALITÉ DE VIE ASSOCIÉE À LA SANTÉ DU PERSONNEL NAVIGANT AYANT DU REFLUX GASTRO-OESOPHAGIEN**

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Introduction: Frequent and severe symptoms such as heartburn diminish health-related quality of life (HRQL) in aeronautical personnel with GERD. The pathogenesis of GERD seems to be multifactorial. We therefore performed a survey of primary care (internal medicine, gastroenterologist, histologist) to study the reported use and impact of studies and medical therapy for GERD. Effective treatment is necessary to resolve symptoms.

Objectives: To assess 1) the prevalence of typical GERD symptoms (GS) in aeronautical personnel; 2) the risk factors of GERD—the effects of body mass index (BMI), age, gender, food, stress, alcohol on the pathogenesis of erosive esophagitis; 3) the impact of GS on daily activities and whether overall HRQL of patients treated for heartburn differed by the severity of symptoms experienced at the start of treatment.

Methods: Research took place for 3 years (May 2008 - May 2011) and included 164 patients with heartburn more than 4 times per week for 3 months, or intake of antisecretory drugs. All patients were offered an endoscopy in order to verify the erosive esophagitis and biopsy in suspicious patients with Barrett esophagus. Heartburn severity levels were stratified as None/Minor, Mild, Moderate or Severe (GSRS). Complete resolution of heartburn was achieved when no episodes of heartburn occurred during the 7-14 days prior to follow up visit.

Results: GERD symptoms turned out to have a substantial negative impact on the daily activity and quality of life: the avoidance of certain food, sport and other activities, the disturbance of work or sleep. The lower HRQL was particularly evident in patients with severe heartburn. The patients were treated with antacid drugs-IPP for 4 to 8 weeks and prokinetics drugs combined with diet.

Conclusions: Clinically important nocturnal symptoms either alone or in combination with daytime symptoms are commonly experienced in a large number of aeronautical personnel with heartburn. Physicians should be prepared to describe heartburn to their patients, to confirm the diagnosis of GERD rather than use the term as it is.

P 40

English: **THE POTENTIAL EFFECTS OF TOXICOGENOMICS AND EPIGENETICS UPON AEROSPACE MEDICINE**

French: **LES EFFETS POTENTIELS DE LA TOXICOGÉNOMIQUE ET ÉPIGÉNÉTIQUE SUR LA MÉDECINE AÉROSPATIALE**

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Introduction: Toxicogenomics is the study of how toxic substances in the environment interact with human gene loci to produce variable effects, how these effects are modulated, and why they produce variable results in different individuals. Epigenetics is a sub category of Toxicogenomics dealing with the effect of the environment on the transcriptional activity of specific genes, at specific points in time, in specific organs. The ability to identify certain gene loci and their epigenetic modifications can help to predict human disease risk, as well as those who are at increased risk of adverse effects from certain toxic exposures.

Methods: A Review of several studies and their results in these areas was conducted including Toll-Like receptors, Environmental lung disease, Organophosphate exposure effects, mitochondrial role in inflammatory response, and the genetic modulation of hydrocarbon neurotoxicity.

Results: Toll-like receptors have been identified which are involved in Asthma, Coronary artery disease, inflammatory bowel disease SLE, and more. DNA/RNA expression is modified in those suffering from COPD and some forms of asthma; reversing some of these changes can improve Asthma in laboratory animals. Damage associated molecular proteins have been identified in mitochondria which exhibit considerable polymorphism resulting in variable responses to trauma and toxic exposure across the human population.

Conclusions: 1) It is becoming increasingly possible to identify individuals at risk for disease and adverse response to environmental exposures. 2) This knowledge can be used to prevent, mitigate, and possibly cure some diseases/injuries. 3) This knowledge may also be used to identify individuals at greater risk of adverse events, to limit potential flight mishaps and employer liabilities (including health insurance costs). 4) This knowledge can provide an opportunity to improve the health of individuals but can result in economic and career limitations, and even health insurance restrictions, paradoxically leading to poorer health.

