

58th International Congress of Aviation and Space Medicine – 7th Asia Pacific Congress of Aerospace Medicine 10-14 October 2010

ANDRÉ ALLARD LECTURE

TO BE THE BEST: STRIVING FOR EXCELLENCE IN AVIATION

ÊTRE LE MEILLEUR: RECHERCHE DE L'EXCELLENCE EN AVIATION

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Healthcare is burdensome to many nations. Safety and Sustainability are key issues. Medical practice has much to learn from aviation in terms of safety. Some 40 years after aviation became safe, medicine was deemed unsafe as reported by the Institute of Medicine in 1999. Some countries spend up to 16% of their GDP on healthcare. Some companies spend up to 30 cents in every dollar of costs on employee health care. Singapore spends 4% of its GDP on health with government spending no more than half of this. How is this possible? What about the ageing workforce and greying nations?

Small nations fight to survive and remain relevant in the world economy. Singapore is no exception. Be it in civil aviation or healthcare, competition is fierce and many agencies continue to rank countries globally for their performance. Three success spoilers confront us. They are climate change, infectious diseases and terrorism. Can they be overcome?

Efforts to address these challenges require multi-disciplinary and multi-agency approach. Aviation Medicine is one discipline that can embrace new roles to bring together some of the medical related solutions required by countries dependent on aviation connectivity. There are 28 local doctors with special interest in aviation medicine. They contribute much to the development of civil aviation (the success of Changi Airport), as well as in peace keeping and humanitarian relief missions mounted by our armed forces.

JOHN ERNSTING PANEL ON CLINICAL AVIATION MEDICINE

Monday 11th October 2010, 1030-1215hrs.

INFECTIOUS DISEASES AND INTERNATIONAL AIR TRAVEL

MALADIES INFECTIEUSES ET TRANSPORT AÉRIEN INTERNATIONAL

Chairpersons: Prof Anthony Batchelor (*King's College London, UK*)
Dr Anthony Evans (*International Civil Aviation Organisation*)

[OR01]

English: GLOBAL EPIDEMIOLOGY AND IMPACT OF AIR TRAVEL ON SPREAD OF INFECTIOUS DISEASES

French: EPIDEMIOLOGIE GLOBALE ET IMPACT DU TRANSPORT AERIEN SUR LA TRANSMISSION DES MALADIES INFECTIEUSES

Annelies Wilder-Smith

Department of Medicine, National University Health System / Department of Epidemiology and Public Health, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Aircraft play a role in the rapid global dissemination of diseases and can also serve as carriers for vectors. As an interconnected, mobile society, we face a number of disadvantages in combating pandemics compared to our predecessors. Epidemic spreading patterns changed dramatically after the development of modern transportation systems. In pre-industrial times, the spread of disease was mainly a spatial-diffusion phenomenon. When the Black Death was spreading through 14th century Europe, it generated an epidemic front that passed as a continuous wave through the continent at about 200 – 400 miles per year. The 1918 influenza pandemic took one year to spread from the US to isolated Pacific islands, while the 1957 flu virus moved around the globe in about six months. In 2003, SARS spread to 5 countries within 24 hours after introduction to Hong Kong. The speed and pattern of the 2009 H1N1 pandemic was even more astonishing with a rapid but patchy propagation pattern shaped by human-mobility networks that allow infected people to travel across continents in one day or less. Through mathematical modeling we are now able to analyze social aggregate states made up of millions of people, taking into account the complexity and non-uniformity of transportation fluxes and population movements. The interconnectedness makes draconian travel restrictions almost impractical and reduces the effectiveness of any containment or mitigation strategies that are limited to a single country.

Furthermore, a serious problem is posed by the inadvertent transport of mosquitoes aboard aircraft arriving from tropical countries where vector-borne diseases are endemic to countries where such diseases are not endemic. A serious consequence of such transportation modes has for example been “airport malaria” reported from Europe, North America and elsewhere. In addition, vectors for yellow fever, dengue, chikungunya and other vector borne diseases have been imported to countries via aircrafts. There is an important on-going need for the disinsection of aircraft coming from airports in tropical disease endemic areas into non-endemic areas, as documented by the International Health Regulations.

[OR02]

English: INFECTIOUS DISEASES AND THEIR IMPACT ON INTERNATIONAL AIRPORTS

French: LES MALADIES CONTAGIEUSES ET LEURS RÉPERCUSSIONS DANS LE TRAFIC AÉRIEN INTERNATIONAL

Walter Gaber, R Gottschalk

Frankfurt Airport, Germany / Airports Council International

Historically, ships brought infectious diseases to the continents of the world, but in this modern era, infectious diseases and pandemics are primarily spread through aviation as a mode of travel. This is a significant issue in the realm of infection control because of the increased potential for the rapid worldwide transmission and spread of disease. Although the transmission of infectious diseases to airline passengers inside an aircraft is a rare occurrence, it is essential to implement entry and exit screening procedures at airports within the context of the International Health Regulations (IHR) in order to slow down the spread of infection, especially during the early phases of a pandemic event. Currently, there are no standardised procedures for health screening at airports, thus allowing individual regional authorities to determine what they deem to be appropriate screening measures for implementation.

We will discuss a new pragmatic approach for entry and exit screening procedures at international airports, propose a new classification system for contacts within the aircraft, and discuss changing the fixed enforcement of standardised community mitigation measures to the implementation of measures that correspond to specific characteristics of individual pathogenic agents. The proposed catalog of screening measures is aimed at attaining the goals of the IHR, which states that the measures should be reasonable while avoiding inconvenience or harm to passengers and should not be any more disruptive to the smooth handling of passenger traffic than is necessary.

[OR03]

English: A CASE OF ACTIVE TUBERCULOSIS IN A CABIN CREW: THE RESULTS OF CONTACT TRACING

French: UN CAS DE TUBERCULOSE ACTIVE CHEZ UN AGENT DE BORD: LES RÉSULTATS DE LA RECHERCHE DES CONTACTS

Claude Thibeault, P Rivest, F Tanguay, C Lacroix, R Menzies

Consultants Aeromed Inc. / International Air Transport Association

Introduction: Transmission of communicable diseases on board aircraft has received its share of attention. Tuberculosis (TB) is the disease for which contact tracing is done most often. Very few studies have been published for active TB in cabin crew.

Methods: The public health authorities advised the Medical Advisor of this airline that a cabin crew had been diagnosed with active TB. Contact tracing was done for the cabin crew that worked with the index case for more than eight hours. Cabin crew were divided in two groups according to their exposure: Crew members that had worked with face to face tasks with the index case (group 1) or without face to face tasks (group 2). The susceptible cabin crew had one Tuberculin Skin Test (TST) more than 8 weeks after the last exposure. Those with a TST > 5 mm have been recommended to have a QuantiFERON®-TB Gold In-Tube (QFT) assay.

Results: Among the 56 identified contacts, 32 agreed to be evaluated, of which six (19%) had a TST > 5 mm. Of those six, four had a QFT with one positive result. None had disease. The positive rates in the two exposure groups were similar. All the positive cases were over 34 year old and were born in Canada.

Conclusion: The same positive rate in the two exposure groups, the absence of TST > 5 mm among the 10 contacts < 34 and the high proportion of QFT negative among the TST positive contacts suggest that there was no transmission of TB to the cabin crew.

[OR04]

English: CONTROL OF INFECTIOUS DISEASES LINKED TO AIR TRAVEL – LESSONS FROM SARS AND INFLUENZA A (H1N1) IN SINGAPORE

French: CONTRÔLE DES MALADIES INFECTIEUSES ASSOCIÉES AUX VOYAGES AÉRIENS-LES LEÇONS DU SRAS ET DE L'INFLUENZA A(H1N1) À SINGAPOUR

Steven Ooi, J Cutter, L James

Ministry of Health, Singapore

The important role of global air travel in dissemination of novel emerging infectious diseases has been highlighted by the SARS epidemic which spread rapidly from Southern China and the Hong Kong Special Administrative Region through international air travel. SARS transmission was reported in at least three flights from symptomatic patients to other passengers and crew. The widespread dissemination of the novel influenza A (H1N1) in 2009 is thought to be related to the high number of flights out of the major early centers of the epidemic.

Singapore investigations into a cluster of six cases confirmed transmission of the influenza A (H1N1) on board a commercial aircraft. TB transmission among passengers sitting in close proximity to the index case has also been documented on long-haul flights. Other infectious diseases with documented in-flight transmission on commercial aircraft include measles and even food-borne illness. Despite the occurrence of respiratory illnesses, modern commercial aircraft ventilation systems are generally believed to be highly efficient at keeping the air free of pathogens through the use of HEPA filters and frequent re-circulation of cabin air which reduce the risk of transmission of respiratory infections. Nonetheless, measures to reduce the risk of in-flight transmission are warranted, including pre-flight identification of ill travelers, provision of enhanced cleaning and/or ventilation during outbreaks of respiratory infections, and enhanced global surveillance of emerging infectious diseases.

Rapid containment strategies depend on timely detection and isolation of all cases, and the early identification and/or quarantine of close contacts. Such efforts need to be based on a clear understanding of the transmission of respiratory viral pathogens. Global air travel has been a tremendous boon to modern commerce and communications, but the challenge is to make it safer for travelers in this era of rapidly emerging microbial threats.

SPECIAL SCIENTIFIC PANEL

Monday 11th October 2010, 1315-1530hrs.

CREW AND PASSENGER HEALTH IN AIR TRAVEL

LA SANTÉ DES PASSAGERS ET DES ÉQUIPAGES DANS LE TRANSPORT AÉRIEN

Chairpersons: Dr Jarnail Singh (*Civil Aviation Authority of Singapore, Singapore*)
Dr Rose Ong (*Cathay Pacific Airways*)

[OR05]

English: PRE-TRAVEL PREPARATION

French: PRÉPARATION PRÉ-VOYAGE

Lim Poh Lian

Tan Tock Seng Hospital, Singapore

Introduction: Over the past decade, travel volumes have increased substantially for business, leisure, volunteerism and immigration. While many travelers have uneventful trips, others experience medical problems during or after travel that are potentially preventable with good pre-travel preparation and vaccines.

Pre-travel preparation consists of advice, vaccinations and preventive medications depending on the exposures involved. A good travel medicine consultation entails a thorough, thoughtful understanding of:

- a) Destination-specific risks
- b) Traveler-specific risks

Methods: Case-based discussions will be used to illustrate the approach taken in travel medicine. Vaccinations addressed will include:

- a) Specialized vaccines: Yellow fever, rabies, Japanese encephalitis
- b) Recommended vaccines: Hepatitis A & B, typhoid, cholera, meningococcal
- c) Routine vaccines: MMR, tetanus, pertussis, polio, varicella, influenza, pneumococcal

The following topics will also be covered briefly:

- a) Altitude illness
- b) Malaria prophylaxis
- c) Outdoor risks: Tick bites, animal bites, schistosomiasis

Challenging & common scenarios we see in our travel medicine practice include:

- a) Pregnant travelers & children
- b) Older travelers & those with medical problems
- c) Long-term expatriates: business, relief workers, missionaries

Conclusion: At the end of this session, participants should gain an appreciation of the full range of travel medicine services that can be deployed to help reduce risk and keep travelers healthy and productive.

[OR06]

English: MEDICAL CONSIDERATIONS IN LONG HAUL FLIGHTS

French: CONSIDÉRATIONS MÉDICALES DANS DE LONGS VOLS DE SAISIE

Jarnail Singh

Civil Aviation Authority of Singapore, Singapore

Long haul flights pose a challenge in fatigue risk management for flight and cabin crew. The Civil Aviation Authority of Singapore (CAAS) went through a comprehensive fatigue management rule development process when it approved ultra long range flights which exceeded the prevailing flight and duty time limits. These flights, from Singapore to Los Angeles and Newark, have been operating for about 6 years now. At the international level, fatigue risk management has also been looked at and the International Civil Aviation Organization (ICAO) has set up a Fatigue Risk Management Systems Task Force to look at managing fatigue related safety risks based upon scientific principles and knowledge. This paper will look at fatigue and alertness in flight and cabin crew, the unique challenges posed by ultra long range flights and the progression from prescriptive flight and duty period limits to performance based fatigue risk management systems.

[OR07]

English: TRAVEL MEDICINE: AIRCREW FITNESS TO FLY

French: MÉDECINE DE VOYAGE: L'APTITUDE AU VOL DU PERSONNEL NAVIGANT

Michael Berry

Federal Aviation Administration, USA

In the United States, aircraft carrying passengers for hire are governed by Federal Aviation Regulations (FARs) CFR 14, Parts 121 or 135. Aircrew (pilots) flying aircraft covered by these FARs must hold either first class or second class medical certificates thereby meeting medical standards published in CFR 14, Part 67. Adherence to these Part 67 medical standards for aircrews is one means of ensuring both the safety of the U.S. National Air Space, and worldwide aviation.

During calendar year 2009, the U.S. Federal Aviation Administration (FAA) Office of Aerospace Medicine received 379,423 applications for medical certificates of all classes. Of these, 188,736 were applications for first class medical certificates and 77,218 were applications for second class medical certificates. CFR 14 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 in CFR 14 Part 67, as long as there is no danger to public safety. In calendar year 2009, there were 30,226 Special Issuance medical certificates authorized. Of these, there were 11,219 first class Special Issuance medical certificates, and 5,976 second class Special Issuance medical certificates authorized.

The major categories of denial of medical certificates in descending order of magnitude are cardiovascular, medications, psychiatric, neurologic, sleep disorders, endocrine, and cancer. The major categories of Special Issuance certificates in descending order of magnitude are cardiovascular (arrhythmias, valvular disease, coronary artery disease), diabetes, sleep disorders, cancer, neurologic. FAA safety data will be presented as well as the actual numbers of Special Issuance medical certificates issued in each category with a discussion of the safety implications. FAA current experience with certification in heart transplantation, and depression treated with medication will also be discussed.

[OR08]

English: AEROMEDICAL SAFETY CONSIDERATIONS FOR TRANSPORTATION OF PATIENTS BY AIRLINES

French: CONSIDÉRATIONS DE SÉCURITÉ AÉROMÉDICALE POUR LE TRANSPORT DES PATIENTS PAR DES COMPAGNIES AÉRIENNES

Melchor J Antuñano

Federal Aviation Administration, Civil Aerospace Medical Institute, USA

Commercial air travel has become one of the fastest and safest modes of public transportation around the world. The vast majority of pleasure and business travelers (some of whom have medical problems) reach their final destination without incident. However, due to the aging nature of the world population (including longer life expectancies), the increasing number of long and ultra-long flight operations, and the growing number of people who can afford to fly commercially; there is a global trend that shows an increase in the number of passengers who routinely fly without reporting their medical pathology.

Among these passengers, there are some who have moderate to severe pathologies who experience medical problems during flight that must be dealt with expediently and appropriately. The commercial aircraft fleet is also being used more frequently around the world for the elective transportation of patients (instead of utilizing air ambulance services). Therefore, the proper knowledge of aeromedical safety considerations and medical criteria for the transportation of diseased passengers or patients (unreported or reported) is an increasingly important issue for airline medical departments, as well as for medical personnel (physicians, physician assistants, nurses, paramedics, EMTs, etc.) who, while flying as passengers, may find themselves becoming incidental medical care providers during flight.

The results of several studies on the prevalence of passenger medical incidents during flight will be discussed. This presentation will also discuss pre-flight operational safety aspects and aeromedical safety considerations to deal with known and unknown medical incidents, and the application of medical criteria for elective transportation of patients onboard commercial airline transports.

[OR09]

English: DEEP VEIN THROMBOSIS AND AIR TRAVEL

French: THROMBOSE DE VEINE PROFONDE ET VOYAGE AÉRIEN

Lee Lai Heng

Singapore General Hospital, Singapore

The association between air travel and venous thromboembolism (VTE), in particular its potential for sudden death from fatal pulmonary embolism, has generated much interest in the past decade as air travel becomes increasingly frequent. Most studies showed that air travel increases the risk of VTE, the magnitude of the risk differs, depending on the study population and study methodology. However, the absolute risk remains very small.

The mechanisms responsible for the increased risk of VT after (air) travel have not been insufficiently studied to draw firm conclusions. Although one controlled-study showed that immobilization that could lead to coagulation activation after air travel, there is no conclusive evidence for the causal role of travel-related factors such as stasis, dehydration, cramped seats and hypobaric hypoxia. Personal risk factors for VTE such as thrombophilia or oral contraceptive use are more important as they significantly increase the risk of developing VTE not just during travel but in any other high risk situation.

Advice on behavior modification during air travel is based more on common sense rather than evidence. Given the risk-free benefit, all passengers should be advised to maintain adequate hydration and exercise. Compression stockings should be recommended for long haul flights as it reduces the incidence of ultrasound detected asymptomatic DVT and has very little side effects.

Currently, there is no evidence for 'routine' pharmaco-thromboprophylaxis for all passengers during air travel. In passengers with additional risk factors for VTE, prophylactic dose low-molecular-weight heparin may be considered. Aspirin is not recommended because there is not evidence of benefit and it is associated with a significant rate of adverse gastrointestinal effects.

[OR10]

English: ETHICAL CONSIDERATIONS IN MEDICAL TOURISM

French: CONSIDÉRATIONS ÉTIQUES DANS LE TOURISME MÉDICAL

Alastair Vincent Campbell

Centre for Biomedical Ethics, National University of Singapore, Singapore

Ever since an enterprising medical passenger managed to save a fellow traveller's life using a coat hanger, questions of ethical dilemmas in aviation medicine have been the subject of continual debate. In this brief paper I shall consider two issues: the responsibilities of medically qualified passengers when in-flight medical emergencies arise; and the ethical appropriateness of using commercial flights for the transport of

sick persons involved in 'medical tourism'. In the former case there are questions both of the limits of the duties of doctors and of the appropriate policies for airlines to adopt. In the latter case issues of justice arise, and also the possibility that airlines are, in some cases, colluding in illegal activities. There are no simple answers to these problems, but there is an urgent need for both the airlines and the medical profession to clarify their respective ethical and legal responsibilities and to devise clear and consistent policies.

FREE PAPERS

Monday 11th October 2010, 1600-1800hrs.

COMMUNICATIONS LIBRES

Chairpersons: Dr Claude Thibeault (*International Air Transport Association*)
Dr Richard Tan (*Singapore Aeromedical Centre, Singapore*)

[OR11]

French: THE USE OF MEDICINES BY PILOTS. THE ROLE OF PHARMACISTS

French: LA PRISE DE MÉDICAMENTS PAR LES PILOTES. LE RÔLE DU PHARMACIEN

M Monteil, L Fratus, A Lepoyvre, P Bertran, F Brocq, B Sicard, H Gommeaux, G Welsch, J Gomis, Y Limpas, A Martin Saint-Laurent, J Paris, P Doireau, P Maillouchet

French Military Medical Service, TOULON Cedex 9, Var, France

Introduction: Medicines affect flight safety, including potential impairment of alertness and/or psychomotor performance. For reasons of health care economy, French authorities encourage the development of the sale of over-the-counter medicine. So, a survey seemed useful to evaluate the role of pharmacists in the drug consumption of pilots.

Methods: An anonymous self-questionnaire was distributed to 1,500 civilian and military pilots (applicants and student pilots excluded) who applied during the first six month of year 2009 to the Roissy, Bordeaux and Toulon Aeromedical Center for the renewal of their medical certificate. 88 % (1,316) of the questionnaires were duly completed and returned. Men were in the majority in the group. The mean age was 39 years and 6 months. Almost two thirds of the subjects have a civilian activity.

Results: In response to a benign health problem, more than one pilot in five seek advice from their pharmacist for treatment. These advices, when deemed adequate, represent the 4th reason not to consult a physician. However, nearly half the time, the pharmacist never questioned his patient about his profession or job-specific constraints. Two thirds of pilots surveyed say they know the regulations. Pictograms of a specialty drug's effects "on the ability to drive vehicles or operate machinery" are displayed, but less than one of two pilots search systematically for their presence on the box before taking a medicine.

Conclusion: The use of medicines without medical advice is growing in France, including the pilot population. The pharmacist must be aware of the safety issues of some jobs and their specific constraints. He is also involved in pilots' information to prevent potential hazards in flight.

[OR12]

English: THE PILOT PROFESSION FEMINIZATION AS SEEN BY PILOTS

French: LA FEMINISATION DU METIER DE PILOTE VUE PAR LES PILOTES

A Martin Saint-Laurent, C Rivet, A Lepoyvre, F Brocq, P Maillouchet, Y Limpas, Y Limpas, H Gommeaux, G Welsch, J Gomis, J Paris, B Sicard, M Monteil

Aeromedical Center Roissy Air France, Roissy CDG Cedex, Val d'oise, France

Introduction: Given the increasing feminization of the pilot profession and the opening to women of all

specialties in military aviation, a survey seemed useful to evaluate how the pilots were living with the feminization of their profession.

Methods: An anonymous self-questionnaire was distributed to 1,000 civilian and military pilots (applicants and student pilots excluded) who applied during the first six months of year 2009 to the Roissy and Toulon Aeromedical Center for the renewal of their medical certificate. 87 % (869 questionnaires) were duly completed and returned. Men were in the majority in the group. The mean age was 39 years and 6 months. Almost three quarters of the subjects have a civilian activity.