P 41

English: **AN UNDERESTIMATED DISEASE GROUP IN AVIATION MEDICINE: HEPATOBILIARY PATHOLOGIES AND ABNORMALITIES DIAGNOSED BY ULTRASONOGRAPHY AMONG TURKISH MILITARY AIRCREW**

French: **UN GROUPE DE MALADIES SOUS-ESTIMÉ EN MÉDECINE D'AVIATION: PATHOLOGIES ET ANOMALIES HÉPATOBLIAIRES DIAGNOSTIQUÉES PAR ÉCHOGRAPHIE CHEZ LE PERSONNEL NAVIGANT MILITAIRE TURQUE**

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Introduction: We aimed to make a descriptive study of hepatobiliary pathologies and abnormalities (fatty liver, hepatomegaly, solid and cystic liver pathologies, cholelithiasis, gallbladder polyps, postoperative absent of gallbladder, hemangioma) among military aircrew and make aware those who are involved with the aeromedical disposition of aircrew.

Materials and method: Ultrasonographic findings of military aircrew who came to periodic medical examinations between May 2007 and December 2010 were assessed.

Results: The study group included 8358 aircrew; 1561 (18.68%) had grade I-III fatty liver, 34 (0.41%) had liver cyst, 340 (4.1%) hepatomegaly (mostly secondary to fatty liver), 76 (0.91%) hemangioma, 71 (0.85%) had cholelithiasis, 149 (1.68%) had gallbladder polyps and 55 (0.66%) had cholecystectomy.

Conclusion: None of the aircrew with these diseases were permanently grounded from flight duties. We suggest that

there is a need to discuss and review the required health standards for aircrew, related to hepatobiliary diseases which are underestimated despite its associations with severe illnesses (obesity, insulin resistance etc) and syndromes (metabolic syndrome).

P 42

English: **ANTITHROMBOTIC TREATMENT AND THE DIGESTIVE RISKS - ROUTINE OR PRIORITY?**

French: **LE TRAITEMENT ANTITHROMBOTIQUE ET LES RISQUES DIGESTIFS - ROUTINE OU PRIORITÉ?**

R Ionescu

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Antithrombotic therapy with aspirin and / or clopidogrel is used to prevent and treat cardiovascular disease, cerebrovascular and peripheral vascular disease. Because of the increased spread of these diseases, but also, the development of coronary interventional techniques, thrombolytic therapy, single or dual, is frequently recommended by doctors.

Aspirin is the mainstay drug for the treatment of the patients with cardiovascular disease and ischemic attack, however, even low doses of aspirin increase the risk of digestive bleeding, especially in patients with dyspeptic history; endoscopic studies have shown that aspirin doses of 70-300 mg/day, used in the treatment of occlusive vascular diseases, induce changes in gastrointestinal mucosal such as petechiae, erosions and ulcers in over 50% of patients at 1 month of treatment; these lesions most often are silent and may even disappear with continuing antithrombotic treatment; gastrointestinal bleeding is the most important secondary effect, especially in elderly patients with associated pathology; current strategies to reduce the risk of digestive bleeding include the use of mucosa protectors and eliminating risk factors - for example, *Helicobacter pylori*.

The challenge today is related to the design of protective gastrointestinal therapeutic protocols in these patients. Studies have found that the presence of cardiovascular disease is an independent risk factor for gastrointestinal bleeding in patients treated with non-steroidal anti-inflammatory drugs (NSAIDs). Also, aspirin may increase the risk of gastrointestinal bleeding in patients who are treated with specific inhibitors of COX - 2. The large number of patients treated with antithrombotic agents and the large number of digestive risks require a specific protocol in the management of these patients. Exploration of the history and gastrointestinal tract in patients at risk, and personalized treatment with gastric protection reduces adverse gastrointestinal events.