Results: 77% of surveyed pilots are working with female pilots in their immediate professional aviation environment. 87% have already flown with a woman pilot. Eight times out of ten, they believe that the feminization goes well. However, a negative experience is most often reported in military aviation ($p=0.04$) and especially by men (for flying with a male or a female pilot). The presence of a woman relates mainly in the eyes of pilots to a change of the behavior of other crew members and military entourage. The differences between female and male pilots relate to emotional stability (considered more vulnerable especially by men), poorer failures management and a lower mechanical sense (recognized by both sexes).

Conclusion: Even if it remains low, the feminization of the pilot profession is a reality (in France: 2.7 % of military pilots and 4.2 % of commercial pilots). Women as pilots are regarded, predominantly and by both sexes, as natural (88 % of pilots interviewed) and non-confrontational (56 %).

[OR13]

English: IS THE ALARA PRINCIPLE APPLICABLE TO CREW EXPOSED TO COSMIC RAYS?

French: LE PRINCIPE D'OPTIMISATION EST-IL APPLICABLE À L'EXPOSITION DU

G Desmaris

Air France, Roissy, France

L'aviation commerciale, qui s'affranchit des barrières géographiques, accélère les échanges socio-économiques. C'est une activité pleinement justifiée si elle s'inscrit dans une démarche de développement durable. Aujourd'hui, deux seuls pilotes suffisent pour la conduite d'un avion et le nombre d'hôtesse et stewards est optimisé. Ces professionnels encore indispensables sont exposés au rayonnement cosmique car les carlingues sont perméables à celui-ci. Réduire l'altitude, modifier une route, pour bénéficier davantage de la protection de l'atmosphère et de la magnétosphère, n'est pas chose aisée, lorsqu'elle n'est pas impossible. Il en va de même de l'optimisation des trajectoires pour réduire un temps de vol, mais qui peut néanmoins être améliorée.

La seule action réaliste consiste à modifier la programmation des vols des navigants les plus exposés en vue de réduire leur exposition individuelle. Pour ce faire, une dosimétrie spécifique par modélisation mathématique ainsi que des applications informatiques ont été développées. La dose annuelle collective du personnel navigant d'Air France reste stable autour de 2,3 mSv. Elle est désormais supérieure à celle des travailleurs de l'industrie nucléaire. L'étude de la distribution des doses montre que seulement 5% des navigants se situent au dessus de 4 mSv, deux ou trois individualités mordant légèrement les 5 mSv.

Jusqu'à ce jour, la contrainte volontaire de dose fixée à 6 mSv par an a pu être respectée. Les mobilités entre le moyen et le long courrier au cours de la vie professionnelle permettent une certaine équité face à l'exposition qui demeure inférieure à 100 mSv sur la carrière. Ainsi les grands principes de radioprotection sont respectés.

[OR14]

English: EXPOSURE TO JET FUEL IN AIRCRAFT MAINTENANCE: A TOXICOLOGY STUDY

French: EXPOSITION AU KÉROSÈNE EN MAINTENANCE AÉRONAUTIQUE: UNE ÉTUDE TOXICOLOGIQUE

M Klerlein, O Tassin, C Joly, E Delrieu, A Gisquet, V Feuillie, R Rak
Air France, Roissy Cdg Cedex, 95, France

Introduction: Les métiers de la maintenance aéronautique comportent de fréquentes situations d'exposition au kerosene. La nature chimique de ce distillat de pétrole rend l'étude de l'exposition professionnelle difficile, tant au plan des mesures atmosphériques que de la biométrie. Nous présentons ici une étude multicentrique portant sur 86 salariés de maintenance exposés au Jet Fuel A1.

Methodes: 86 salariés volontaires répartis en 3 groupes d'exposition d'intensité croissante ont porté un badge de prélèvement passif dédié aux vapeurs organiques lors de leur vacation de travail, et ont fourni un échantillon d'urine avant et après la vacation. La contamination atmosphérique par le jet fuel a été estimée au moyen de la concentration du naphthalène et de la somme de hydrocarbures aliphatiques en C6- C12. La présence de benzène a également été recherchée. L'exposition réelle des salariés a été évaluée en comparant les concentrations de naphthols et de SPMA (acide S Phenyl Mercapturique - biomarqueur du benzène) avant et après poste. Un groupe témoin non exposé a bénéficié des mêmes mesures.

Résultats et Conclusions: La concentration atmosphériques de jet fuel reste faible dans l'ensemble des tâches de maintenance aéronautique, la probabilité de dépassement des valeurs limites étant restée en dessous de 0.5 %. Il n'a pas été mis en évidence de différence statistiquement significative pour les biomarqueurs urinaires avant et après poste, et la très discrète augmentation observée de SPMA a été retrouvée a la fois dans les groupes exposés et le groupe témoin, sans lien avec l'intensité de l'exposition. L'atmosphère des réservoirs montre toutefois une contamination plus élevée par le jet fuel même lorsque la ventilation fonctionne.

[OR15]

English: IMPLANTABLE CARDIOVERTER DEFIBRILLATOR: CASE REPORT IN A CABIN CREW MEMBER, AEROMEDICAL CONCERNS

French: DÉFIBRILLATEUR AUTOMATIQUE IMPLANTABLE : A PROPOS D'UNE OBSERVATION CHEZ UN PERSONNEL NAVIGANT COMMERCIAL, IMPLICATIONS AÉRONAUTIQUES

P Pichereau, P Aeberhard, J Paris

Air France, Roissy Cdg Cedex, Ile de France, France

Introduction: L'implantation d'un défibrillateur automatique implantable (DAI) est un élément majeur de la prévention de la mort subite chez les patients ayant présenté une arythmie ventriculaire soutenue.

Observation: Monsieur X, personnel navigant commercial (PNC), âgé de 35 ans, ressent une tachycardie de courte durée, à deux reprises, dans un contexte sportif. Une épreuve deffort est alors réalisée : au cours de celle-ci apparaît une tachycardie ventriculaire spontanément résolutive. Des explorations cardio-vasculaires complémentaires sont réalisées et amènent à discuter plusieurs diagnostics quant à la cardiopathie causale. L'indication d'implantation d'un DAI est finalement retenue.

Discussion: Les spécificités de la profession de PNC nous amènent à discuter des conséquences de la pose d'un DAI chez ce premier steward français implanté.

[OR62]

English: CABIN CREW PROFESSIONAL RISKS AND WORK ACCIDENTS IN SHORT HAULS : ANY SPECIFICITY? CONSEQUENCES FOR MEDICAL PREVENTION AND RESULTS - AIR FRANCE DOMESTIC NETWORK

French: RISQUES PROFESSIONNELS ET ACCIDENTS DE TRAVAIL DES HOTESSES ET STEWARDS COURT-COURRIER : UNE SPÉCIFICITÉ?

R Rak

Air France, Roissy Cdg Cedex, Ile de France, France

La prévention des accidents de travail reste un élément de grande importance pour le médecin d'une compagnie aérienne. Elle a d'autant plus de chance d'être efficace si elle est adaptée et ciblée. L'analyse

du suivi des accidents de travail des hôtesses et stewards, la connaissance et la comparaison des courts et longs courriers sont des éléments préalables pour des actions de prévention médicale plus efficaces.

L'activité des hôtesses et stewards d'AIR FRANCE est sectorisée pour les différents types d'exploitation qui sont distincts. La surveillance médicale est également spécifique à chaque secteur. Cette étude consacrée aux accidents de travail court-courrier et à leur prévention met en évidence des différences notables avec le long courrier, en ce qui concerne les otites en vol (accidents les plus fréquents) et les troubles ostéo-articulaires et vertébraux.

Elle détaille les principales mesures efficaces de prévention réalisées ainsi que les résultats intéressants obtenus, sur ces deux groupes de pathologie.

[OR63]

English: OTOSCLEROSIS AND AEROMEDICAL FITNESS: 10 YEARS EXPERIENCE

French: OTOSPONGIOSE ET APTITUDE AÉRONAUTIQUE: 10 ANS D'EXPÉRIENCE

J Couturier, A Martin Saint-Laurent, J Paris, M Frachet

Air France, Roissy Cdg Cedex, Ile de France, France

INTRODUCTION: L'otospongiose est une pathologie dépistée lors des visites ORL du personnel navigant civil. Sur décision du Conseil Médical de l'Aéronautique Civil (CMAC), depuis l'an 2000, cette pathologie après bilan complet et chirurgie éventuelle peut aboutir en visite de renouvellement à une aptitude par dérogation. Visualisation d'une vidéo de chirurgie de l'otospongiose.

METHODE: Etude rétrospective sur 10 ans des cas d'otospongiose découverts et des décisions prises par le CMAC.

RESULTATS: Entre 2000 et 2009, nous avons répertorié 40 dossiers, avec une répartition de 19 pilotes et 21 hôtesses et stewards. Sur la totalité de ce personnel navigant technique et commercial atteint de cette pathologie, 80% ont été opérés, 15% des dossiers ont justifié d'une inaptitude, 85% ont bénéficié d'une aptitude par dérogation selon des critères spécifiques respectant les conditions de sécurité aérienne.

CONCLUSION: Le suivi depuis 10 ans et les résultats sans complications évolutives obtenus après chirurgie, pour cette pathologie, permet d'alléger les critères d'obtention d'aptitude. Information des médecins agréés et experts de la simplification de ces critères
Mots clefs: otospongiose, aptitude par dérogation
Keywords: otosclerosis, fitness with waiver.

[OR64]

English: SICKLE CELL DISEASE AND AIR TRAVEL

French: DRÉPANOCYTOSE ET TRANSPORT AÉRIEN

L Suire, O Lorin de Reure, J Donne

SOFRAMAS

INTRODUCTION: Cette pathologie touche principalement l'Afrique de l'Ouest : région péri équatoriale, mais est aussi présente tant dans les Antilles françaises qu'en Amérique du Nord, ainsi qu'en Inde, et le sud de l'Europe. C'est en Afrique que la prévalence est la plus importante, allant jusqu'à 0,15%. Les accès de drépanocytose sont marqués par la crise vasoocclusive, liée à l'aspect particulier des hématies: falciforme. Les drépanocytaires présentent un profil psychologique particulier, ainsi qu'une éventuelle toxicomanie aux antalgiques: dérivés morphiniques. Le transport aérien regroupant la majorité des risques de survenue des crises, une réévaluation du problème lié à ce mode de transport prend toute son importance

METHODE: Les premières publications remontent à 1956. L'augmentation constante du trafic aérien passager impose la connaissance des signes et problèmes inhérents à cette pathologie. Un déroutement

récent dun vol AF Paris Los Angeles nous conduit à réétudier 10 années de transport au sein de la compagnie, la littérature retrouvant quand à elle un décès en 2000.

RESULTAT: Les crises survenues en vol sont actuellement toutes prises en charge sur le même mode:

- réchauffement
- oxygénation
- antalgiques
- anxiolytiques

La revue rétrospective des cas montre que le plus important serait une visite préalable auprès du médecin aéroporuaire qui pourrait alors autoriser ou non le vol, en fonction du taux dhémoglobine, de la saturation en O₂, de la prise en charge de la pathologie dans une structure spécialisée.

CONCLUSION: La drépanocytose reste une contre indication au vol

AEROSPACE PHYSIOLOGY I

Tuesday 12th October 2010, 0830-1000hrs.

PHYSIOLOGIE DE L'ALTITUDE I

Chairpersons: Dr Ulf Balldin (*USA*)
Capt Erin Fager (*United States Air Force, USA*)

[OR16]

English: USE LOWER BODY NEGATIVE PRESSURE TO INCREASE +GZ TOLERANCE OF FIGHTER PILOTS

French: UTILISATION DE LA PRESSION NÉGATIVE AUX MEMBRES INFÉRIEURES POUR AUGMENTER LA TOLÉRANCE DES PILOTES DE CHASSE AUX ACCÉLÉRATIONS +GZ

H Liu, Z Fu, X Xu

The Center of Clinical Aviation Medicine, PLA, General Hospital of the Air Force, Beijing, China

Introduction: +Gz is a kind of special environment encountered repeatedly by fighter pilots during aerobatics. With the equipping of high performance fighters, +Gz will appear more and more frequently and with higher value and longer time. This will undoubtedly challenge the +Gz tolerance of pilots. Pilots with poor +Gz tolerance will experience greyout, blackout or even G-LOC during flight with +Gz. This situation endangers flight safety severely. Since long term before, lower body negative pressure (LBNP) method has been used in aerospace medical field as a means to simulate +Gz. This experiment was designed to investigate the feasibility of using lower body negative pressure (LBNP) to increase +Gz tolerance of fighter aviators.

Methods: LBNP exercise was applied for 1-2 week on 4 fighter pilots who suffered from +Gz intolerance and didn't pass the centrifuge test one hour per day. LBNP exercise began with -50 mmHg for 5-10 min. If it can be well tolerated, LBNP was increased gradually with a step of -10 mmHg until a max pressure of -80 mmHg. Heart rate, blood pressure, breathing rate, SaO₂ and ear pulse as well as complaints, symptom and signs were recorded.

Results: The LBNP tolerance as well as +Gz tolerance of 3 pilots increased after LBNP exercise and they passed the centrifuge test finally, but 1 pilot failed. The common characteristics of the 3 pilots were as follows: Their increasing level of heart rate at the 3rd minute of LBNP reduced day by day with LBNP exercise and their decreasing level of SBP at the 3rd minute of LBNP level off. Their LBNP tolerance increased from -50 mmHg to -80 mmHg for 8 minutes.

Conclusion: Lower body negative pressure exercise can increase the +Gz tolerance of fighter pilots.

[OR17]

English: BIOFEEDBACK TRAINING FOR ANTI-G STRAINING MANOEUVRE USING SPIROMETRY AND ELECTROMYOGRAPHY: THE RSAF EXPERIENCE

French: FORMATION DE BIOFEEDBACK POUR LA MANOEUVRE ANTI-G UTILISANT LA SPIROMÉTRIE ET L'ÉLECTROMYOGRAPHIE : L'EXPÉRIENCE DE LA RSAF

SM Cheong, G Kang, T Teoh

Republic of Singapore Air Force Medical Service, Singapore

Introduction: Anti-G Straining Manoeuvre (AGSM) is the primary form of protection for aircrew operating in high G environment. The Republic of Singapore Air Force (RSAF) has developed a prototype AGSM Trainer, utilising biofeedback techniques to provide objective evaluation of an aircrew's AGSM. A preliminary study was conducted to establish normative parameters.

Methods: 8 subjects participated in the study. They consisted of 4 operational fighter pilots and 4 pilot trainees with no prior high G experience. The AGSM Trainer consisted of a surface EMG unit with bidirectional tidal volume sensors that are integrated to a mock cockpit with cloned recording displays and complete flight controls. Measurements were collected in 3 phases. Phase 1 recorded individual muscle maximal voluntary contraction (MVC) and resting activity. Phase 2 recorded all 5 muscles tensing at once simulating the muscle tensing component of AGSM. Phase 3 involved execution of five AGSM cycles with full biofeedback recording.

Results: Comparison between the two groups revealed that the operational pilot group were better able to initiate correct muscle firing sequence and maintain muscle tension. Spirometry data showed more consistent inspiratory-expiratory rates, breathing duration and volume exchange in this group.

Conclusion: The RSAF's AGSM Trainer is a novel biofeedback-based trainer and the results of this study support its use to complement centrifuge training. Further study using larger comparative populations would be useful to correlate biofeedback values with actual G performance.

[OR18]

English: FULL COVERAGE G-SUITS IN U.S. AIR FORCE COMBAT AIRCRAFT

French: VESTES ANTI-G À COUVERTURE COMPLÈTE DANS LES AVIONS DE COMBAT DE L'ARMÉE DE L'AIR AMÉRICAINE

KG Hughes

US Air Force School of Aerospace Medicine Brooks, San Antonio, TX, United States

Introduction: G-induced loss of consciousness (GLOC) remains a significant problem for the United States Air Force (USAF) F-15C and F-16 communities. Pilots flying these aircraft still wear 5-bladder G-suits. However, improved G-suit technology is available which has successfully reduced GLOC in many aircraft around the world.

Methods: A review of current literature and centrifuge studies was completed, and an analysis of USAF GLOC mishap statistics from 1993 to 2009 performed. Pilot surveys from both the RAF Typhoon and USAF Raptor communities were conducted. An operational assessment of full coverage G-suits was completed in September 2009, evaluating the effectiveness of full coverage G-suit technology in legacy aircraft.

Results: GLOC mishap rates have been increasing in the USAF over the past ten years despite education, training and emphasis on fitness. Full coverage G-suits provide subjectively and objectively improve levels of G-protection and reduce fatigue. There is a slight perceived increase in thermal burden. However, pilots feel the G-protection from full coverage G-suits far outweighs this detractor.

Conclusion: Full coverage G-suits should be fielded in F-15C and F-16 aircraft in the USAF Inventory to improve the combat effectiveness of aircrew at high levels of G, and to prevent the further loss of life and combat assets.

[OR19]

English: G-TRAINING PROGRAMMES FOR RSAF AIRCREW

French: PROGRAMMES DE FORMATION ANTI-G POUR LE PERSONNEL NAVIGANT DE LA RSAF

CG Chua, SH Wong

Republic of Singapore Air Force Medical Service, Singapore

Introduction: Anti-G straining manoeuvre (AGSM) is a physically demanding, yet important action to enhance one's G tolerance. It is a combination of muscle-tensing and Valsalva manoeuvre performed rhythmically every 3 to 4 seconds. Poor physique and sub-optimal coordination of both movements result in easy fatiguing and poor G-tolerance. Various programmes have been introduced by the Republic of Singapore Air Force (RSAF) Medical Service to enhance G-tolerance amongst aircrew trainees and trained fighter aircrew. Amongst these include AGSM habituation centrifuge training and Aircrew Systematic Strength and Endurance Training (ASSET). Prior to centrifuge G- qualification test, aircrew trainees are required to attend a structured training programme to master the correct technique of performing AGSM. ASSET, which comprises a series of gym workout exercises, has been introduced to improved aircrew's physique in countering G.

Methods: Details of AGSM habituation centrifuge training and ASSET are highlighted in this presentation. The first time pass rates for centrifuge G- qualification, as well as G-LOC rates between pilot trainees pre- and post- implementation of AGSM habituation training have also been compared.

Results: The introduction of AGSM habituation centrifuge training has led to an overall improvement in first attempt G-qualification performance amongst aircrew trainees. Improvements in G-tolerance have also been observed amongst trained aircrew who have participated in ASSET.

Conclusion: The G-training programmes introduced by the RSAF have enhanced aircrews' G-performance in the centrifuge.

[OR20]

English: A COMPARISON OF PERCEPTUAL ABILITIES BEFORE AND AFTER TRAINING ON SPECIAL AVIATION GYMNASTIC DEVICES

French: LA COMPARISON DES CAPACITÉS DE PERCEPTION AVANT ET APRÈS L'ENTRAÎNEMENT SUR DES APPAREILS DE GYMNASTIQUE SPÉCIAUX

O Truszczynski, M Deren, P Zielinski, F Skibniewski

Military Institute of Aviation Medicine, Warszawa, Poland

Introduction: Some aspects of human adaptation to flight environment (e.g. integration of peripheral and central vision during flight performance) were evaluated in the Military Institute of Aviation Medicine in Poland. The presented research was aimed at evaluating the impact of SAGD on the dynamics of perceptual abilities. This was examined on 44 subjects (males), who performed twice on perceptual and psychomotor tests. Both examination points were separated by one month intense training.

Methods: The Military Institute of Aviation Medicine has developed and implemented methodology for measuring perceptual and motor parameters adapted for use with SAGD. We applied following methods; the Schulte tables, peripheral vision Line test and Krzy|owy apparatus test. Tests were executed at the special prepared research standpoint with help of touch screen.

Results: Statistical analysis proved that the mean general perceptual performance improved in the one month of training on SAGD. Additionally we observed significant differences within applied methods. Of interest were results obtained on the Krzy|owy apparatus, which significantly increased. Other tests were less susceptible to SAGD training. In those cases, some improvements were observed but only on levels of complementary indicators.

Conclusion: The results suggested that training of SAGD has contributed perceptual integration. It was

especially visible when applied tests induced individuals to engage both (peripheral and central) systems and they were forced to switch on from one to another. Central vision effectiveness measured by the Schulte tables test did not improve after training which agrees with the fundamental underlying assumptions.

[OR21] Did not attend

[OR43] (Time slot change at request of presenter)

English: THE AEROMEDICAL DISPOSAL OF ATRIAL FIBRILLATION. BEYOND THE 1% RULE?

French: LA DISPOSITION AÉROMÉDICALES DE LA FIBRILLATION AURICULAIRE. AU DELÀ DE LA RÈGLE DU 1%?

M Joy

UK CAA, Virginia Water, Surrey, UK

Atrial fibrillation was first described in China 2000 years BC. The life time risk of the development of atrial fibrillation has been estimated in the USA and Europe to be one in four for both males and females. The past three decades have seen an almost epidemic increase in the burden, worldwide, of the condition. Multiple aetiologies are involved and the right and left atrial substrates vary, being associated with different clinical correlates in different individuals. There is mounting evidence of genetic predisposition with polymorphism on the SCN5A gene (responsible for the Brugada and one genotype of the long QT syndromes) being described. There is an overall fivefold increase in risk of stroke and in the Euro Heart survey, 2/3rds had hypertension and 1/3rd ischaemic heart disease. Rheumatic involvement of the mitral valve increases the stroke risk 10 fold. 25% of the population < 65 years will have the lone form. 1 in 8 of 162 Class 1 & 2 cardiovascular denials over a recent 7 year period in the UK were due to atrial fibrillation

Atrial fibrillation may be paroxysmal, persistent or permanent. The usual trajectory is for progression to the permanent form over a period of some 5 years although this is very variable. Treatment involves the maintenance of sinus rhythm (if possible) with beta blockade (including sotalol), verapamil and occasionally a Class 1c agent (ie flecainide). The side effect profile of amiodarone should disbar but a new Class 3 agent (dronedarone), whilst less effective may be suitable, but needs evaluation. Rate control may be the only option, the base requirement being that the pilot is free of symptoms at all times. The need for anti-coagulation (other than aspirin use) is determined using the Chads2 score - if > 1, warfarin is indicated and the pilot is generally unfit. The new Direct Thrombin Inhibitors (DTI) such as dabigatran are not yet approved for stroke prevention in AF but will be discussed.

AEROSPACE PHYSIOLOGY II

Tuesday 12th October 2010, 1030-1215hrs.

PHYSIOLOGIE DE L'ALTITUDE II

Chairpersons: Prof Thais Russomano (*Micro-Gravity centre, POCHRS, Brazil*)
Prof Chen Xiaoping (*China Astronaut Research and Training Centre, People's Republic of China*)

[OR22]

English: SPACE DISORIENTATION: DIFFERENCES BETWEEN MEN AND WOMEN

French: DÉSORIENTATION SPATIALE: LES DIFFÉRENCES ENTRE HOMMES ET FEMMES

P Verde, L Piccardi, P Trivelloni, F Bianchini, C Guariglia, E Tomao

ItAF- Aerospace Med. Dept.- Flight Test Centre, Pomezia, Rome, Italy

Introduction: No data was available until now with regard to sex differences in flight orientation. Nevertheless gender differences are commonly reported in human navigation on the ground. It is well known that to orientate themselves when navigating, women are more likely to use landmark-based strategies and men, Euclidean-based strategies.

Methods: Participants included 41 military pilots and 38 students (non-pilots). All participants were tested individually for: mental rotation (experiment #1), path memory (experiment #2A) and position memory (experiment #2B). Walking Corsi Test and Corsi Block-Tapping (CBT) Test were used to assess short term memory (span), long term memory (supraspan) and delayed recall.

Results: In experiment #1 no differences were found in terms of accuracy between male and female non-pilots and male and female pilots; in terms of time, male non-pilots are faster than female non-pilots (female pilots carry out the test at the same velocity). Male and female pilots are significantly faster than male non-pilots. In experiment #2 when span is assessed, female non-pilots show differences as regard as male non-pilots and as regard as the group of pilots (males and females), than male non-pilots.

Conclusion: Flying hours do predict mental rotation speed, in fact both male and female pilots with a higher number of flying hours are faster than pilots with a lower number of flying hours. Male and female pilots carry out test of space memory (path and position) equally well. Flying hours do not predict performance in these tests. The pilot population learns faster than the non-pilot population and are better in short term memory.

[OR23]

English: ISSUES SURROUNDING SPATIAL DISORIENTATION SIMULATORS

French: DÉFITS ENTOURANT LES SIMULATEURS DE DÉSORIENTATION

WR Ercoline, LP Krock

Wyle IS&E, San Antonio, Texas, United States

Introduction: Spatial disorientation (SD) remains a serious problem to all flyers - military, general and commercial. The latest statistics released by the USAF Safety Center show the problem has not changed much for the USAF flying community in the last decade, and several other national and international reports show that SD is still a killer for those who fly as either a vocation or as an avocation. The continued use of SD simulators for improved flight training practices and pilot awareness of spatial disorientation remains a focus among the aerospace medical communities. The aerospace medical community remains the driving force behind the need for improved flight training to counter SD. Results of these efforts are the advancement of certain technologies that appear to improve overall flight performance.

Methods and Results: More recently several of these new devices, known as SD simulators, have shown to possess the capability to provide high fidelity flight simulation realism as well as the motion cueing and visual flexibility necessary to generate several of the recognized SD illusions. This presentation summarizes the state of SD simulators with particular emphasis on devices available today. The SD simulators are grouped into four separate and distinct categories using a procedure developed by the latest RTO NATO SD working group. Each category of simulator is explained with pros and cons.

Conclusions: Several international aerospace organizations have incorporated these SD simulators into their flight training curriculum. A method to determine the effectiveness of these new devices for improving flight performance is presented.

[OR24]

English: CLINICAL VALIDATION OF THE EARLOBE ARTERIALIZED BLOOD COLLECTOR

French: VALIDATION CLINIQUE DU COLLECTEUR DE SANG ARTÉRIALISÉ DU LOBE AURICULAIRE

T Russomano, FP Falcao, M Vian, CN dos Reis, LM Borges

MicroG Centre/PUCRS, Porto Alegre, RS, Brazil

Introduction: The need to collect and analyze arterial blood in extreme environments, such as space, in a variety of clinical, emergency and research situations has become increasingly important with the construction of the International Space Station, and plans for long-term manned space missions. However,

there is currently no safe and reliable method to perform it in space. An alternative is the technique of sampling arterialized blood from the earlobe, which has been in use in clinical medicine and physiology for over 60 years.

Methods: The Earlobe Arterialized Blood Collector (EABC) was developed by the Microgravity Centre, PUCRS/Brazil to enable collection of arterialized blood from the earlobe of astronauts by non-medically trained personnel, whilst minimizing risks of environmental contamination, infection and pain. A clinical validation study was performed on 12 patients with a medically determined need for measurement of arterial blood gas tensions and acid-base variables. Every collection consisted of one blood sample taken from the arterial side of an arterial-venous fistula and one of arterialized blood from the earlobe. Blood analyses were based on the EC8+ i-STAT® cartridge (Abbott) that measures pH, PCO₂, HCO₃⁻, BE_{ecf}, Glu, BUN, Na⁺, K⁺, Cl⁻, TCO₂, AnGap, Hct and Hb. After each collection, the patient was asked to complete a pain assessment scale and the earlobe incision length measured.

Results: The mean of the differences obtained from the arterialized and arterial samples ranged from 0.006 (for pH) to 2.8 mg/dL (for glucose). The squared correlation was equal or above 0.93 in 10 of the 13 blood variables measured, being the lowest for PCO₂ (0.68). The mean (+/-SD) of the perceived pain (from 0 to 10 points) and earlobe cut length were 2.7 (2.4) points and 4.4 (1.3) mm, respectively.

Conclusion: Findings indicated that EABC usage in a clinical environment can deliver results that represent the same physiological properties as arterial blood.

[OR25]

English: ARTIFICIAL GRAVITY WITH ERGOMETRIC EXERCISE PREVENTS CARDIOVASCULAR DECONDITIONING DURING HEAD-DOWN TILT BED REST

French: LA GRAVITÉ ARTIFICIELLE ET L'EXERCICE ERGOMÉTRIQUE PRÉVIENNENT LE DÉCONDITIONNEMENT CARDIOVASCULAIRE PENDANT LE REPOS AU LIT EN POSITION DE TRENDELENBURG

X Sun, C Yang, Y Wang

Fourth Military Med University, Xi'an, Shaanxi, China

Introduction: Short-arm centrifuge induced artificial gravity (AG) has been considered as a multi-system or integrated countermeasure against cardiovascular deconditioning, bone and muscle loss during microgravity. We proposed and developed a centrifuge-induced artificial gravity device with ergometric exercise. The purpose of the present study was to examine the effects of AG combined with exercise training on cardiovascular function during 4d head-down tilt (HDT) bed rest. Furthermore, alterations of cerebral circulation and volume regulating hormones are discussed.

Methods: 12 healthy male subjects were randomly divided into control and AG groups. All subjects remained in -6° head-down tilted beds at all times throughout the bed rest period. Subjects in the AG group received 1 h of alternate +1 to +2 Gz (at the foot) centrifugation with 40 W ergometric exercise per day. The control group stayed 4 d in HDT, at rest, without any countermeasure. Orthostatic tolerance and cardiovascular function were measured before and after HDT.

Results: All the subjects in both groups completed the tilt tests before HDT. However, 2 subjects in the control group and 1 in the AG group did not complete the tilt tests after 4d of HDT. Compared to the Pre-HDT, there was no statistical difference in the hemodynamic variables: stroke volume (SV), cardiac output (CO), cardiac index (CI), total peripheral resistance (TPR), and compliance of popliteal vein in the AG group after 4d HDT. However, SV, CO and CI decreased, while TPR and compliance of popliteal vein increased significantly in the control group after 4d HDT.

Conclusion: Daily 1h AG with 40W exercise training is effective against cardiac dysfunction during simulated weightlessness.

[OR26]: Did not present due to presentation corruption with no backup.

[OR27]

English: MEDICAL SELECTION OF COSMONAUTS AND ORTHOSTATIC TOLERANCE

French: LA SÉLECTION MÉDICALE DES COSMONAUTES ET LA TOLÉRANCE ORTHOSTATIQUE

YI Voronkov, NV Degterenkova, GP Stepanova, EI Dobrokvashina, MA Skedina

State Scientific Center of Russian Federation - In, Moscow, Russia

During selection of special contingent, much attention is given to the research of cardiovascular system (CVS) regulation, its ability to adapt to various stressful conditions, and detection of changes in mechanisms of its regulation. Various parameters of CVS undergo significant changes both during adaptation to space flight, directly under conditions of weightlessness and during readaptation to terrestrial environment. One of the informative methods for detecting problems in CVS regulation is a postural orthostatic test. The test simulates an impact of various gravity loads and is used to detect mainly abnormalities in regulation of cardiac activity and vascular tone. This work was designed to research regulation of hemodynamics during passive orthostatic test.

15 practically healthy people in the age from 18 to 34 years old have passed the test. The test was carried out on a turning table where the angle of regimes corresponded to: a baseline - 0°; +75° - 20 min.; the recovery period 5 min. - 0°. Medical monitoring was carried out during every 5th minute on all regimes. The following parameters were recorded: 12 Lead ECG and the BP, parameters of myocardium by means of "CardioVisor-06" device, and microcirculatory bloodstream (MCB) was estimated by means of ultrasonic high-frequency dopplerograph "Minimax-Doppler-K" with 20 MHz sensor. The impedance method of rheoencephalography (REG) by means of the "Encephalan-EEGR-13103" device was used to research cerebral blood circulation, with recording of parameters using frontomastoid and bimastoid leads.

During baseline period, parameters were within normal limits in all the test subjects. High tolerability to the test was observed in 10 test subjects and in other 5 subjects, dynamics of parameters during test reflected problems in mechanisms of CVS regulation in its separate parts. This group was united by decrease in pulse pressure for 28-50 % and increase of HR for 29-54,5 % from baseline values.

[OR28]

English: PLACENTAL GROWTH FACTOR (PLGF) IN CORONARY ARTERY DISEASE AND STRESS

French: LE FACTEUR DE CROISSANCE PLACENTAIRE (PLGF) DANS LES MALADIES CORONARIENNES ET LE STRESS

A Sundaresan, BA carabello, SK Mehta, TT Schlegel, NR Pellis, DL Pierson, CM Ott

Texas Southern University, Houston, Texas, USA

Introduction: Previous studies in our laboratory with normal human lymphocytes revealed a more than five-fold increase ($p < 0.001$) in angiogenesis inducers such as Placental Growth Factor (PIGf) in a physiologically stressful environment such as modeled microgravity, a space cell culture analog. Up-regulation of PIGf suggests de-regulation of cardiovascular signaling pathways. These observations raise the question as to whether PIGf participates in the stresses of cardiovascular disease.

Methods: To assess whether PIGf expression was de-regulated in Coronary Artery Disease (CAD), human blood samples from 30 healthy donors (Johnson Space Center), and thirty three blood samples of cardiac catheterization patients from the Veteran's Administration Hospital, Houston, TX, were analyzed for PIGf protein by an immunoassay. PIGf is gaining impetus as a cardiovascular panel biomarker in Acute Coronary Syndrome (ACS).

Results: Preliminary results of the PIGF testing are promising in that the mean \pm SD value of PIGF in the asymptomatic subjects studied thus far is just 16.5 ± 6.6 ng/L (patients with known coronary artery disease, increasing beyond the clinical threshold level (>27 ng/L)). Case history details were collected to analyze correlations with cardiovascular risk factors. Correlations with blood pressure, triglycerides (*plipidemia, diabetes and body mass index will be presented in this study. The search for new, reliable markers of

plaque instability and cardiovascular stresses is an advancing area, with special implications in civil and military aviation, as well as spaceflight.

Conclusion: The attempt is to study PIGf further as a cardiovascular stress indicator, and assess whether it gives any insight into plaque instability. The significance of its up-regulation in microgravity also needs to be elucidated. There is an increased level of the need to assess these in aerospace medicine.

*Supported by: NASA NSTI NNA06CB14H
PI: Dr.A.Sundaresan*

OPERATIONAL AVIATION MEDICINE
Tuesday 12th October 2010, 1315-1500hrs.
MEDECINE AERONAUTIQUE OPERATIONELLE

Chairpersons: COL(Dr) Robin Low (*Republic of Singapore Air Force Medical Service, Singapore*)
Dr John Crowley (*U.S. Army Aeromedical Research Laboratory, USA*)

[OR29]

English: THE OPERATIONAL PILOT-PHYSICIAN AS A TRUE FORCE MULTIPLIER IN COMBAT MILITARY OPERATIONS AND MILITARY MEDICINE

French: LE PILOTE-MÉDECIN OPERATIONNEL: UNE VÉRITABLE EFFET MULTIPLICATEUR DANS LES OPÉRATIONS DE COMBAT MILITAIRE ET LA MÉDECINE MILITAIRE

SC Hadley

United States Air Force, Niceville, FL, USA

Introduction: Immediate forward battlefield surgery has been employed by US military forces since the Civil War. The US-Vietnam conflict introduced rapid helicopter medical evacuation and Operation DESERT STORM honed this concept with the addition of forward surgical teams, greatly reducing battlefield morbidity and mortality. Operation ENDURING FREEDOM (OEF-Afghanistan) afforded further advancement of battlefield evacuation and treatment tactics when a forward deployed USAF Helicopter Pilot-Physician/surgeon functioned in the dual role of a flying mission commander then physician/surgeon on four combat missions and medical evacuations.

Methods: This presentation, including slides and graphic photos, will discuss specific operations and lessons learned in missions behind enemy lines that involved high value casualties and mass casualty combat evacuation. The Pilot-Physician served as the air mission commander commanding the mission hundreds of miles behind enemy held territory, triaged 31 critical casualties, then conducted and directed other medical personnel in life saving Advanced Trauma Life Support hours before reaching the nearest medical facility.

Results: The operational insight and lessons learned from a Pilot-Physician deployed as a USAF Special Operations Wing Operations Officer in Operation ENDURING FREEDOM will be presented. Personal observations on the deployment, living conditions and four combat rescues hundreds of miles behind enemy lines in Taliban held territory will be presented. One of the presented rescues is highlighted in the recently released book "The Only Thing Worth Dying For" by Eric Blehm. (Non-disclosure: Col Hadley, MD has no affiliation or profit from the book.).

Conclusion: Utilization of a trained operational Pilot-Physician is a true force multiplier in any armed conflict or natural disaster by providing an individual who serves in the dual capacity as an operator and a physician, providing medical care further forward on the battlefield and decreasing the morbidity and mortality on the battlefield.

[OR30]

English: THE EFFICACY OF MODAFINIL IN MAINTAINING ALERTNESS LEVEL IN MALES OF CHINESE ETHNICITY IN A 40-HOUR CONTINUOUS WAKEFULNESS SLEEP DEPRIVATION STUDY

French: L'EFFICACITÉ DU MODAFINIL À MAINTENIR LE NIVEAU DE VIGILANCE DES CHINOIS MÂLES DANS UNE ÉTUDE DE PRIVATION DE SOMMEIL CONTINUE DE 40 HEURES

D Chua¹, BC Goh², HS Lee³, LK Tey⁴, YY Tan⁴, KW Lai¹

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²*Clinical Trials Unit, National University Hospital, Singapore*

³*Bioanalytical & Pharmacokinetics Laboratory, National University of Singapore, Singapore*

⁴*Defence Medical & Environmental Research Institute, DSO, Singapore*

Introduction: Modafinil is a wakefulness-promoting stimulant that has been shown to be effective in preserving performance during prolonged periods of sleep loss. To the authors' knowledge, there is no known research conducted to investigate the effects of Modafinil in local Chinese population in Singapore. The study investigated the efficacy of 3 dosage regimes in maintaining the alertness level of Chinese Singaporeans, who were subjected to 1 night of sleep deprivation. The pharmacokinetics of Modafinil in these subjects was also investigated.

Methods: A double-blind, randomised study involving 80 healthy Chinese male volunteers was conducted. Volunteers were kept awake for 40 hours continuously. They were randomly assigned to 1 of 4 treatment groups (50mg, 100mg, 200mg and placebo). Drugs/placebo were administered at 10pm, 6am and 2pm. Volunteers' alertness were assessed using a test battery consisting of physiological, cognitive and subjective measurements every 4 hours. 5mL of blood was drawn at selected time-points upon drug administration as part of the pharmacokinetic (PK) analysis. PK sampling was conducted for volunteers in all treatment groups.

Results: Repeated Measures Analysis of Variance with Bonferroni adjustments were performed to assess the effects of different dosage regimes on volunteers' test performances. Significant differences were found for several test parameters between the higher doses (100mg and 200mg) and placebo. PK analysis showed that Modafinil exhibited a dose-proportional linear relationship, with higher doses leading to a higher maximum plasma concentration (C_{max}) and a slower wash-out rate. No adverse events that required immediate medical attention occurred during the study.

Conclusion: The doses were well-tolerated in Chinese Singaporeans. The 100mg and 200mg dosage regimes were found to be effective in attenuating physiological and cognitive deterioration in sleep-deprived individuals. The results corresponded well with the PK profile, with a higher dose leading to higher C_{max}.

[OR31]

English: HOW IS THE WORKING ENVIRONMENT IN A SIKORSKY S92 HELICOPTER IN TERMS OF NOISE AND VIBRATION?

French: QUEL EST L'ENVIRONNEMENT DE TRAVAIL DANS UN HÉLIPTÈRE SIKORSKY S92 EN TERMES DE BRUIT ET DE VIBRATIONS?

J Kåsin

Institute of Aviation Medicine, Oslo, Oslo, Norway

Introduction: Sikorsky S92 is a widely used helicopter for the transport of oil workers to oil platforms in the North Sea. Pilots are flying 6-8 hours per day in this helicopter and up to 850 hours per year. Helicopter pilots have had a subjective feeling that the S92 has not demonstrated any improvement in the areas of noise and vibration control compared to earlier helicopter types. The helicopter has therefore been mapped in relation to the EU's noise (2003/10/EC) and vibration (2002/44/EC) directive.

Methods: Whole-body vibration measurements were performed in accordance with ISO 2631-1. Subject sits on a measurement cushion which has accelerometers fitted in 3 axes (Endevco, type 2560, Brüel & Kjær, Denmark). The Noise measurements were performed by using a Head and Torso simulator, (HATS, type 4128C, Brüel & Kjær, Denmark). Sensors for both noise and vibration were connected to a front end

(Type 3560C, Brüel & Kjær, Denmark). Data is stored on a portable PC with uptake and analysis software (Pulse Labshop 10.0, Brüel & Kjær, Denmark).

Results: S92 with 3 anti-vibration generators (AVG) reach the action value of the vibration directive. S92 with 6 AVG are below. The noise levels inside David Clark headset type H10-26 show an average of 85.8 dBA on the left ear and 86.5 dBA on the right ear. This is above the EUs upper exposure action values: LEX, 8h 85 dB(A).

Conclusion: In relation to EU directives, noise and vibration values in S92 are located in the borderline zone. With double hearing protection and 6 AVG, the helicopter will be able to achieve the acceptable values.

[OR32]

English: OPERATIONALISATION OF AN AIRCREW FATIGUE ASSESSMENT SUITE

French: UTILISATION OPÉRATIONNELLE D'UN ENSEMBLE DE TESTS POUR ÉVALUER LA FATIGUE DU PERSONNEL NAVIGANT

J Low, D Chua, KW Lai

Republic of Singapore Air Force Medical Service, Singapore

Introduction: Aircrew fatigue continues to be a significant concern in modern aviation. Increasing requirements for 24/7 flying operations, extended duration sorties and multiple time zone crossings provide continued impetus for fatigue countermeasure and risk management system development. While major advances have been made in fatigue detection software and equipment, much has been achieved in the laboratory, with few studies demonstrating the successful fielding of fatigue assessment suites in actual flying operations.