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English: **INSULIN-DEPENDENT DIABETES MELLITUS IN CABIN CREW**

French: **DIABÈTE INSULINO-DÉPENDANT CHEZ L'ÉQUIPAGE DE CABINE**

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Introduction: In July 2008 EUOPS 1.995 has taken effect in the Netherlands. Annex III, subpart O concerns cabin crew. This part includes requirements about medical fitness. Every cabin crew member is obligated to undergo a medical assessment at regular times. The following medical requirements are applicable for each cabin crew member (AMC.OPS 1.995 (a) 2): good health, free from any physical or mental illness which might lead to incapacitation or inability to perform cabin crew duties, normal cardiorespiratory function, normal central nervous system, adequate visual acuity, 6/9 with or without glasses, adequate hearing and normal function of ear, nose and throat. The Dutch Civil Aviation Authority advised KLM to apply ICAO, class 2 medical standards.

Methods: In 2009 the Aeromedical Institute has conducted medical assessments for 7000 KLM cabin crew members. The assessment is based on a confidential questionnaire with 45 questions. After approval every cabin crew member receives a new due date, five years later. In certain medical conditions the cabin crew member will be examined by the AME or the occupational physician or other specialists are consulted. If a cabin crew member is ineligible he or she will be informed as well as KLM. After that they can appeal on a committee of independent medical experts.

Results: About 7 cases were initially judged as unfit caused by insulindependent diabetes mellitus. They all appealed and were returned to flight status after assessing their individual medical data.

The following conditions were set by the committee of appeal: 1) monitoring of blood glucose before and during flight, 2) fast-working sugars are to be present during flight, 3) any irregularity should be mentioned, 4) hypoglycaemia should be reported, and 5) every year a medical assessment is made on the base.

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English: **AIR TRANSPORTATION OF THE ILL AND INJURED - CLINICAL CONSIDERATIONS**

French: **TRANSPORT AÉRIEN DES MALADES ET DES BLESSÉS - CONSIDÉRATIONS CLINIQUES**

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Introduction: Understanding of the physical, physiological and psychological constraints imposed by travel and flight environment will allow anticipation and prevention of problems that may otherwise occur during the transfer. Medical transportation via air ambulance should be reserved for selected and specific patients to whom, preflight evaluation and clinical findings should be able to reveal vulnerable situations and offer the basis for the most appropriate preventive attitude.

Clinical considerations refer to specific evaluating methods applied to patients that are to be air transported, in order to deliver the most adequate care during the flight.

Discussion: The decision to evacuate any patient by air must be made with the best interest of the patient in mind. A clear understanding of the stresses of flight is essential and every effort must be made to minimize the clinical workload for the inflight medical teams. Preflight evaluation must be thoroughly adapted to each case and any possible medical problem should be identified early, so that adequate supervision and appropriate treatment can be given prior to, or

during, the journey.

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English: **THE SICK BAY OF THE MODERN JETLINER: WHERE ARE WE?**

French: **L'INFIRMERIE DE L'AVION COMMERCIAL MODERNE; OU EN SOMMES NOUS ?**

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Background: When a medical emergency takes place during passenger flights modern airliners lack a place where to treat the sick person, the main limitation being the financial impact of not using that space for revenue generating seats. What can be done about this situation at this point and what are the prevailing trends in the current industrial environment?

The problem in context: Physicians called to help in flight and passengers alike are clamoring for better conditions to address medical care on board. The industry is slowly beginning to respond but to date the modern airliner lacks a sick bay area where to provide medical care and interventions. At the same time the number of passengers is constantly increasing and so are the medical emergencies.

What we have now: Sick bay units can be assembled and are fully equipped for the transportation of sick passengers but they have to be ordered in advance. For many decades some companies provide stretchers and ancillary services to disabled customers but they also have to be ordered in advance. We do not have a section in the plane where a treatment setting can be improvised.

What may be coming: A designated space thus far unused in some new models Where a stretcher can be deployed and a new stretcher that can be stored and deployed on demand that can be installed anywhere in the aircraft.

Conclusion: Medical care on board is hampered by the absence of a space where the doctor can work with the patient; the present situation is primitive and cumbersome to conduct meaningful medical help. We may now be at the beginning of a trend towards improvement of the situation without sacrificing significant revenue.