Methods: An assessment suite consisting of an (i) ocular saccadometer; (ii) computer - based cognitive test and (iii) subjective fatigue questionnaire was fielded to measure multiple fatigue parameters in 12 Republic of Singapore Air Force (RSAF) fighter aircrew performing a long-distance ferry mission. 10 aircrew flew each of 3 ferry legs, crossing 9 time zones in total and flying on average 7 hours per leg. For each ferry leg flown, pre and post-flight parameters were recorded and subsequently compared against each individual's baseline results. Zolpidem-assisted sleep and caffeine lozenges were also employed as operational fatigue countermeasures.

Results: The fatigue assessment suite was successfully fielded in support of ferry operations. Saccadic velocity measurements decreased as expected after each ferry leg, falling most markedly by 3.6% after the first. Reaction time and cognitive test performance indices showed weaker correlations with anticipated fatigue levels. Subjective questionnaire scores proved the most sensitive measurement, with aircrew reflecting on average 20% increase in fatigue scores after each ferry leg.

Conclusion: With minor modifications, existing commercial fatigue detection tools can be successfully operationalised and deployed in support of actual operations. While saccadic velocity continues to show good results as a measurement of physiological fatigue, cognitive testing however appears more susceptible to variables in the field environment. Subjective questionnaires remain a reliable measure of aircrew fatigue and the development of fatigue detection algorithms should continue to incorporate parameters from all three domains.

[OR33]

English: AEROMEDICAL REVIEW AND VALIDATION FOR TRANSPORTS OF CRITICALLY ILL PATIENTS

French: LA RÉVISION AÉROMÉDICALE ET LA VALIDATION POUR LE TRANSPORT DES PATIENTS CRITIQUES

MM Angles, DM O'Brien

13 Air Force, Hickam AFB, HI, USA

Introduction: The Pacific theater serves approximately 450,000 active duty and their dependents, DoD civilians and other beneficiaries. The Theater Patient Movement Requirements Center-Pacific (TPMRC-P) is a Division of the 13th Air Force Surgeon Generals Directorate that provides joint theater wide medical regulating services to include clinical validation of patient movement requirements averaging 3,600 patient movements, including 30 high acuity patient transports annually using a Critical Care Air Transport Team (CCATT) or a Joint Medical Attendant Transport Team (JMATT).

Discussion: The development of specialized teams that can provide capability to rapidly evacuate critical casualties with no decrease in the level of care is a paradigm shift from the Cold War era secondary to the US military's OEF and OIF experience. The use of these types of teams has increased in peacetime movements and in humanitarian responses. This increase in the transport of critically ill or injured patients has refined our aeromedical evacuation (AE) system and has been the nidus for the formal TPMRC policies for aeromedical review and validation by AE trained registered nurses and residency trained flight surgeons.

Conclusion: The clinical and aeromedical review of patients transported in the aviation environment requires the standardized review and use of clinical practice guidelines by aeromedical experts ensuring the safe and timely movement of critically ill and injured patients.

[OR34]

English: AEROMEDICAL CONSIDERATIONS FOR A PATIENT WITH TRAUMATIC BRAIN INJURY FOR AIR REPATRIATION: A CASE DISCUSSION

French: CONSIDÉRATIONS AÉROMÉDICALES POUR LE RAPATRIEMENT AÉRIEN D'UN PATIENT PRÉSENTANT UN TRAUMATISME CRÂNIEN : PRÉSENTATION D'UN CAS

W Lim¹, P Zhao²

¹Republic of Singapore Air Force Medical Service, Singapore

²HQ Medical Corps, Singapore Armed Forces, Singapore

Introduction: The flight environment is especially hazardous for patients with traumatic brain injury (TBI), who are especially vulnerable to secondary damage by cerebral hypoxia and raised intra-cranial pressure (ICP). The major consideration for any patients with TBI for air repatriation must be to prevent secondary brain injury.

Methods: Through a case discussion, this poster will review current literature and opinions on the care of patients with TBI for air repatriation. The presentation will highlight environmental, operational and physiological hazards during air transfer. Clinical management must aim towards a safe transfer and reducing any potential adverse long term neurological sequelae.

Conclusion: In-flight medical crew must possess the appropriate monitoring equipment, be familiar with the care of neurosurgical patients and the unique hazards of the flight environment.

[OR35] Withdrawn

CLINICAL AVIATION MEDICINE (ENT AND OPHTHALMOLOGY)

Thursday 14th October 2010, 0830-1000hrs.

MEDECINE AERONAUTIQUE CLINIQUE (ORL ET OPHTHALMOLOGIE)

Chairpersons: Dr Pooshan D. Navathe (*Civil Aviation Safety Authority, Australia*)
SLTC(Dr) Gerard Nah (*Republic of Singapore Air Force Medical Service, Singapore*)

[OR36]

English: REFORMED PERMANENT MEDICAL GROUNDING APPRAISAL FOR FIGHTER JET AVIATORS WITH LUMBAR DISC HERNIATION----A NEW WAY OF EVALUATION BASED ON TCM PHILOSOPHY OF "YING-YANG BALANCE"

French: ÉVALUATION AMÉLIORÉE DE LA PERTE DE LICENCE PERMANENTE DES PILOTES DE CHASSE AVEC UNE HERNIE DISCALE LOMBAIRE-UNE NOUVELLE MÉTHODE D'ÉVALUATION BASÉE SUR LA PHILOSOPHIE TCM DE LA "BALANCE YING-YANG"

P Zhao

PLA Air Force General Hospital, Beijing, P.R.China

It is generally recognized that lumbar intervertebral disk herniation (LDH) is a common disease producing quite a lot of biomechanical trouble of the spinal column to fighter jet aviators. It is difficult to conduct a medical evaluation to aviators with LDH, and even more difficult to decide if he should be medically flying qualified. We rely too much, in the past, on the structural image report of a protruded nucleus pulposus inside the spinal canal from radiologists, which seems not always to coincide with the clinical situation we had expected.

The PLA Center of TCM Spinal Manipulative Orthopedics in China PLA General Air Force Hospital has produced a new method of medical evaluation for the fighter jet aviator with LDH, based on TCM principles of Yin-Yang balance. It reflects that the biomechanical balance of spinal column might be of vital importance. The evaluation principle is much more practical than the traditional consideration of protruded disc tissue inside the spinal canal. The reducing rate of medical permanent grounding cases after 4 years of practice of the principle has been significantly proved in the center.

[OR37]

English: REAL-WORLD ATTENUATION OF FOAM EARPLUGS

French: L'ATTÉNUATION DES BOUCHONS D'OREILLES EN MOUSSE SUR LE TERRAIN (IN VIVO)

AM Smith

RAAF AVMED, Edinburgh, South Australia, Australia

Introduction: Work-related exposure to hazardous levels of noise is a significant occupational threat around the world. Foam earplugs are used widely across all industries; however, poorly-fitting earplugs can provide inadequate attenuation. This project aimed to document the attenuation of foam earplugs as worn by typical aircrew.

Methods: A group of 43 air crew was asked to insert foam earplugs as they normally would. The technique was documented, and the attenuation afforded by the earplugs was measured. The study was repeated after each subject received one-on-one training to insert the earplugs.

Results: Before training, the group-mean attenuation was only 15 dB - only 10% and 2% of earplugs reached the SLC80 and NRR (respectively) for the earplug. After training, the group mean attenuation increased to 25.5dB with 47% and 31% of earplugs now meeting or exceeding the SLC80 and NRR (respectively). 43% of subjects exhibited an improvement from 15 dB. Before training, only 10% of earplugs were inserted deep enough to provide the wearer with optimum attenuation. After watching a short training video, 97% of earplugs were inserted deep enough to provide adequate noise attenuation. There was no significant advantage in terms of attenuation achieved or technique followed - for those who had previously undergone training through Defence in how to insert earplugs.

Conclusion: The real-world attenuation of foam earplugs exhibited in this study is significantly lower than the factory- specified level of attenuation, and can be attributed to inadequate formal training to insert foam earplugs correctly. Personnel wearing poorly fitting earplugs may be receiving inadequate noise protection, exposing them to the potential risk of noise-induced hearing loss. A brief training intervention significantly increases the level of attenuation wearers can achieve from their earplugs.

[OR38]

English: SUNGLASSES FOR PILOTS

French: LUNETTES DE SOLEIL POUR PILOTES

MJ von Mülmann

EUSAM, Lensahn, Schleswig-Holstein, Germany

There is a demand for high quality sunglasses for pilots. There is a great variety of choice which is additionally influenced by stylish trends. Due to new techniques in depiction, especially of the PFD and NAV-displays, special interest should be paid to visual acuity and colour perception. Furthermore, there is also an increasing spectrum of colour decoding information, either by text or graphic.

Sunglasses should not only protect against increased light exposure but they must guarantee a natural reproduction of colours without any adulteration.

While negative effects of UV-exposure are already well known, the normal blue spectrum of the visible light between 420nm and 490nm is coming more and more into the centre of focus. Though there are no proven scientific findings about possible dangers, popular science arguments are published about increasing developments of macula degeneration and cataract. On the part of the optical industry, besides normal sunglasses, artificial lenses for implantation after cataract surgery are also equipped with a blue filter system. It totally disregards if and in how far colour perception, etc. is affected.

Based upon earlier evaluations at the Flugmedizinisches Institut der Swiss Air Force, 50 trichomat pilots were evaluated at the Aeromedical Center Frankfurt using Ishihare-plates and anomaloscope using one pair of air traffic approved sunglasses and another one with blue filter. While the normal sunglasses produced a slight protanomalialia, the other led to significant deuteranomalialia.

The significant danger using sunglasses with blue filters is interfering with the interpretation of important information from the TFT displayed in blue on a black screen by changing the visually perceived information to a very dark blue or even nearly black. Therefore, such sunglasses should not be allowed in cockpits with CRT- or TFT-displays.

[OR39]

English: OPERATIONAL BASED VISION ASSESSMENT (OBVA) LABORATORY DEVELOPMENT

French: LE DÉVELOPPEMENT DU LABORATOIRE D'ÉVALUATION VISUELLE EN FONCTION DES OPÉRATIONS

JM Gooch, S Hadley, BT Sweet, M Winterbottom, J Gaska

USAF School of Aerospace Medicine, San Antonio, TX, USA

Introduction: Most current military aviation vision standards derive from vision research conducted during World War I. Although pass/fail thresholds have been periodically verified and modified, there have always been challenges to the operational relevance of some vision standards. While the science behind vision standards is sound, the current operational environment has changed dramatically, introducing new visual challenges with emerging technology. The Operational Based Vision Assessment (OBVA) program is an effort led by the USAF School of Aerospace Medicine to examine the relationship between measured visual capabilities and modern day operational human performance.

Methods: The OBVA laboratory will incorporate a high fidelity synthetic environment (simulator) to compare the relationship of standard clinical measures of color vision, high contrast visual acuity, low contrast acuity, stereopsis, dynamic visual acuity, motion perception and mesopic vision to operational performance during simple and complex visual tasks. A recently completed US Air Force Medical Service feasibility study resulted in the affirmation that current technology will support the planned laboratory development and subsequent human performance investigations.

Conclusion: The OBVA project is a funded collaborative aeromedical research initiative designed to exploit current flight simulation technology capability to fill the gap between aeromedical vision standards and operational vision requirements. Operational effects of various vision protection and enhancement technologies will also be studied.

[OR40]

English: AN OVERVIEW OF REFRACTIVE SURGERY AND VISION PERFORMANCE MAXIMISATION IN AVIATION

French: SURVOL DE LA CHIRURGIE RÉFRACTIVE ET DE L'OPTIMISATION DE LA PERFORMANCE VISUELLE EN AVIATION

G Nah

Republic of Singapore Air Force Medical Service, Singapore

Good vision is critical to aviation safety and pilot performance. A clear understanding of medical technologies that can enhance or optimise this attribute is an important component of the practice of aerospace medicine.

In this presentation, the author will describe and review the various existing and emerging medical technologies for vision performance enhancement that have been, or can potentially be employed to improve the vision of aviators. Such technologies include:

1. Advanced laser corneal refractive surgery (CRS):
 - a. Advanced Surface Ablation (ASA).
 - b. Femtosecond Laser In-Situ Keratomileusis (LASIK).
 - c. Wavefront-optimised CRS.
 - d. Wavefront-guided CRS.
 - e. Topography-guided CRS.
 - f. All-femtosecond laser CRS. g. Blend Monovision CRS.
2. Implantable phakic intraocular lenses.
3. Neuronal facilitation training.

The advantages and disadvantages of these technologies as they relate to the aviation environment will be also be discussed. New objective methods of measuring quality of vision such as the Rabin Super Vision Test Chart will also be introduced.

[OR41]

English: OPERATIONAL EVALUATION FOR CONTINUOUS WEAR CONTACT LENSES FOR AIRCREW IN THE TROPICAL AVIATION ENVIRONMENT

French: ÉVALUATION OPÉRATIONNELLE DU PORT CONTINU DES LENTILLES CORNÉENNES PAR LE PERSONNEL NAVIGANT DANS LE MILIEU AÉRONAUTIQUE TROPICAL

HB Lim, M Tan, J Low, D Chua, G Nah

Republic of Singapore Air Force Medical Service, Singapore

Introduction: Silicone hydrogel contact lenses have high oxygen permeability (dK) that allow a duration of continuous usage. Balafilcon A (Purevision, B&L) is an example of a high dK silicone hydrogel contact lenses that has been approved by FDA for continuous wear for 30 days and nights.

Methods: A group of aircrew (n=20) were recruited for the operational evaluation. These aircrew were required to either use contact lenses or spectacles when performing their flying duties. In the former group, the aircrew were required to wear the Balafilcon A (Purevision, B&L) contact lenses continuously for 14 days. During the 14 days, they were evaluated daily for visual acuity, comfort level and development of contact lenses related complications. The operational evaluation started in January 2010 and is expected to be completed by September 2010.

Results: The study group will elaborate on the proportion of aircrew who experienced ophthalmic related problems, proportion of aircrew who developed ophthalmic related complications and proportion of aircrew who satisfactorily completed the evaluation for continuous wear contact lenses with no adverse outcomes.

Conclusion: The authors expect that Balafilcon A contact lenses will prove to be a safe and hassle free refractive alternative for 14 days of continuous usage in the tropical aviation environment for aircrew.

CLINICAL AVIATION MEDICINE (CARDIOLOGY AND GENERAL AVIATION MEDICINE)

Thursday 14th October 2010, 1030-1200hrs.

MEDECINE AERONAUTIQUE CLINIQUE (CARDIOLOGIE ET MEDECINE AERONAUTIQUE GENERALE)

Chairpersons: Dr Peng Chung Mien (*Singapore Aeromedical Centre, Singapore*)
Dr Wang Jian-Chang (*General Hospital of Air Force, People's Republic of China*)

[OR42]

English: NATURAL HISTORY OF MITRAL VALVE PROLAPSE IN MILITARY AIRCREW

French: L'HISTOIRE NATURELLE DU PROLAPSUS DE LA VALVE MITRALE CHEZ LE

A Grossman, O Wand, A Prokopetz, A Assa

IAF aeromedical center, Petah tikva, Israel, Israel

Introduction: Mitral valve prolapse (MVP) is a common cardiac condition frequently associated with mitral regurgitation and a leading cause to mitral valve surgery. MVP has been associated with heart failure, arrhythmias, embolic phenomena, infective endocarditis and sudden death. The natural history of MVP, particularly in military aircrew, is a subject of ongoing research.

Objectives: To describe the natural history of MVP in military aircrew, and to evaluate the association between high-performance flight and the natural history of MVP.

Methods: Study population included all Israeli air force (IAF) aviators diagnosed with MVP. We retrospectively analyzed medical records for demographic data, medical history, relevant clinical events, and echocardiographic findings.

Results: We identified 20 aviators with MVP. 15 were aircrew of high-performance aircrafts. Mean age at end of follow-up was 41.4 years. Mean duration of flight career was 22.3 years. Mean time between first and last echocardiographic study was 8.5 years. In 4 subjects there was significant progression of mitral regurgitation, all were high-performance aviators. 3 subjects suffered relevant clinical events: 2 high-performance aviators progressed to severe mitral regurgitation due to chordae rupture, one of them required surgical repair; 1 low-performance aviator developed paroxysmal atrial fibrillation and underwent pulmonary vein ablation. Average annual rate of aeromedically significant events was 0.7% for both high- and low-performance aviators.

Conclusion: MVP is associated with a small but significant risk of complications in military aircrew personnel. Further research is required to assess a possible association between high-performance flight and between progression of mitral regurgitation and chordae rupture in subjects with MVP. Medical approval of military aircrew candidates should take possible future complications into consideration.

[OR43] (Time slot change to be after OR 20 at request of presenter. Please see at that time window for abstract)

English: THE AEROMEDICAL DISPOSAL OF ATRIAL FIBRILLATION. BEYOND THE 1% RULE?

French: LA DISPOSITION AÉROMÉDICALES DE LA FIBRILLATION AURICULAIRE. AU DELÀ DE LA RÈGLE DU 1%?

M Joy

UK CAA, Virginia Water, Surrey, UK

[OR44]

English: STRESS ELECTROCARDIOGRAPHY FOR AGE 60 MEDICAL ASSESSMENT – AN OUTCOME REVIEW

French: L'ÉLECTROCARDIOGRAPHIE DE TENSION POUR L'ÂGE 60 ÉVALUATION MÉDICALE – UNE RÉVISION DE RÉSULTAT

WH Gan¹, KH Chan², CH Chong³

¹*Licensing Medical Examiners Board, Civil Aviation Authority of Singapore*

²*ST Medical Services*

³*Civil Aviation Authority of Singapore*

Introduction: In November 2006, International Civil Aviation Organisation Council adopted an amendment to SARPS Annex 1 – Personnel Licensing, which increased by five years the upper age limit for commercial pilots operating two-pilot aircraft. Although the amendment did not recommend any additional compulsory investigations for age 60 and above licensing medical assessment, Civil Aviation Authority of Singapore implemented the compulsory performance of stress electrocardiography (ECG) as a routine for all age 60 pilots renewing their Class 1 licenses.

Methods: A retrospective review of all the routine stress ECG results was done for age 60 Class 1 medical assessments between November 2006 and May 2010. The outcomes of further cardiac evaluation tests for pilots with abnormal stress ECGs were examined to determine the presence of coronary artery disease (CAD) and the eventual impact on their aeromedical dispositions.

Results: Out of a total of 126 routine stress ECGs performed at age 60 medical assessments during period of review, 7 pilots (5.56%) were found to have abnormal stress ECGs. Of these, 5 underwent myocardial perfusion (MIBI) scans with the following outcomes – 1 case of negative MIBI scan, 1 case of positive MIBI scan, 2 cases of negative MIBI scans but CT angiographies showed mild and moderate severities of CAD respectively, and the last case of false positive MIBI scan with only luminal irregularities on coronary angiography. The 2 remaining cases with positive stress ECG proceeded directly for coronary angiography, with one case each of single vessel disease and triple vessel disease.

Conclusion: Overall, the rate of CAD detected functionally or anatomically was 3.97%, or an average of almost 3 pilots every 2 years, through implementation of routine stress ECG at age 60 medical assessment. Cases were detected when still clinically silent, with all pilots returning to flying duties after medical intervention. This screening modality is beneficial in contributing towards flight safety in commercial aviation and the long term well-being of pilots who are at risk of cardiac events from CAD.

[OR45]

English: DIFFERING DEFINITIONS VERSUS METABOLIC SYNDROME - AN INDIAN AVIATION PERSPECTIVE

French: DÉFINITIONS DIFFÉRENTES DU SYNDROME MÉTABOLIQUE - UNE PERSPECTIVE DE L'AVIATION INDIENNE

S Jeevarathinam, N Taneja

Aviation Medicine Specialist, Vellore, Tamil Nadu, India

Introduction: The early detection and prevention of risk factors among the multi-ethnic working population to optimize flight safety being the prime motto of civil aviation, the Metabolic Syndrome (MetS) has gained its recent international attention. With many defining criteria for MetS, no uniform consensus has been arrived at yet for application of specific definition in the Indian population. Till now, there is no published study of MetS in Indian aircrew. Literature search did not reveal any study in the aviation field comparing the predictability of various definitions of MetS. This study was thus carried out to gain some evidence based data on this domain.

Methods: The prevalence of MetS among 421 Indian civil aircrew reporting for their medical evaluation during the calendar year 2007 was analyzed using the MetS criteria of WHO, NCEP-ATP III and IDF. Further analysis was done to verify whether the differing definitions identified the same group of individuals.

Results: The mean age of the aircrew was 38.1 years. All except 33 aircrew were males. The prevalence of MetS varied from 2.6% to 5.2% with maximum and minimum prevalence found using IDF and WHO definition respectively. It was observed that only 3, 4 and 8 aircrew fell in MetS category using WHO & NCEP, WHO & IDF and NCEP & IDF definitions respectively. Only 2 aircrew satisfied the criteria of all 3 MetS definitions. Overall, the maximum prevalence of MetS was 6.7% detected by at least one definition.

Conclusion: Lower prevalence of MetS in aircrew compared to the general population could be attributed to the regular aeromedical evaluation to maintain higher health fitness as per the ICAO standards. The detection of somewhat different group of subjects by different defining criteria adds impetus to the growing consensus of the need to arrive at a unifying ethnicity based criterion for the diagnosis of MetS suitable for risk assessment in the aviation field.

[OR46]

English: IN-FLIGHT EVENTS AFFECTING COMMERCIAL AIRLINES' CREWMEMBERS: A 1-YEAR REVIEW

French: ÉVÉNEMENTS MÉDICAUX EN VOL AFFECTANT LES ÉQUIPAGES DE LIGNES AÉRIENNES COMMERCIALES: UNE REVUE DE 1 AN

PM Alves, G Bartos, R Leigh, D Streitwieser, N Nerwich

MedAire, Tempe, Arizona, USA

Introduction: Remote ground-based medical advisory services were primarily conceived to support in-flight medical events in passengers (Pax). Nevertheless, crewmembers (CMs) also are able to access these services. A careful review of In-Flight Medical Events Affecting Crewmembers (IFMECs) may provide useful information in regard to the events potential implications and prevention. The objective of this study is to better understand the epidemiology of IFMEC.

Methods: The database of a commercial provider of in-flight medical advisory services was retrospectively analyzed from Apr 09 to Mar 10. Cases were divided into CM and Pax groups. Epi-Info 3.5.1 was utilized for statistical analysis.

Results: 18,338 in-flight medical events were initially retrieved. In 885 (4.8%) cases a CM was involved. CMs were more often from the female gender (72% vs. 53%) and younger (32 ± 10.1 vs. 44 ± 12.1) than Pax. More calls from CMs came from long-haul flights (61%), whereas calls from medium-haul flights were more frequent for Pax. Gastrointestinal issues were the most frequent medical events for CMs, seconded by traumato-orthopedic events. Neurologic events were the third cause of IFMEC and the first for Pax. 1% (9) of the CM cases and 2.5% of the Pax cases resulted in route diversion (OR= 2.5 95% CI 1.3-4.8, p= 0.001). No difference on the hospitalization ratio post-event was found between the groups.

Conclusion: IFMECs are significantly different in nature than medical events occurring among Pax. This can at least partially be explained by baseline demographic differences. In this review, most cases were related to relatively minor medical problems, but serious conditions occurred causing CM impairment and even incapacitation, as well as diversions.

[OR47]

English: NEW APPROACHES TO DEALING WITH MEDICAL INCIDENTS ON LONG-HAUL FLIGHTS

French: NOUVELLES APPROCHES DU TRAITEMENT DES INCIDENTS MÉDICAUX SUR DES VOLS LONGS COURRIERS

V Feuillie, P Rodriguez-Redington, JL Schmitlin

Air France, Roissy, CDG cedex, France

Introduction: The number of in-flight medical incidents remains very low in relation to the constant rise in passenger traffic. Cabin Crews benefit from regularly updated paramedical training sessions. First aid kits and emergency medical kits are at the disposal of a doctor present on the flight. The conditions for conducting a medical examination on board are sometimes difficult due to the lack of space in the cabin and the absence of diagnosis equipment on board the plane. Occasionally, due to these factors, a flight is diverted if the patient cannot be treated properly on board the aircraft.

Methods: We have been looking at ways of improving the in-flight medical treatment provided to passengers by taking advantage of the additional space and improved technology on board the new Airbus A380 long-haul aircraft.

Results: The space available in the cabin of the Airbus A380 has enabled us to set up a medical area on the main deck, featuring an examination table and a curtain divider for the patient's privacy. With the progress made in telemedicine, the doctor can perform an ECG on board using a miniature device which automatically transmits information by satellite to the emergency medical service on the ground (Paris SAMU). Here is the initial feedback we have received about the medical treatment carried out on board our A380 long-haul flights.

Conclusion: The new possibilities now available for providing passengers with medical care will enable us to improve diagnosis and offer treatment which is better adapted to the patient's pathology and thus avoid having to re-route the plane.

AEROMEDICAL SELECTION, POLICIES AND REGULATIONS

Thursday 14th October 2010, 1300-1500hrs.

SELECTION AEROMEDICALE, POLITIQUES ET REGLEMENTS

Chairpersons: Dr Dougal Watson (*Civil Aviation Authority, New Zealand*)
Dr Chong Chun Hon (*Civil Aviation Authority of Singapore, Singapore*)

[OR48]

English: AN UNDERESTIMATED DIAGNOSIS IN AVIATION MEDICINE WITH RISK OF SUDDEN INCAPACITATION

French: UNE DIAGNOSE SOUS-ESTIMEE EN MEDICINE AERO-SPATIALE AVEC RISQUE D'UNE INCAPACITE SUBITE

J Kriebel, U Stüben

Aero Medical Center (AMC), Deutsche Lufthansa AG, Frankfurt Airport, Germany

Migraine and migrainous headaches are ubiquitous disorders / syndromes that do not follow geographical and social borders. Their prevalence and frequency are different for men and women. According to international statistics, 12 – 20% of women and 6 – 8% of men suffer from various types of migraine. There is also an age-related prevalence, peaking between 25 and 50 years. Diagnosis is usually made by history and clinical examination. Some complicated migraines need further neurological and neuroradiological diagnostic evaluations.

Flight crews seem to be less affected than the general population, which probably can be explained by their reluctance to disclose any history of migraine symptoms.

In our experience, this attitude among professional and leisure pilots as well as flight attendants can hold significant risks to life and medical certification as some acute and/or progressively neurological disorders are migrainous in origin. Had information been received regarding symptoms - often present for a long time such as in cases of complicated migraines - timely diagnosis and treatment could have prevented acute neurological complications and deficits such as focal or grand mal seizures. Such information, often obtained after neurosurgical treatment, completes these formerly negative histories.

This is confirmed by our retrospective review during the waiver processes in our AMC. We determined that prior to a neurological emergency, which included some in-flight incapacitations, all but one of the 72 cerebrovascular malformations (CVM: 29 aneurysms, 33 arteriovenous angiomas, 10 cavernomas) presented at an earlier time with migraines or migrainous severe headaches. None of these episodes had been reported to the AMEs. In 74% of the cases, we identified migraines with aura (classic migraine). In two cases there was migraine without aura; the invariant occurrence of the hemicranial headaches on the same side should have been seen as a warning syndrome. All intracranial aneurysms (AN) were correlated with a history of migraine. Their ruptures provoked life threatening subarachnoid hemorrhages.

The following vignettes will demonstrate the predilection of different CVMs to present as variations of complicated forms of migraine (ophthalmic, ophthalmoplegic and accompagnée-forms with sensorimotor pareses, aphasia or seizures). Simultaneous video and EEG recordings of a grand mal and a complex partial seizure will illustrate the risks for aviation safety.

These practical aeromedical experiences demonstrate that the AME needs to be aware of the importance to ask the right questions.

[OR49]

English: AN ANALYSIS OF COMPLEX CASES IN AUSTRALASIA: TOWARDS A SAFETY MANAGEMENT SYSTEM BASED AEROMEDICAL ASSESSMENT

French: UNE ANALYSE DES CAS COMPLEXES EN AUSTRALASIE: VERS UNE ÉVALUATION AÉROMÉDICALE BASÉE SUR UN SYSTÈME DE GESTION DE LA SÉCURITÉ

PD Navathe, T Sham, M Drane, D Fitzgerald

CASA, Canberra, ACT, Australia

CASA issues about 40,000 applicants with Class 1 Class 2 and Class 3, medical certificates every year. Some of these applicants have no medical condition, and some have non-significant medical conditions. However, there are some who have complex diagnoses or conditions and do not meet the medical standards. This paper reports on 5515 problematic aeromedical cases in Australia over the period 1990 to 2003.

Medical problems encountered were cardiovascular (31%), psychiatric (20%), malignant neoplastic (12%), neurological (11%), visual (5%) and other conditions. The data from Australia is compared with that from New Zealand and commonalities are identified. Initial examinations identified more cases in the earlier age groups. Cases identified in existing medical certificate holders were mostly in the ages between 45-60years. Periodic examinations identified almost 80% cases. The authors propose that based on the ICAO SMS model of aviation medical assessment, the medical assessment of pilots should target the two age groups where there is the highest opportunity for case finding.

[OR50]

English: MEDICAL EXAMINATION PROCESS AND STANDARDS FOR CABIN CREW

French: NORMES ET PROCÉDURE D'EXAMEN MÉDICAL POUR LE PERSONNEL NAVIGUANT COMMERCIAL

S Sodhi, N Bastaki

Etihad Airways, Abu Dhabi, UAE

Introduction: A comparative study has been made to measure the effectiveness of pre-employment medical assessment vis-a-vis pre-employment medical questionnaire format for cabin crew selection.

Methods: Medical records of cabin crew were retrospectively reviewed between Jan 2007 to May 2010. Comparison was made between the rejection rates of cabin crew who underwent full medical assessment and those who filled only the questionnaire. Secondly comparison was made between the sick absenteeism and health profile amongst the two groups.

Results: From Jan 2007 to Jun 2009, 2578 candidates underwent full medical assessment with a rejection rate of 1.04%. From Jul 2009 to May 2010, 319 candidates underwent only questionnaire assessment with zero rejection. The health profile during employment was similar between the two groups. The five major causes of license suspension amongst cabin crew were ENT, orthopedic, psychiatric, surgical and gynecological problems.

Conclusion: The questionnaire format for pre-employment selection of candidates was found to be equally effective as full medical assessment. The former is economical, less time consuming, and easy to carry out. The illness patterns amongst crew suggest the areas of emphasis while designing the questionnaire form.

[OR51]

English: MEDICAL ATTRITION IN MILITARY PILOT SELECTION: A SINGAPORE PERSPECTIVE

French: ÉLIMINATION MÉDICALE DANS LA SÉLECTION DES PILOTES MILITAIRES: UNE PERSPECTIVE DE SINGAPOUR

B See, WH Gan, R Low

Republic of Singapore Air Force Medical Service, Singapore

Introduction: Republic of Singapore Air Force (RSAF) pilot applicants undergo a comprehensive Pre-Employment Medical Screening (PEMS) examination to minimise medical attrition during training. A previous study of PEMS outcomes from 1984 to 1991 revealed that 41.3% of pilot applicants failed medical selection. Of these, ophthalmological (34.3%), anthropometric (23.7%) and ENT (13.7%) conditions accounted for the top 3 causes of failure. With changing disease patterns and the revision of selection vision standards by the RSAF, a follow-up study of PEMS outcomes from 1999 to 2006 was conducted to determine their impact on PEMS failure trends.

Methods: The RSAF's electronic database of PEMS outcomes from 1999 to 2006 was reviewed retrospectively. Pilot applicants who failed to meet non-medical selection criteria and those who were lost to medical follow-up were excluded from analysis as no decisions were made on their medical fitness for flying training.

Results: Of the 7183 pilot applicants examined, 3392 (47.2%) failed to meet the RSAF's medical selection criteria. Anthropometric (17.8%), respiratory (17.7%) and ophthalmological (14.7%) conditions were the 3 major causes of failure. Active asthma and remitted childhood asthma constituted almost all of the cases under the respiratory category, while refractive errors (79.5%) and squints (8.6%) constituted the majority of cases under the ophthalmological category.

Conclusion: 1. The proportion of pilot applicants attrited for ophthalmological conditions has fallen due to a relaxation in the entry eyesight criteria. The introduction of a corneal refractive surgery programme for pilot trainees is expected to further reduce this attrition. 2. The rising prevalence of atopy in Singapore has elevated respiratory conditions to one of the 3 major causes of failure at military pilot medical selection in Singapore.

[OR52]

English: APPLICANTS - STONES: REGULATORS - STICK? AEROMEDICAL DECISION MAKING IN KIDNEY STONES

French: DISPOSITION AÉROMÉDICALE DES CAS DE LITHIASE RÉNALE

M Drane, PD Navathe, D Fitzgerald

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Kidney stones are a common finding in the general population, and appear to be commoner in hot climates. In addition, major advances in imaging have made renal calculi an increasingly common incidental finding in applicants to Civil Aviation Safety Authority for a medical certificate. The severity of symptoms (and therefore incapacitation) gives this diagnosis considerable importance in the assessment pilots.

Urologists and aviation medicine specialists frequently have widely differing perspectives about the significance of this finding, and the implications both for treatment and then follow-up. The literature on recurrence of symptoms in people with kidney stones is limited, and so such applicants present a real challenge to the aeromedical decision-maker.

This paper addresses the questions of diagnosis, treatment and re-certification which are faced by a regulatory authority. In particular, approaches to follow-up imaging and considerations of radiation minimisation are reviewed and an assessment paradigm is presented.

[OR53]

English: COMPETENCY-BASED TRAINING FOR MEDICAL EXAMINERS: AN ICAO INITIATIVE

French: FORMATION AXÉE SUR LES COMPÉTENCES POUR LES MÉDECINS EXAMINATEURS: UNE INITIATIVE DE L'OACI

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The International Civil Aviation Organisation undertook an initiative to develop competency-based training for aviation medical examiners. The competency based approach has been adopted by ICAO in other operational contexts. A survey amongst member States revealed considerable diversity in approaches to the question of medical examiner training, with considerable scope for harmonisation.

The ICAO Medical Provisions Study Group developed guiding principles, undertook a task analysis, and from this was formulated a competency framework for medical examiners, providing guidance on which to base a training programme. The presentation outlines the process adopted and lays out the competency framework, which together provides an approach which has the potential to shift the emphasis of both the practice and training of medical examiners.

[OR54]

English: FIFTY YEARS AND MOVIN' ON: UNITED STATES AIR FORCE SCHOOL OF AEROSPACE MEDICINE PACKIN' TO OHIO

French: CINQUANTE ANS ET ÇA CONTINUE: L'ÉCOLE DE MÉDECINE AÉRONAUTIQUE DE L'ARMÉE DE L'AIR AMÉRICAINE DÉMÉNAGE EN OHIO

LP Krock, WR Ercoline

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Introduction: The United States Air Force School of Aerospace Medicine (USAFSAM) has a ninety-two year, rich heritage in the domains of discovery, education and training. For the last fifty of those years the USAFSAM mission was located at Brooks Air Force Base (BCB), Texas. Resulting from a 2005 Base Reduction and Closure (BRAC) Commission action, the USAFSAM mission, currently located at BCB, moves to Wright Patterson Air Force Base (WPAFB), Ohio, by September 2011. For the past six years, mission requirements were collected, functional mission synergies embodied into a new structure, workforce strategy debated, planned and transferred, tens-of-thousands of items inventorised and manifested to move or transfer for reutilization and a new mega-facility planned and readied at WPAFB to receive the flagship aeromedical training institute of the United States Air Force and our international partners. To our international partners, this transition to WPAFB should be uneventful; offering more opportunities than heretofore available. Furthermore, our international outreach program recently grew to include the export of courses to sponsoring countries; some 20 of these five-to-ten day courses bring the classroom to the student in their homeland country.

Methods and Results: Employing review of historical documents, observations related to logistics and personnel actions, and commentary about the inauguration and closure processes, insight will be offered relative to the complexity of this BRAC directed relocation and what can be expected by our international partners by this move.

Conclusion: U.S. Congressional direction declared: "close and move". As it turns out, doing so is not quite

as simple as it sounds, but the final actions related to the BRAC 2005 action are now being performed, and will be accomplished by mid-year 2011. The new School Complex at WPAFB offers the World-Wide Team-Aerospace a resource to achieve the highest goals of quality and safety; all the while fostering life-time, cooperative international relationships.

[OR55]

English: EVOLUTION OF AIRLINE AND OCCUPATIONAL MEDICINE IN THE UNITED STATES - A CAUTIONARY TALE

French: L'ÉVOLUTION DE LA MÉDECINE AÉRONAUTIQUE ET DE LA MÉDECINE DU TRAVAIL AUX ÉTATS-UNIS - UN RÉCIT EXEMPLAIRE

RR Orford

Mayo Clinic, Scottsdale, AZ, United States

Airline medicine emerged as a branch of aerospace and occupational medicine in the 1930s and grew rapidly with the growth of airlines following the Second World War. This paralleled the growth of occupational medicine and of industry in general. In recent years, growth in both occupational medicine and airline medicine has slowed or halted. Many airlines have actually reduced or eliminated their in-house medical staff, principally in the United States. Similar changes may occur internationally in the future.

The first reason for the decline of airline and occupational medicine in the USA is outsourcing, a corporate strategy devised in the late 1980s in order to focus on core business, increase flexibility, and reduce costs. The advantages and disadvantages of outsourcing, and its impact on occupational and airline medicine will be explored. A second reason for the decline in airline medicine results from broader changes in the field of medicine. In the United States medical services are often viewed by businesses as commodities rather than as professional services. Cost, rather than quality, therefore now often drives business decisions on medical service levels and staffing.

The impacts of these changes on airline pilot, passenger, and employee health and safety will be discussed. While outsourcing in defined areas such as in-flight emergency services and care for worker injuries may be effective and economical, there are hidden costs in other areas which cannot be easily outsourced, such as medical policy development and administration, disability management, environmental health assessment and control, health and productivity management, and accident and incident investigation. Corporate medical intelligence and management in all of these areas is crucial, and can most effectively and economically be provided by an in-house physician medical director with training and experience in airline medicine.

HUMAN FACTORS AND SAFETY

Thursday 14th October 2010, 1530-1700hrs.

FACTEURS HUMAINS ET SÉCURITÉ

Chairpersons: Dr Larry P. Krock (*USAF School of Aerospace Medicine, USA*)
Ms Delicia Ser (*Republic of Singapore Air Force Medical Service, Singapore*)

[OR56]

English: HUMAN FACTORS ISSUES IN COCKPIT AUTOMATION IN CIVIL AVIATION

French: ÉLÉMENTS DE FACTEURS HUMAINS DANS L'AUTOMATION DES POSTES DE PILOTAGE DANS L'AVIATION CIVILE

MJ Antunano

FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, USA

Cockpit automation started with analog technologies such as gyroscopic auto- pilots, automatic stabilizers,

auto landing gear down systems, auto flaps, emergency alarm/warning systems, etc. Today's glass cockpits utilize digital systems operated by computers including flight directors, fly-by-wire controls, auto-throttle, auto-trimming, auto-landing, GPS navigation systems, TCAS, EGPWS, head-up displays, head-mounted displays, helmet-mounted displays, synthetic voice advisory systems, anti-lock braking, anti-skid, etc. Future cockpits may include voice/vision/mind controlled systems, 3-D holographic displays, artificial intelligence systems, automated upset-recovery systems, etc. Digital automation promised more effective, efficient and safe flight operations due to improved systems reliability, less required maintenance, lower energy consumption, better control of power plants, more precise navigation, elimination of monotonous repetitive tasks, better pilot situational awareness, reduction of pilot workload, etc.

However, due to differences in cockpit automation design approaches used by different manufacturers, there is not a single standardized design philosophy that ensures an optimum interface between the pilot and the automated systems. Unwanted consequences of today's glass cockpits include increased pilot mental workload, increased head-down time associated with programming of computers, higher risk of pilot errors associated with computer programming, pilot complacency/monotony/boredom and decreased vigilance inflight, decreased situational awareness, difficulty identifying automation malfunctions including false alarms, sudden and unexpected malfunctions, concerns about decreased performance in manual piloting skills and abilities, concerns about pilot transition between aircraft from different manufacturers, concerns about pilot transition between old aircraft (analog) and new aircraft (digital), pilot confusion, transfer of control authority between captain and first officer, etc. To eliminate unwanted consequences of automation we must: 1) apply standardized principles of human-centered automation in the design of future automated cockpits, 2) implement pilot selection and training approaches to ensure the safe operation of future automated systems under nominal and emergency conditions, and 3) improve aircraft certification standards that ensure optimum operational safety assessment of new automated cockpit systems.

[OR57]

English: THE DEVELOPMENT OF RSAF'S HUMAN FACTORS ANALYSIS MODEL: A CASE STUDY IN IMPROVING HUMAN FACTORS INCIDENT REPORTING

French: LE DÉVELOPEMENT DU MODÈLE D'ANALYSE DES FACTEURS HUMAINS DE LA RSAF: UNE ÉTUDE DE CAS POUR AMÉLIORER LA DÉCLARATION DES INCIDENTS RELIÉS AUX FACTEURS HUMAINS

CY Cheng, D Ser

Republic of Singapore Air Force Medical Service, Singapore

The RSAF (Republic of Singapore Air Force) adopted Wiegmann and Shappell's (2000) Human Factors Analysis and Classification System (HFACS) for its incident and accident classification and analysis in 2004. Recently, the RSAF reviewed the HFACS model, reviewing and simplifying the factors and sub-factors within HFACS, as well as incorporating intelligent flow programming simulating a typical accident investigation fact-gathering structure.

The new system, named Human Factors Analysis Model (HFAM), contained modified factors and sub-factors within HFACS and integrated it with the RSAF's existing 5M (Man, Machine, Medium, Management, Mission) Model, which is generally used for post accident fact gathering. The process of this review will be shared and explained together with the principles of the intelligent flow programming which incorporates the principles of Reason's Swiss Cheese Model.

The HFAM was implemented in the RSAF in November 2009. This paper will also share the outcome of this review, comparing qualitative differences in the way users have reported incidents from November 2009 to June 2010, as compared to the period from January 2008 to November 2009. In addition, quantitative changes in the reporting patterns and breadth/depth of incident analysis of events in the RSAF (i.e. in terms of the number of factors selected breadth, and number of sub-factors selected depth) after the implementation of HFAM will also be reported. Recommendations following the results of the review will also be given.

[OR58]

English: OVERVIEW OF A CLINICAL REVIEW PROCESS FOR ADVERSE EVENTS: PARALLELS BETWEEN THE HEALTHCARE AND AVIATION SYSTEMS

French: SURVOL D'UN PROCESSUS DE RÉVISION CLINIQUE DES ÉVÉNEMENTS DÉFAVORABLES: PARALLÈLES ENTRE LES SYSTÈMES DE SANTÉ ET D'AVIATION

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Introduction: Healthcare is widely acknowledged to have a high risk of errors which are of devastating consequences to the patient, not unlike the risks faced by the aviation industry. The aviation industry introduced various measures to help improve safety, focusing on systemic review of incidents resulting in a significant improvement in safety in the airline industry over the years. The healthcare industry has also adopted various measures to improve the safety of healthcare delivery to patients. In 2005, Tan Tock Seng Hospital in Singapore launched a continuous, retrospective chart review program to identify potentially preventable adverse events for quality improvement by employing a 2-stage review methodology.

Methods: Selected cases are flagged for review based on the outcome to the patient (i.e. inpatient death, or unplanned re-admission). Cases with potentially preventable adverse events identified are flagged to clinicians for review. Departmental peer reviews are conducted to suggest recommendations for improvements for areas of concern. A hospital level committee reviews and endorses recommendations where appropriate.

Results: The chart review program, coupled with other hospital initiatives has helped reduce the hospital adverse event rate by 31% within 5 years.

Conclusion: Similar to the airline industry, the chart review program has 2 main characteristics: a retrospective, randomized analysis of flagged cases to identify potentially problematic areas within the hospital for improvement purposes, and a ground approach to the issues identified with the departments involved conducting peer reviews and coming up with recommendations for improvements on issues. Such a system of review and continuous improvement is vital for high reliability organizations in the airline and healthcare industries, where quality standards ensure the safety of millions across the globe.

[OR59]

English: AIRCRAFT ACCIDENTS ANALYSIS IN THE ROYAL THAI AIR FORCE IN ONE DECADE (1998-2007) USING HUMAN FACTOR ANALYSIS AND CLASSIFICATION

French: ANALYSE DES ACCIDENTS D'AVION DANS L'ARMÉE DE L'AIR ROYALE THAÏLANDAISE EN UNE DÉCENNIE (1998-2007) EN UTILISANT L'ANALYSE ET LA CLASSIFICATION DES FACTEURS HUMAINS

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Introduction: The objective of this study is to design a form for recording causes of aircraft accidents, for the Royal Thai Air Force (RTAF), using the Human Factors Analysis and Classification System (HFACS) and to study causes of aircraft accidents in RTAF in one decade, which shall guide the strategic design for preventing future accidents.

Methods: We studied the sample of 42 cases of aircraft accidents in the RTAF from 1998-2007, using HFACS form in Thai, which contains 4 main factors and 18 sub-factors.

Results: From the 18 sub-factors, the leading causes are inadequate supervision (100%), skill-based error (83.3 %), and decision error (80.9%), respectively. Each aircraft accident has, as causal factors, an average of 7 sub-factors. From 42 cases of aircraft accidents, the main leading causal factors are: level 3 unsafe supervision, level 1 unsafe acts, level 2 pre-conditions for unsafe acts, and level 4 organizational influences, respectively. We also found correlations and influences between each of the 4 main factors. The higher level of factors influenced the lower level of factors. We found 7 pairs of these influences. The leading 3

are: crew resource management has influence on 2 sub-factors - perceptual error (11.5 times) and violation (9.88 times), and adverse mental reaction influences violation (6 times).

Conclusion: The first short term strategy recommended for accident prevention is the correction of unsafe supervision (inadequate supervision). The long term strategy is to correct crew resources mismanagement, which would lead to reduction of perceptual error and violation. The HFACS and the new HFACS form is a useful tool in the safety management process, as both a classification tool and a tool to assess efficiency in aircraft accident prevention. To prevent and correct causes of aircraft accident in the RTAF, we need adequate supervision, proper crew resources management training, continuous flight training (including simulator training), and a pro-active safety programme to correct the latent failures.

[OR60]

English: WELL-BEING & PILOTS' FLYING: AN EMPIRICAL STUDY ON THE IMPACT OF MEDICAL STATUS ON MENTAL HEALTH

French: BIEN-ÊTRE ET LES PILOTES OPÉRATIONNELS: UNE ÉTUDE EMPIRIQUE DE L'IMPACT DU STATUT MÉDICAL SUR LA SANTÉ MENTALE

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Introduction: Medical examination is done periodically for all military aircrew apart from entry medical examination to assess fitness for flying. Aviators disqualified from flying may experience lower levels of Psychological Well-Being (PWB). This also has a bearing on their recovery and return to flying. The present study aims to determine the impact of medical status upon PWB of aircrew.

Methods: 110 military pilots reporting for medical boards or aero-medical training voluntarily participated in the study. 46 pilots belong to medically fit-to-fly category, 20 pilots to temporary low medical category and 44 to permanently unfit-to-fly category. Diener's Satisfaction With Life Scale (SWLS), WHO Well-being Index, Watson's Positive Affect and Negative Affect Scale (PANAS), Marlowe-Crowne Social Desirability Scale questionnaires, demographic inventory were administered. Statistical analysis using PASW was carried out.

Results: The descriptive data showed that in general the aviators were in the average range profile on SWLS irrespective of their category. On PWB, the active flyers reported to have good quality of life while temporary and permanently grounded reported to experience average quality of life. The group displayed a high Positive Affect (PA) score irrespective of the flying status. One-way ANOVA revealed highly significant differences between the three groups of aviators on the dimensions of PWB. Post-hoc results manifested that there is a significant difference between active flyers and temporarily grounded pilots on SWLS and PWB. A significant value was also obtained between active flyers and permanently grounded flyers (significant difference among the three groups of medical status in their perception about satisfaction with life when total flying hours are taken as a covariate).

Conclusion: The maintenance of grounded aviator is examined in the light of the findings and available literature. Implications for future research on PWB in Indian Air Force and the role of aviation medicine in facilitating the grounding among medically disqualified is discussed.

[OR61]

English: THE HUMAN VISUAL SYSTEM AND ITS LIMITS ARE CHALLENGED TODAY MORE THAN EVER IN THE HIGH DEMANDS OF MODERN AIRCRAFT AND REMOTELY PILOTED AIRCRAFT

French: LE SYSTÈME VISUEL HUMAIN ET SES LIMITES SONT REMIS EN CAUSE AUJOURD'HUI PLUS QUE JAMAIS DANS LES EXIGENCES ÉLEVÉES DES AVIONS MODERNES ET DES AVIONS TÉLÉGUIDÉS

SC Hadley

USAF, Niceville, FL, USA

Introduction: The current operational flying environment has changed dramatically with emerging technology including all glass cockpits and multi - function displays which challenge the human visual system and to its physiological limits.

Methods: This presentation will discuss the human visual system including visual anatomy, visual acuity, visual field, color vision, contrast sensitivity and perception of vision. Clinical aspects of normal deterioration of vision during an aircrew's career will next be discussed including cataracts, refractive surgery, glaucoma and decreased retinal function. Finally visual illusions will be presented and analyzed.

Conclusion: The high demands of today's modern aircraft with multi-function all glass displays challenge the limits of the human visual system. Aeromedical specialists must remember the human behind the machine in both flying aircraft and remotely piloted aircraft.

58th International Congress of Aviation and Space Medicine – 7th Asia Pacific Congress of Aerospace Medicine 10-14 October 2010

AEROSPACE PHYSIOLOGY

PHYSIOLOGIE DE L'ALTITUDE

[PR01]

English: EFFECTS OF COMPOUND CHINESE DRUG "TIAN-QI-HANG-LI-PIAN" ON WHOLE BLOOD RHEOLOGICAL PROPERTY, SERUM ANTIOXIDATIVE ABILITY AND MYOCARDIAL ULTRASTRUCTURE IN RATS AFTER HIGH G STRESS

French: LES EFFETS DU MÉDICAMENT CHINOIS "TIAN-QI-HANG-LI-PIAN" SUR LA PROPRIÉTÉ RHÉOLOGIQUE DU SANG, L'ABILITÉ ANTIOXIDANTE DU SÉRUM ET L'ULTRASTRUCTURE MYOCARDIQUE CHEZ LE RAT APRÈS UNE ACCÉLÉRATION ÉLEVÉE

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Introduction: To observe the effects of compound Chinese drug "Tian-qi-hang-li-pian" on blood rheological properties, serum antioxidative ability and myocardial ultrastructure in rats after high G stress.

Methods: Male rats were divided into six groups (n=12): (1) Normal control; (2) Stress control; (3) High G stress; (4)-(6) different dosages (0.75, 1.5, 3.0g liquid extracts/kg) of drug. The groups (4)-(6) were orally given the drug once daily, continually for 14d; and the others were given the distilled water. The groups (3)-(6) were exposed to +10Gz 5min in the next morning. The stress controls were only immobilized in animal centrifuge for 5min. The blood and a piece of myocardium in left ventricle were obtained when the rats were anesthetized at 1h after high G stress. The blood rheological property, serum SOD activity and MDA content of different groups were detected and myocardial ultrastructure was observed by using electron transmission microscope.

Results: Compared with the normal controls and stress controls, the blood viscosity and hematocrit were significantly increased after high G stress, but they were significantly improved when the drug was pretreated. The serum SOD activity was remarkably decreased and MDA content was significantly increased after high G stress but the SOD activity was significantly increased and MDA content was decreased when the drug was given. Compared with the normal controls and stress controls, the obvious ultrastructural injury in myocardium was observed after high G stress, but the high G stress induced ultrastructural injury was significantly improved when the drug was pretreated.

Conclusion: The compound Chinese drug "Tian-qi-hang-li-pian" had significant protective effects on blood rheological properties, serum antioxidative ability and myocardial ultrastructure in rats after high G stress.

[PR02]

English: THE HEMODYNAMIC CHANGES DURING ANTIGRAVITY STRAINING MANEUVERS ASSESSED BY IMPEDANCE CARDIOGRAPHY - PRELIMINARY REPORT

French: LES CHANGEMENTS HÉMODYNAMIQUES AU COURS DE MANOEUVRES ANTI-GRAVITÉ ÉVALUÉES PAR CARDIOGRAPHIE IMPÉDANCE - RAPPORT PRÉLIMINAIRE

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Introduction: The anti-G straining maneuver (AGSM) is still an important part of pilot protection for G-induced loss of consciousness. It affects peripheral resistance, chest pressure, baroreceptors and autonomic nervous system activity. In consequence, the AGSM has influence on parameters that determine heart systolic function and left ventricle work. The AGSM is a combination of muscle tension (MT) and breathing techniques, but up till now it is not known which component affects more the physical aspects of blood circulation and cardiac function. The aim of the study was comparative assessment of changes in selected hemodynamic parameters during classical Valsalva maneuver (VM), MT and AGSM series.

Methods: Ten healthy pilots were examined. Hemodynamic parameters were recorded by impedance cardiography in rest and during VM, MT and AGSM. Each test lasted 15s. Cardiac output (CO), left ventricle work index (LVWI), pre-ejection period (PEP), left ventricular ejection time (LVET) and Heather Index (HI) were measured.

Results: Mean values of parameters in rest, VM, MN and AGSM were equals: CO 6,3; 7,2; 7,34 and 10,6 l/min, LVWI 4,1; 4,7; 5,4 and 7,8mmHg x l / [min x m²], ACI 93,3; 92,4; 77,2 and 134,4 1000/s., PEP 124,6; 120,6; 114,4 and 96,9ms; LVET 297,2 ; 261,7; 260 and 244,6 ms, HI 0,32; 0,27; 0,25 and 0,51. In comparison with rest LVET was statistically shorter during VM and MT; CO increase only during MT and AGSM; PEP became shorter during MT and AGSM; LVWI was higher during AGSM and MT and HI was higher only during AGSM.

Conclusion: 1. During the AGSM series, the dynamic changes in preload, afterload and sympathetic activity significantly affect parameters of systolic function and left ventricle work. 2. The hemodynamic trend during AGSM similar to MT suggests higher input of muscle tension.

[PR03]

English: COGNITIVE EFFECTS OF LOW LEVEL HYPOXIA MEASURED BY COGSTATE TESTING: A VALIDATION STUDY

French: LES EFFETS COGNITIFS DE L'HYPOXIE LÉGÈRE MESURÉS PAR LE TEST COGSTATE: UNE ÉTUDE DE VALIDATION

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Introduction: Because the same altitude produces different levels of hypoxia in different subjects, we used the GO2altitude normobaric hypoxicator system to dynamically change the level of inspired oxygen to target and maintain SpO₂ levels of 80+/-5% and a repeatable, sensitive computerised cognitive testing system (Cogstate Research) delivered and analysed by internet, to measure the cognitive and psychomotor effects of this moderate level of hypoxia.

Methods: Cogstate Research uses a Detection test (DET) of Psychomotor Function/Processing Speed; an Identification task (IDN) for Visual Attention/Vigilance; a One Card Learning Task (OCL) tests Visual Learning & Memory; a One Back Task (ONB) tests Attention/Working Memory and a Chase test of Visual Motor Function. This initial validation study performed 21 separate testing sessions on 7 consenting subjects. A practice session presented all tasks, followed by a normoxic and a normobaric hypoxic session in which the operator but not the subject knew whether normoxic or hypoxic gas mixture was being administered. A questionnaire determined that on only half these presentations were subjects aware of any performance impairment during the normobaric hypoxic presentation.

Results: The mean results for DET and IDN presentations calculated from an Excel data spreadsheet are tabulated below.

SpO2 Task Correct Errors Responses Speed Variability Accuracy

98.0% DET 35 0 35 2.5252 0.1163 1.5708

81.2% DET 36 3.4 39.4 2.5791 0.1246 1.3218

98.0% IDN 30 0.4 30.4 2.7784 0.0936 1.5203

81.2% IDN 30 1.8 31.8 2.7081 0.0940 1.3924

For Detection and Identification, hypoxia SpO2 81.2% increased errors and reduced the speed of processing and accuracy, but did not affect Learning, Working Memory or Chase Task.

Conclusion: GO2altitude normobaric hypoxicator produced a chosen hypoxic stimulus (SpO2 80%) with little variability. Cogstate testing accurately measured the impairment of Psychomotor processing and Visual attention/vigilance at this moderate hypoxic level equivalent to 14,000ft altitude.

[PR04]

English: THE RR INTERVALS ENTROPY CHANGES DURING +GZ ACCELERATION IN MILITARY PILOTS

French: LES CHANGEMENTS D'ENTROPIE DES INTERVALLES RR PENDANT L'ACCÉLÉRATION DANS L'AXE +GZ CHEZ LES PILOTES MILITAIRES

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Introduction: G-LOC anticipation is one of the most important problems in aviation medicine. This abstract presents results of assessments of the RR intervals entropy changing during +Gz centrifuge exposure in pilots.

Methods: The investigation has been carried out in 20 military supersonic aircraft pilots (F-16, Mig 29). All of them were subjected to two centrifuge exposures: the first was the linear profile of acceleration at 0.1 G per second and the second was a steady-state time profile at 4G. The completion of acceleration was performed by the pilots themselves. Time of exposure, level of acceleration and four signals of ECG were recorded with sampling frequency of 1kHz. The entropy of RR intervals was analysed in whole records and in different parts of records during increase, steady state, decrease of acceleration and during rest.

Results: The changes of the RR intervals entropy during acceleration was expected and demonstrated in previous research. In current study, observed changes of RR intervals entropy was independent of the kind of acceleration profile but dependent on the value of exposure duration. Pilots who terminated centrifuge profiles earlier had significantly lower RR intervals entropy compared to pilots who completed acceleration profiles for a longer duration.

Conclusion: The assessment of the RR intervals entropy changes during high +Gz exposure may be useful for G-LOC anticipation during real flights.

[PR05]

English: EFFECT OF EXERCISE ON AERIAL SPECIAL GYMNASTICS APPARATUSES ON BLOOD SERUM LEVELS OF SELECTED BIOCHEMICAL INDICES

French: INFLUENCE DES EXERCICES FAIT AVEC DES APPAREILS SPÉCIAUX DE GYMNASTIQUE AÉRIENNE SUR LES NIVEAUX SÉRIQUES DE CERTAINS INDICES BIOCHIMIQUES

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Introduction: Evaluation of ASGA exercise and its effect on serum metallothionein (MT), zinc, copper, creatinine, protein, neuron specific enolase (NSE), and physical fitness.

Methods: 55 young cadets are divided into two groups: group A (N=41), studied and group B, control (N=14), participated in the study. Blood was analyzed. Samples were drawn twice: prior to and after exercise (series I), during (series II), and after completion of exercises on ASGA (series III). Serum MT, zinc, copper, creatinine, protein, and NSE were assayed with test kits. Fitness tests were used to assess physical fitness. Obtained results were compared with baseline values.

Results: Significant decrease in serum MT was noted in both groups in all three series, except series II in group B. In group A, inconsiderable increase in NSE was found in series I, significant in series II, and inconsiderable in series III. In group B, significant increase in NSE was noted in series I and II, and inconsiderable in series III. Significant decrease in serum zinc was seen in series I and II in both groups; inconsiderable increase in series III in group A, and decrease in group B. In group A, serum copper significantly decreased in all three series and inconsiderably increased in group B. Serum creatinine increased significantly in all series in both groups, except series I in group A. In group A, serum protein decreased markedly in series III. Serum protein increased significantly in series II in both groups. Physical fitness improved considerably.

Conclusion: Serum MT is a valuable diagnostic tool in the assessment of adaptation to the exercise on ASGA load and physical fitness improvement.

[PR06] (Did not attend)

[PR07]

English: CO₂ INDUCED CHANGES IN VESTIBULAR FUNCTION IN THE AEROSPACE ENVIRONMENT

French: CHANGEMENTS DANS LA FONCTION VESTIBULAIRE INDUITS PAR LE CO₂ DANS L'ENVIRONNEMENT AÉRONAUTIQUE

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Introduction: Soon after the effect of oxygen deprivation upon the structure of the Organ of Corti and its trans-membrane potentials was shown by Lawrence (1952), vestibular reactions during Coriolis accelerations during hypoxia and in space flights became relevant in the 1960s. Their resilience to hypoxia (1978), change cytoplasmic acidification with CO₂ insufflations, its washout and H⁺ in the Hensen cells.

Historical Review: The 1980s indicate that CO₂ in the middle ear influences the acid-base regulation of inner ear fluids and cochlear function. The 1990s have studies of the effects of respiratory ventilatory responses of hypocapnia in perception of motion and motion sickness, via the cerebral V1 area which is a gateway for visual motion information processing. The 1990s show head-up tilt (HUT) as a means of simulating weightlessness both before and after centrifugation, changes in BP(eye), PET(CO₂), CFV in the middle cerebral artery (transcranial Doppler ultrasound), (CVR), for dynamic cerebral autoregulatory gain. Vestibular cues in orthostatic cardio-respiratory response, visual, and proprioceptive integrations generally align initially with the longitudinal body axis and influence subjective tilt and self-motion in varying gravitational conditions. NASA-ESA-DARA's simulation study with two different CO₂ levels wherein systemic and psychological responses such as hyperventilation as mediated by carotid baroreceptors in microG and the supine position have been shown.

Conclusion: The topical increases of CO₂ in the spacecraft environment has significant consequences and the measurement of non invasive CO₂ functions of respiration and gas exchange take on a new and powerful meaning. The relative importance of 'Air or Oxygen' to breathe, in extreme gravitational changes may need to be explained by re-deriving the basics of the Physio-chemical, steady-state linkages of Bohr-Haldane Laws and Haldane and Verigo-Bohr effects, and like Ludwig, re-bridge the gap from qualitative gas analysis to quantitative research into the kinetics of gas binding in individual organs and sensitive to weightlessness.

[PR08]

English: SYSTEM FOR MONITORING SELECTED PHYSIOLOGIC PARAMETERS DURING TRAINING ON SPECIAL GYMNASTIC DEVICES

French: UN SYSTÈME POUR OBSERVER CERTAINS INDICATEURS PHYSIOLOGIQUES PENDANT L'ENTRAÎNEMENT SUR DES APPAREILS DE GYMNASTIQUE SPÉCIAUX

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Introduction: Fast jet pilots are exposed to variable accelerations in-flight. Physical fitness training with use of special gymnastic devices (SGD) performed especially at the beginning of a flying career may provide increased spatial disorientation resistance. MIAM has developed and produced physiological parameters monitoring set for use during SGD augmented training. The presentation discusses the construction and possibilities of use of such monitoring set.

Discussion: The Monitoring system consists of: 10 mobile recorders for monitoring of 2 channels ECG, 3 axis accelerations and current HR value. Those parameters are presented on an operator station as a graph and in digital form. There is also alarm function (audio and video) warning the operator when critical values are exceeded and when arrhythmia is present. Measurement module is taken for galvanic skin resistance (GSR) during exercises in the Barany chair.

Conclusion: The presented system allows us to compare pilots circulatory system reactions in selected phases of SGD training like tilt table orthostasis or Coriolis test on Barany chair. Initial results show benefits of system use in circulatory and vestibular oriented training.

[PR09]

English: CHANGES IN POSTUROGRAPHIC TEST RESULTS BEFORE AND AFTER TRAINING WITH SPECIAL AVIATION GYMNAS TIC DEVICES

French: CHANGEMENTS DANS LES RÉSULTATS DU TEST POSTUROGRAPHIQUE FAIT AVANT ET APRÈS L'ENTRAÎNEMENT SUR DES APPAREILS DE GYMNAS TIQUE SPÉCIAUX

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Introduction: Aviation motion sickness remains to be a problem amongst military aircrew, especially in transport aviation. Connection between vestibular and vegetative neural pathways can cause vegetative disturbances during motion sickness episodes and compromising flight safety. It is possible to diminish these unfavorable reactions through decrease of vestibular sensitivity by repeatable vestibular stimulation (habituation). Part of the training for young pilots is exercising on special aviation gymnastic devices (SAGD). Such training enhances vestibular habituation. One of the measurements of vestibular system function is posturographic testing. The aim of the work was comparison of posturographic parameters tested before and after SAGD training.

Methods & Results: Subjects were 44 male young pilots (age 19.5 +/- 1.2 yr) who underwent 2 months special training on SAGD in Polish Air Force Academy. They participated before and after training in two series of measurements in three conditions (eyes closed, eyes open and with visual feedback. Posturographic assessment revealed improvement in terms of postural stability, speed of CoG movements and CoG deviations.

Conclusion: Use of posturography can be beneficial in assessment of SAGD training results.

[PR10]

English: UNITED STATES AIR FORCE COMMANDER-DIRECTED ACCELERATION TRAINING

French: FORMATION EN ACCÉLÉRATION DEMANDÉE PAR UN SUPÉRIEUR DANS L'ARMÉE DE L'AIR AMÉRICAINE

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This presentation will give attendees of the 58th International Congress of Aviation and Space Medicine an opportunity to learn about the Commander Directed Acceleration Training (CDAT) program that is currently utilized by the United States Air Force.

Centrifuge training is a successful method to teach aircrew to combat G-induced loss of consciousness (GLOC) by implementing an effective and timely anti-G straining maneuver (AGSM). USAF centrifuge training consists of initial, qualification and refresher training. CDAT is utilized as a retraining tool by an organizational commander to address specific concerns. Any aircrew member may return to the centrifuge facility for acceleration training at the discretion of his or her commander. During the 3-day program, a qualified Aerospace Physiologist will evaluate and improve an aircrew's performance under G. The demands of operating High G aircraft often detract from AGSM performance, therefore all High G aircrew must be able to balance flying operations and AGSM employment. CDAT will conclude in a recommendation made by the Aerospace Physiologist to the aircrew's commander. This formal, written recommendation will evaluate whether the AGSM provides adequate protection against the G levels capable of being produced by the aircraft. The recommendation may also include flight restrictions for aircrew whose centrifuge performance indicates a higher propensity to problems.

[PR11]

English: TRAINING ON SPECIAL AERIAL GYMNASTIC INSTRUMENTS (SAGI) AS A METHOD OF FITNESS AND PHYSICAL CONDITION PREPARATION OF CADETS FOR MULTI-ROLE AIRCRAFT PILOTS

French: EXERCICE AVEC DES APPAREILS SPECIAUX DE GYMNASTIQUE AÉRIENNE COMME MÉTHODE DE PRÉPARATION AU CONDITIONNEMENT PHYSIQUE ET À L'APTITUDE DES CANDIDATS PILOTES DES AVIONS POLYVALENTS

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Introduction: One of the tasks of aviation physiology is seeking ways to improve pilots' performance through specialized physical training. The purpose of this research was to analyze the influence of the special aerial gymnastic instruments (SAGI) training (looping, gyroscope, Rhine hoop)* on fitness, physical efficiency, coordination and spatial orientation among aviation aspirants.

Methods: 19-year-old cadets of the 1st year underwent forty-hour training - an experimental group (group I, N=41) using SAGI and control group (group II, N=14) underwent the standard physical education program. Before and after the training, both groups were examined. Physical fitness was estimated on the basis of the following tests: shoulder girdle strength, speed, speed endurance and abdominal muscle strength. Coordination was examined using the Aero- Synthetic Fitness Test (ASFT), anaerobic strength by means of Wintage Anaerobic Test and body components were measured by means of bioelectric impedance method using the Akern BIA101SE analyzer.

Results: SAGI training improved the ASFT results from 49.71±5,39s to 45.13±4,03s (p16 m run results from 2.92±0.11s to 2.86±0.09s (p from 71.80±13.44 to 79.20±13.76 [p(10x10m run)] changed irrelevantly. Maximum anaerobic efficiency improved from 12.95±1.53W/kg to 13.39±1.44W/kg [p 8.56±0.66W/kg to 8.84±0.61W/kg] (p did not change). The experimental group achieved higher progression of coordination and spatial orientation but differences between the two groups were not statistically significant.

Conclusion: SAGI training is the effective method of coordination and orientation development in conditional and fitness preparation for flights.

[PR12]

English: DEVELOPMENT OF AN AUTOMATED SYSTEM FOR DETECTING DANGEROUS G FACTOR ELEMENTS OCCURRING IN AIR TRAINING MISSIONS

French: DÉVELOPPEMENT D'UN SYSTÈME AUTOMATISÉ POUR LA DÉTECTION DES ÉLÉMENTS DANGEREUX RELIÉS À LA GRAVITÉ LORS DES MISSIONS DE FORMATION

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Introduction: G-LOC is a problem affecting not only pilots of high manoeuvre jet aeroplanes, but also cadets who undergo training on aircraft with much lower performance. Even while learning the basic maneuvers within a designated area, a pilot student is exposed both to fast-changing G-forces achieving significant values and the dangerous push-pull effect. The presented system has been developed to detect the conditions for the formation of acceleration stimuli difficult or impossible to compensate by the human body.

Methods: Records from the on-board recorder of the PZL-130 TC-1 'Orlik' aircraft were examined, which allowed the characteristic shapes of acceleration profiles to be specified. Profiles of the linear, interval, and push-pull types were implemented on the human centrifuge. 20 selected pilots had a test using the centrifuge, during which their physiological signals such as heart rate, systolic and diastolic pressure, were recorded. In the further phase, mathematical models of behaviour of the physiological parameters subjected to the influence of the acceleration profiles were developed. As a result of advanced study by physiologists, pilots and bioengineers, those values of acceleration parameters were selected which may pose a potential danger.

Results: The integrity of the system implemented within the defined threat detection algorithms was tested using a database containing 87 signals recorded by the on-board recorder during various types of missions. All of the 26 places selected by experts as potentially dangerous were detected and correctly identified by the system. The reporting feature provides a result summary of the analysis.

Conclusion: The system developed at the Military Institute of Aviation Medicine can be used in the pilot training process to identify potentially hazardous components of a flight. This can allow better pre-flight preparation and appropriate responses during a flight. Further work will focus on developing models for at least partial prediction of the behaviour of selected physiological parameters.

[PR13]

English: EFFECT OF SIMULATED MICROGRAVITY ON BIOLOGICAL BEHAVIORS OF HUMAN PERIODONTAL LIGAMENT STEM CELLS

French: L'EFFET DE LA MICROGRAVITÉ SIMULÉE SUR LES COMPORTEMENTS BIOLOGIQUES DES CELLULES SOUCHES DU LIGAMENT PÉRIODONTAL HUMAIN (DESMODONTE)

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Introduction: Previous studies have suggested that periodontal ligament stem cells (PDLSCs) play a crucial role in regeneration of periodontal defects. A theoretical way would be to provide a stimulatory environment to rapidly expand PDLSCs in vitro to expedite tissue engineering of periodontium. We hypothesize that three-dimensional (3D) dynamic simulated microgravity (SMG) culture system would benefit periodontal stem cells proliferation and differentiation, and growth factor like IGF-I would enhance osteogenesis of hPDLSCs in 3D culture system.

Methods: hPDLSCs were isolated from surgically extracted human teeth, and enriched by collecting multiple colonies. HPDLSCs were inoculated on Cytodex 3 micro-carriers and cultured in RCCS. The morphology and proliferation of hPDLSCs were tested. IGF-I of different concentrations were added into the culture system, and markers of osteogenesis were investigated.

Results: After clinorotation for 7 days, hPDLSCs actin filaments became obscure and extenuated, and indicated dispersed distribution. Cell cycle analysis showed that an increasing number of hPDLSCs in SMG proceeded into the G2/S phase as compared with that in NG. The expression of ALP, COL I and OCN in SMG caused a 1.38, 1.27, 1.08 folds increase as compared with those in NG for 1 day of incubation, respectively. 100%g/ml IGF-I caused the increase of ALP expression of hPDLSCs significantly in 3D environment.

Conclusion: SMG affects the biology of hPDLSCs by promotion of proliferation and viability, alterations of

morphology and disorganization of microfilament system. Besides, SMG treated hPDLSCs present increased matrix mineralization and up-regulated expression of mineralization associated genes after incubation in osteogenic medium. IGF-I enhances the osteogenesis of hPDLSCs in 3D environment.

[PR14] (Did not attend)

[PR15]

English: THE CHANGE OF BRAIN FUNCTION BY LIVING AND WORKING IN A SPECIAL CLOSED ENVIRONMENT

French: LE CHANGEMENT DE FONCTIONNEMENT CÉRÉBRAL EN VIVANT ET EN TRAVAILLANT DANS UN ENVIRONNEMENT SPÉCIAL FERMÉ

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Introduction: In aviation and space-flight, or in the operation of the naval vessels on or under the sea, the people live and work in a special closed environment. This particular environment will have physiological and psychological effects on human body, which is a concern in the aviation and medical field all over the world. In this experiment three volunteers work and live in a special closed environment for two months. The purpose of this study is to observe the change in psychology, physiology and brain function, and to analyse the effects of long-term special closed environment on the brain function by comparing the characteristics of EEG.

Methods: Volunteers are three males, aged 27-35 years old, of good health, free of any organic disease and no neuropsychiatry. They are required to live and work in a special closed environment for two months and during this period to complete tasks required by the experiment. Before beginning the experiment and after completing the experiment, every person accepts an EEG check. From then on, they need accept the same check every ten days for a month. EEGs are recorded and analysed for all subjects using a Neurophysiologic information work-station. The electrodes of the EEG are placed in accordance with the international standards of 10-20 system and recorded 16 channels on the scalp. The EEG data are processed as follows. Firstly, the EEG is passed through a digital wave filter to exclude interrupters. Then, a mathematical model of the EEG is built. Finally, the peculiar index of EEG is calculated: memory characteristics index of the cerebrum, associating characteristics index of the cerebrum, power spectrum density peak characteristics.

Results: There is a change of six frequency band of EEG power spectrum between before and after the experiment. All three subjects have shown that the power value of the frequency band after the experiment increased.

OPERATIONAL AVIATION MEDICINE

MÉDECINE AÉRONAUTIQUE OPÉRATIONELLE

[PR16] (Did not attend)

[PR17]

English: EJECTION ASSOCIATED INJURIES WITHIN THE ROYAL THAI AIR FORCE DURING 2005-2010

French: TRAUMATISMES ASSOCIÉS AUX ÉJECTIONS DANS L'ARMÉE DE L'AIR ROYALE THAÏLANDAISE ENTRE 2005-2010

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Introduction: Ejection seats have saved the lives of many pilots having survived an ejection. Nevertheless, ejection injuries are seen in all modern aircraft. An epidemiological study of seven ejections made by the Royal Thai Air Force (RTAF) during 2005-2010 was carried out and analyzed.

Methods: Data was obtained from the Aeromedical Flight Safety Division of the Institute of Aviation Medicine RTAF Staff, and from the personal reports of pilots who survived ejections.

Results: From 2005-2010, there were seven recorded ejections, which consisted of one single ejection and three double ejections. Of these, two accidents occurred with the F-5E Tiger; one was a single ejection and the other was a double ejection. The other accidents occurred with the PC-9 Pilatus which was a double ejection, and with the F-16 Fighting Falcon which was a double ejection. There were four survivors, two pilots were uninjured, whilst the third pilot sustained slight injuries during landing phase. There was a pilot who suffered major injuries from compression fractures of the thoracic spines during the egress phase. Two F-5E Tiger pilots died from direct impact to the ground after a low- altitude ejection. One of the F-5E Tiger pilot died due to failure of the parachute to deploy fully. Typical injuries were those of the spine and lower limbs. The most severe injury was a vertebral fracture caused by ejection acceleration. This is followed by lower limb injuries during the parachute landing fall.

Conclusion: The pilot position in the ejection seat, aircraft control and the pilot's ejection seat training especially in how to assume the necessary body position during both egress and landing phases are important determining factors for successful ejections.

CLINICAL AVIATION MEDICINE

MEDECINE AERONAUTIQUE CLINIQUE

[PR18]

English: PREVALENCE AND CHARACTERISTICS OF METABOLIC SYNDROME IN CHINESE AIR FORCE PILOTS

French: PRÉVALENCE ET CARACTÉRISTIQUES DU SYNDROME MÉTABOLIQUE CHEZ LES PILOTES DE L'ARMÉE DE L'AIR CHINOISE

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Introduction: Metabolic syndrome is a widely prevalent and multifactorial disorder and associated with development of cardiovascular disease, stroke, and diabetes mellitus, conditions that are disabling for military aircrew members. The prevalence of metabolic syndrome varies in different geographic areas and is of concern in Chinese.

Methods: Data was collected for 332 Chinese Air Force (CAF) pilots (mean age 28.35 ± 3.34 yr) during medical examinations for modification equipment to high performance fighters, with an added assessment for metabolic syndrome according to the improved International Diabetes Federation (IDF) criteria. Measurements included height, weight, waist circumference, and blood pressure. Blood was drawn in a fasting state for measurement of kidney function, liver function, lipid profile, and fasting blood sugar (FBS).

Results: The crude prevalence was 5.72%. There were significant differences between metabolic syndrome and non-metabolic syndrome groups with respect to lipid profile, systolic and diastolic blood pressure, waist circumference, weight, regular alcohol intake, uric acid and FBS. Subjects with metabolic syndrome had the following distribution of characteristics: 100.0 % had waist circumference >90cm (males), >80cm (females); 89.5% had triglyceride > 1.7 mmol/L; 84.2% had high density lipoprotein (females); 47.4 % were hypertensive (blood pressure $\geq 130/85$); and 10.5 % had FBS >5.6 mmol/L.

Conclusion: The prevalence of metabolic syndrome in this population was not low and is a matter of medical concern, especially since this group of military pilots is generally regarded as very healthy. The findings reported in this study should have an impact on planning of future training and diet programs for pilots.

[PR19]

English: SLEEP APNOEA AND MICRO SLEEP

French: APNÉE DU SOMMEIL ET MICRO SOMMEIL

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Sleep apnoea is with approximately 2% to 3% a wide spread disease among the general population, of which mostly men are affected. The symptoms are quite unspecific thus impeding the diagnosis if no anamnesis from a third party is available. While sleep apnoea alone is causing not only disturbances of the existential orientation but severe disturbances of health, micro sleep too, impairs attention with the consequence of traffic accidents.

In the Aero Medical Center Frankfurt of Deutsche Lufthansa AG during a period of 13 1/2 months 777 pilots were interviewed with the standardized Epworth Sleepiness Scale questionnaire. Two problems were followed up:

1. General accumulation as hint for a sleep apnoea.
2. Is there a work-related correlation caused by the continuously repeated exposition to time shift?

The analysis showed that general symptoms of tiredness caused by the continuous consecutive flights with time shift on the one hand but by the short and medium haul flights with significant irregular duty times on the other hand were significantly more frequent.

There is no significant evidence that Sleep Apnoea within this professional category is more often represented than in the general population. The results are even pointing into the opposite direction. The cause remains, at present, inexplicit because there has been no following screening. Reasons may be the special choice of flying personnel, high occupational motivation, healthy-worker-effect and a more healthy way of life.

Conclusions

Micro Sleep and Sleep Apnoea within personnel of commercial air traffic are under the aspects of aviation safety of no relevance even if single episodes are reported from time to time.

[PR20]

English: HIGH NORMAL BLOOD PRESSURE (PREHYPERTENSION) AT POLISH AIR FORCES

French: LA TENSION ARTÉRIELLE NORMALE SUPÉRIEURE (PRÉ-HYPERTENSION) CHEZ LES PILOTES DES DE L'ARMÉE DE L'AIR POLONAISE

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Arterial hypertension is one of the most important causes of cardiovascular disease - cardiovascular events, especially stroke. During the last decade, an increased interest in the clinical significance of high normal blood pressure (HNBP) (130-139/85-89mmHg) has arisen. Its prevalence is estimated at around 30%-50% and is associated with increased cardiovascular risk. Other cardiovascular risk factors, including metabolic syndrome, are also related to high normal blood pressure values. Pharmacological treatment is advantageous with HNBP patients, when additional risk factors also occur. Although, this reasonable opinion triggers some doubts because of negative influence of +Gz tolerance with respect to fighter pilots.

The aims of this paper were: 1. Estimation of prevalence of HNBP at pilots of Polish Air Force. 2. Estimation of load of some metabolic syndrome components in this population.

Methods: The medical documentation of pilots which were routinely examined in 2009 year by the military aero-medical board was analyzed. A group of 70 pilots (26%) aged 25-55 (mean 36.1 ± 7.5) in which high

normal blood pressure was selected. Among this group 10% were supersonic, 11.4% subsonic, 21.4% transport and 57.1% of helicopter pilots. Each of them had estimated: triglyceride (TG) and glucose (GLU) concentration, and body mass index (BMI).

Results: The mean values of BMI were 26.6 ± 3.2 ; TG 140.5 ± 29.7 ; GLU 91.6 ± 9.7 . 18.5% of pilots had increased of TG concentration, 10% GLU and 44% BMI value. In the tested population, two components of metabolic syndrome (TG-GLU or GLU-BMI or TG-BMI) was observed in nine persons whereas all of three in two. Conclusion: 1. The prevalence of high normal blood pressure in pilots was similar to general population. 2. Some of fighter pilots of Polish Air Force would have the clinical indications to HNBP pharmacological treatment.

[PR21]

English: HEARING LOSS IN AVIATION WORKERS

French: PERTE AUDITIVE CHEZ LES TRAVAILLEURS DE L'AVIATION

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Introduction: Noise is a regular companion of modern living. Approximately 20% of the workforce is exposed to excessive noise in their work environment, 50% of those to levels above 85 dBA. More than 10 percent of the population in developed countries suffers from significant hearing loss. Additionally, hearing is an important factor in general satisfaction and in the safe performance of many jobs, including those in aviation. To ensure safe work, it is imperative that the candidate is able to correctly discern a conversation at the distance of two metres, while their hearing loss as tested by threshold audiometry should not exceed 35 dBA at frequencies of 500, 1000, and 2000 Hz or 50 dBA at 3000 Hz.

Methods: Our study focused on the types of hearing loss present in employees of the Slovenian national air carrier, so we assessed the threshold audiometry results of all employees examined in the past year.

Results: Noise measurements indicate that the daily exposure to noise was 78.8 dBA for flight attendants and 74.4 dBA for pilots, while the values for aircraft mechanics and support staff were varied, depending on the work they were doing (from 67 to 100 dBA). The study included 486 employees of the Slovenian national air carrier whose average age was 40.0 ± 10.4 years. Among them, 189 were pilots, 107 were aircraft mechanics, 176 were flight attendants, and 14 were miscellaneous support staff. The greatest hearing loss according to Fowler was found in aircraft engineers (mean value: 2.4%; maximum value: 44.9%; hearing loss of 10% or more in 15% of cases), followed by support staff (mean value: 1.1%; maximum value: 14.9%). Hearing loss was significantly lower in pilots (mean value: 1.1%; maximum value: 19.0%; hearing loss of 10% or more in 2% of cases), and lowest among flight attendants (mean value: 1.0%; maximum value: 16.1%).

[PR22]

English: CONTRAST SENSITIVITY CHANGES DURING ORTHOSTATIC LOAD

French: CHANGEMENT DE LA SENSIBILITÉ (RÉTINIENNE) AU CONTRASTE PENDANT UN CHARGEMENT ORTHOSTATIQUE

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Introduction: Contrast sensitivity is very important for the ability to recognize details in visual field. Changes in blood distribution caused by +Gz acceleration lead to typical changes in vision quality and therefore to changes in contrast sensitivity.

Methods: Lower Body Negative Pressure method (LBNP) was used to simulate acceleration-induced changes in the blood supply of the human body. The test was done on 28 pilots of the Army of the Czech Republic. The LBNP examination was performed at an exposure to the negative pressure level of -70 mmHg. The pilots were examined in sitting position. The exposure was terminated at the end of a three-

minute period to minimize tolerance through cardiovascular compensation. Contrast sensitivity was tested by means of Vistech Consultants (USA) VCTS (visual contrast test system) charts. Each subject was tested twice. The first test was taken prior to LBNP exposure, and the second one after one-minute of LBNP load.

Results: Results from both tests were compared for every pilot. Obtained data showed statistically significant impairment of contrast sensitivity values during LBNP load at higher frequencies, especially at the frequency levels of 6, 12 and 18 c.deg-1 (cyclus.deg-1). It represented a drop of contrast sensitivity values approximately from 220 to 150 (at frequency level 6 c.deg-1), from 140 to 100 (at frequency level 12 c.deg-1) and from 45 to 30 (at frequency level 18 c.deg-1). Statistically significant results of contrast sensitivity changes in the first minute of LBNP load were obtained and the deterioration of vision was proven.

Conclusion: Results from our testing demonstrate the significant impairment of contrast sensitivity during orthostatic load. Our study confirmed substantial similarity of LBNP load influence on blood pressure regulation to +Gz acceleration load. It is possible to use LBNP method as a method of visual changes evaluation during +Gz load.

[PR23]

English: APPLICATION OF MSCT POSTPROCESSING TECHNIQUES IN LUMBAR SPONDYLOSCHISIS OF THE PILOTS

French: APPLICATION DE TECHNIQUES POST TEST DU CT MULTI-COUPES DANS LA SPONDYLOLYSE LOMBAIRE DES PILOTES

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Introduction: To evaluate the clinical application value of multi-slice CT (MSCT) postprocessing techniques in the diagnosis of lumbar spondyloschisis (LS) of the pilots.

Methods: 384 pilots who had physical examination for re-equipping underwent volumetric scanning with MSCT, then various postprocessing techniques including multiplanar reconstruction (MPR), maximum intensity projection (MIP) and volume rendering (VR) were carried out at the workstation. The information of LS of the pilots was observed. Comparison of the efficacy in the diagnosis of LS with MIP, MPR and VR were undertaken.

Results: There were 15 cases of LS in 384 pilots, with 31 sites of LS in these 15 cases, of which 12 cases were bilateral and 3 cases were unilateral, and 9 cases were associated with lumbar spondylolysis. The diagnosis rate of MPR images was 100% (31/31). The LS could be clearly displayed on MPR images, collar sign of "Scotty dog" could be clearly revealed on oblique sagittal plane, double articular process sign could be revealed on oblique axial plane, lumbar spondylolysis could be clearly revealed on median sagittal plane. The MIP images also displayed all cases, but the viewing of soft tissue is not as well as MPR images. The diagnosis rate of VR images is 80.65% (25/31), and the VR images are close to the real anatomy structure of the lumbar spine, which can display lumbar spondylolysis stereoscopically.

Conclusion: Postprocessing Techniques of MSCT, MPR, MIP show good visualisation ability of spondyloschisis and its secondary abnormality, in which MPR is the first choice reconstruction technique in the diagnosis of spondyloschisis.

[PR24] (Did not attend)

[PR25]

English: THE RELATIONSHIP OF THE RELATED FACTORS AND OBESITY VERSUS METABOLIC SYNDROME IN COMMERCIAL PILOT OF THAI AIRWAYS INTERNATIONAL COMPANYY

French: LA RELATION DES FACTEURS RELIÉS ET DE L'OBÉSITY VERSUS LE SYNDROME MÉTABOLIQUE CHEZ LES PILOTES DE LA COMPAGNIE INTERNATIONALE THAI AIRWAYS

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Obesity and Metabolic Syndrome have emerged as an important clinical and public health problem because it is strongly predictive of diabetes and cardiovascular disease risk that affects quality of life and maybe threatens life. The objectives of this study are to estimate the prevalence of Obesity and Metabolic Syndrome of Thai airways pilots which were defined by International Diabetes Federation (IDF) criteria and The National Cholesterol Education Program (NCEP) and Adult Treatment Panel III (NCEP/ ATP III) Modified Asian Criteria respectively, to study factors that associated with obesity and Metabolic Syndrome, and to employ the research findings to establish the effective strategies for prevention and treatment of Obesity and Metabolic Syndrome of Thai airways pilots.

A cross-sectional survey of Thai airways pilot population aged 25 years and over who were being physically checked-up at the Institute of Aviation Medicine during January 2008 to December 2008 was conducted. There were 448 persons included in the present study. The prevalence of Obesity and Metabolic syndrome in Thai airway pilots is 37.67% and 15.62% respectively. The Obesity versus Metabolic Syndrome associated with age, body mass index, blood pressure, fasting blood sugar, triglyceride level, and HDL level was found to be at significant level 0.05. The active strategies in prevention of the Obesity and the Metabolic Syndrome in Thai airways pilots are presented in this paper.

[PR26] (Did not attend)

[PR27]

English: RESOLUTION OF VESTIBULAR DYSFUNCTION AFTER MICROVASCULAR DECOMPRESSION SURGERY

French: RÉOLUTION DE LA DYSFONCTION VERTIBULAIRE APRÈS LA CHIRURGIE MICROVASCULAIRE DE DÉCOMPRESSION

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Microvascular decompression surgery has become the treatment of choice for hemifacial spasm. Post surgical symptoms of vestibular dysfunction are common but usually transient. The unique occupational demands of military aviators necessitate complete otone urological evaluation following vestibular insults to allow safe return to flying duty. We present a case of a military jet fighter pilot who developed transient vertigo and disequilibrium after microvascular decompression surgery. Resolution of symptoms and complete recovery in the vestibular bedside and laboratory tests allowed us to grant the pilot full solo flying privileges.

[PR28] (Did not attend)

AEROMEDICAL SELECTION, POLICIES AND REGULATIONS

SELECTION AEROMEDICALE, POLITIQUES ET REGLEMENTS

[PR29]

English: NEW MEDICAL STANDARDS & REGULATIONS IN CARC, JORDAN

French: NOUVELLES NORMES MÉDICALES ET RÈGLEMENTS DU CRAC, JORDAN

KM Khalil

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Introduction: In Jordan for the last ten years, all aspects of Aviation business has expanded fast including passenger and cargo transport. This expansion has led to an increase in the demand for other aviation industry services to support that expansion to operate safely and successfully. One of these essential services that are required is the medical service. To keep operations in the aviation industry safe, secure

and economical, the Civil Aviation Regulatory Commission (CARC) governs the aviation medical services by rules and regulations to suit and match the physical, mental and psychological fitness of the personnel to the physiology of the aviation environment.

Method: The Government launched The Aviation Medicine System in Jordan, which consists of four sectors, the Aviation Medicine Department which rules all others sectors, the Aviation Medicine Supreme Committee, the Aviation Medical Consultants and the Aviation Medical Examiners. This system conducts and rules the fitness of airmen whilst also overseeing the aviation industry for the employers.

Results: During the last 3 years the number of disqualifying airmen was decreased to half a percent in comparison to the last 5 years and the flight environment has become safer, more secure and economical.

Conclusion: The study shows the importance of a close and reliable contact relationship between the airmen, Airline companies and the AME where the airmen or the Airlines companies can seek advice when problems occur. The Aviation Medicine System is important for making more specialized evaluation and giving advice to the AMEs, the airmen and to the Airline industries.

[PR30]

English: AEROMEDICAL FITNESS AND FLIGHT SAFETY OF AIR FORCE PILOTS IN CHINA

French: SÉCURITÉ EN VOL ET EXAMEN MÉDICAUX DU PERSONNEL NAVIGANT

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A robust system of aeromedical fitness evaluation, selection and certification of air force pilots is paramount to ensure flight safety. To this end, there is a need to go beyond routine clinical examination, to holistically evaluate the pilot applicant taking into account environmental and societal factors and their impact on one's physical and psychological health. The enhancement of flight safety can be achieved through the following strategies:

1. To identify key aeromedical fitness criteria in the selection of pilots, and implement a stringent medical evaluation process to holistically address these areas.
2. To improve the diagnosis, treatment and prevention of acute ailments in pilots. This will require medical research in diseases such as cardiovascular and cerebrovascular diseases, so as to enable an Evidence-Based Medicine approach towards their management.
3. To maximise force health and performance. This includes the management of myopia through a combination of Chinese-Western medicine approach, strengthening research in aviation physiological threats such as motion sickness and spatial disorientation, and optimisation of pilots' psychological and mental well-being and performance.

HUMAN FACTORS AND SAFETY

FACTEURS HUMAINS ET SÉCURITÉ

[PR31]

English: DYNAMIC ANTHROPOMORPHIC MANIKIN

French: MANEQUIN ANTHROPOMORPHIQUE DYNAMIQUE

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Higher requirements for testing are emerging since the performance envelope of high performance aircraft ejection seats has exceeded 1000km/h for 3rd generation ejection seats and even up to 1300-1400 km/h for the fourth. The Dynamic Anthropomorphic Manikin is designed for developing the high performance aircraft ejection seat. It not only meets the demands for testing human dynamic responses under various stresses in the air and with stability in high speed blast but also characterizes the pilot's body figure.

Manikin tests have covered body measurement, mechanical structure test, signal processing and data analysis software tests and environment tests. The manikin corresponds to the pilot's figure in different percentile and inertial properties. It can record 64 channels of physical or physiological signals when exposed to speedy wind blast as high as 1400km/h. The supporting software enables data processing for different purposes. The Dynamic Anthropomorphic Manikin has been used for evaluating the safety of ejection under high risk by collecting various data. The gathered data and produced assessments are also applied for judging if the impact would cause pilots injury and provide references to the optimization of ejection seat design.

[PR32]

English: COMPARISON OF THE PRACTICE OF SAFETY REPORTING BETWEEN AVIATION AND HEALTHCARE SYSTEMS

French: COMPARAISON DE LA PRATIQUE DE DÉCLARATION DES INCIDENTS/ACCIDENTS ENTRE L'AVIATION ET LES SYSTÈMES DE SANTÉ

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Introduction: The value of voluntary incident reporting has been recognized since the 1940s. Both the healthcare and aviation industries are high-risk industries where safety is paramount and even apparently insignificant errors can lead to catastrophic consequences. While aviation safety reporting systems have been established for more than 30 years, incident reporting in healthcare has only taken off in the past decade.

In Tan Tock Seng Hospital, an intranet-based electronic hospital occurrence reporting system was developed for incident reporting and escalation. We compare safety reporting practices in our hospital and the Republic of Singapore Air Force (RSAF).

Methods: Safety reporting practices between the two institutions are assessed and compared according to several parameters: accessibility, usability, comprehensiveness, uptake rate, level of confidentiality, effectiveness of supporting framework as well as degrees of fairness and impunity.

Results: There are many areas of similarity between the two distinctively different institutions. However, the uptake rate of incident reporting in the healthcare industry appears to be less than that in the aviation industry.

Conclusion: Voluntary reporting is essential in high risk organizations for highlighting both gross mistakes as well as near-miss errors, so that strategies can be implemented to prevent re-occurrence of similar incidents. Incident reporting in both the healthcare and aviation industries have undergone many changes. Rather than focusing on individual errors, there has been a shift in emphasis to detailed and comprehensive analysis of root causes and latent errors in the systemic processes. Experiences from the aviation industry are relevant and valuable to the improvement of safety reporting systems in the healthcare industry.

FREE PAPERS

COMMUNICATIONS LIBRES

[PR33]

English: PLANE PAINTING AND CHEMICAL RISKS

French: RISQUE CHIMIQUE DES PEINTURES AVION

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Introduction: Parmi les nombreux composants chimiques utilisés dans les peintures avion, les chromates sont les plus préoccupants pour la santé, compte tenu d'effets cancérigènes identifiés tant par l'Union Européenne (UE) que par le Centre International de Recherche sur le Cancer (CIRC).

Méthodes: Après un rappel sur les processus opératoires et les situations de travail, les auteurs rapportent les résultats d'études métrologiques d'ambiance effectués annuellement entre 2003 et 2010, couplés à des biométries individuelles urinaires avant et après poste.

Résultats: Si les résultats des mesures de l'atmosphère de travail sont élevés (jusqu'à 10 fois la valeur limite d'exposition), tout particulièrement lors des phases d'application de peinture sous l'avion, les résultats des biométries urinaires du chrome sont tous inférieurs aux valeurs-guide françaises.

Conclusion: Cette étude témoigne de l'efficacité des mesures de prévention mises en place, l'objectif à moyen terme étant de parvenir à substituer les chromates par des produits classés non CMR (cancérigène, mutagène, reprotoxique).

[PR34]

English: MANAGEMENT OF THE FIRST PANDEMIC CRISIS OF THE 21TH CENTURY IN A FRENCH AIR TRANSPORT COMPANY

French: GESTION DE LA PREMIÈRE PANDÉMIE DU 21È SIÈCLE DANS UNE COMPAGNIE AÉRIENNE FRANÇAISE

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Air France, Roissy Cdg, France

Sept jours après l'alerte lancée par les Autorités Sanitaires du Mexique et seulement 3 jours après celle de l'OMS, le premier cas de grippe A (H1N1) était confirmé en France. Ceci se déroulait à une période inhabituelle en Europe au coeur du printemps. Le pic épidémique a débuté réellement en Octobre au moment de la grippe saisonnière, soit près de 6 mois plus tard, pour décroître rapidement au début de l'année suivante. Heureusement, le comportement du virus en cause est resté plutôt stable et n'a pas conduit à une catastrophe sanitaire de grande ampleur.

Le principe de précaution a été tout de suite déployé à l'échelle de la planète aussi bien dans la vie publique que dans la vie privée, à grands renforts de nouvelles technologies: vidéo, internet, télévision. Au demeurant, le service médical de la Compagnie a, en outre, mis en oeuvre une action spécifique large que nous proposons de décrire ici.

Une dizaine de navigants (soit 5/10 000 navigants ou 5% des cas français) ont été touchés de façon certaine (confirmation biologique). Pour d'autres (6 fois plus environ), le diagnostic a été retenu au vu des arguments cliniques. Des éléments plus détaillés sur les cas sont proposés dans cette étude. Il n'y a pas eu de cas secondaire en équipage ni de contagion à bord identifiée. Aucun décès n'est à déplorer, ni même de cas grave.

Cette crise a permis de développer la conscience du risque infectieux, mais aussi et surtout les moyens de gérer ce risque, particulièrement utiles dans le contexte aérien, potentiellement vecteur de dissémination.

[PR35] (Did not attend)

7th APCAM POSTER PANEL

[PR36]

THE FIRST EXPERIENCES WITH RTVue FOURIER DOMAIN OPTICAL COHERENCE TOMOGRAPHY AT EFFICIENT PILOTS

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Introduction: The RTVue is a unique optical coherence tomography (OCT) system that can image both anterior and posterior segments of the eye. In the posterior segment, the RTVue excels in quantitative analysis retina and optic nerve images. In the anterior segment, the RTVue offers unprecedented resolution and speed for corneal and angle imaging.

Methods: The RTVue provides high-resolution imaging of the retina layers with detail and precision. A range of scan patterns is available to fit the imaging needs for retina pathology. The RTVue FD - OCT is the first device to offer complete comprehensive glaucoma analysis including retina nerve fibre layer thickness map (RNFL), optic disc morphology and a unique ganglion cell complex map (GCC) in the macula. The RTVue was originally designed for retina imaging. To obtain high quality corneal and anterior segment images, a corneal adaptor module (CAM) was developed.

Results: Using the RTVue F-D OCT, we examined 58 flying personnel of the Czech Airlines and Czech Air Force during the regular medical fitness assessment in the Institute of Aviation Medicine, Prague. The biggest importance of RTVue F-D OCT is early diagnostic and regular examination of pathological changes at anterior and posterior segments of the eye, for example keratoconus, age related macular degeneration, glaucoma and so on.

Conclusion: The RTVue is the next generation OCT system. The ultra-high speed and high resolution, Fourier – domain OCT technology allows the system advanced clinical protocols to be used for aviation ocular examination with unprecedented resolution and clarity.

[PR37]

THE EFFECTS OF REPEATEDLY STIMULATING VAGUS NERVE ON HEART RATE

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Introduction: The resting heart rate (HR) is the result of sympathovagal balance. It was reported that sinus bradycardia could be induced by negative acceleration (-Gz) and facial immersion in cold water. The underlying mechanism is stimulating the afferent vagus nerve distributing on sino-atrial node. The goal of this study is to investigate if there is an additive effect when the vagus nerve is repeatedly stimulated.

Methods: Thirty healthy male undergraduates volunteered to participate as subjects and their physical fitness were evaluated by step test previously. Cold water immersion (4 °C, for 20 seconds) was conducted 3 times separated by 15 minutes. The beat-to-beat HR was monitored by an oximeter for recording the lowest HR during water immersion. The 15-minute heart rate variability (HRV) was also captured using a miniature physiological signal recorder after water immersion. Frequency-domain analysis including high frequency (HF), low frequency (LF), LF/HF was used to evaluate the autonomic balance.

Results: The result showed that HR dropped very fast on each cold shock and reached the minimum within 13.5 seconds on average. Repeatedly stimulating vagus nerve led it to the gradual increase in HF and LF/HF and the gradual decrease in LF. Besides, the decreasing rate of HR at the moment of first water immersion correlates significantly with the individual physical condition.

Conclusion: Using water immersion mode, this study indicates the potential risk of frequently stimulating vagus nerve. Such situation may also occur during frequent -Gz/+Gc transition while aerial combat maneuver. It is worthy of continued research.

[PR38]

PRELIMINARY SURVEY OF SPATIAL DISORIENTATION IN CHINESE AIR FORCE PILOTS

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Introduction: To investigate aircrews' experience of flight illusion in Chinese Air Force.

Methods: A custom-made flight illusion survey postal questionnaire was distributed to Chinese Air Force pilots to collect anonymous data from pilots.

Results: For the survey, a total of 2366 questionnaires were returned. The general incidence rate of flight illusion in pilots was 89.1%. The most frequently experienced flight illusion episodes were leans. Differences in types of the most frequently experienced flight illusion episodes were found between aircraft categories. Of all the pilots surveyed, only 12.2% were provided flight illusion demonstration and training. All pilots highlighted the equivalent beneficial effects of in-flight illusion demonstration and ground illusion training.

Conclusion: This preliminary survey has shown that illusions is still a significant hazard of military flying and has highlighted the potentially beneficial effects of flight illusion demonstration and training. Flight illusion training should be refined to include visual illusion training and to arrange pertinent flight illusion training for pilots of different aircraft types.

[PR39]

GROUND-BASED SPATIAL DISORIENTATION TRAINING AND ITS REFERENCE VALUES IN CHINESE AIR FORCE PILOTS

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Introduction: To validate the feasibility of applying ground-based spatial disorientation training scenarios to aeromedical training of Chinese Air Force pilots and to provide reference values for assessing the effect of ground-based spatial disorientation training.

Methods: Eighty healthy pilots performed ground-based spatial disorientation training according to the scenarios recommended by NATO. Somatogyral illusion and Coriolis illusion were induced by VST-O type electric rotating chair, while circularvection, autokinetic illusion and pseudo-Coriolis illusion were induced by VST-III type vestibular function examination system. During the illusions demonstration, the parameters of illusions including the latent period and the duration of induced illusions were recorded.

Results: The induced rate of somatogyral illusion, Coriolis illusion, circularvection, autokinetic illusion and pseudo-Coriolis were 100.0%, 90.7%, 72.5%, 49.2% and zero respectively. The induction rate of vestibular illusions was higher than that of visual illusions ($\chi^2=5.0097$, $P<0.05$). The duration of somatogyral illusion, Coriolis illusion (rolling sensation) and Coriolis illusion (tumbling sensation) were 8.4 ± 4.5 seconds, 4.9 ± 2.3 seconds and 5.4 ± 3.0 seconds respectively, while the latent period of circularvection and autokinetic illusion were 34.8 ± 19.0 seconds and 42.8 ± 15.2 seconds respectively.

Conclusion: Ground-based somatogyral illusion, Coriolis illusion, circularvection and autokinetic illusion training scenarios can be demonstrated with the existing training devices of Chinese military pilots and is feasible and effective for aeromedical training of Chinese military pilots. The reference values for the duration of somatogyral illusion, Coriolis illusion (rolling sensation) and Coriolis illusion (tumbling sensation) were less than 17.4 seconds, less than 11.4 seconds and between 0.3 and 9.5 seconds respectively, while the reference values for the latent period of circularvection and autokinetic illusion were less than 72.8 seconds and between 12.4 and 73.2 seconds respectively. We hope that these data can be used in assessment of the effect of ground-based spatial disorientation training.

[PR40]
A CASE REPORT OF MANAGEMENT OF PHOBIA OF FLYING USING PSYCHOLOGICAL COUNSELLING

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Introduction: With the development of civil aviation, more and more travelers chose airplane as the first choice of vehicle. However, some passengers were afflicted with the flight phobia.

Objective: To analyze the causes for flight phobia and investigate the methods and procedure for treating flight phobia by observing one client with flight phobia.

Methods: One male client with flight phobia visited Civil Aviation Medicine Center of CAAC between April and December, 2009. Psychological counselling and guidance were given using the technique of systematic desensitization therapy and cognitive therapy and psychotherapy.

Results: Some treating measures such as relaxation, imitating situation, and present situation and so on resulted in the effective consultation and obvious treatment effects. Through the systematic cognitive psychological therapy, the client had changed his false cognitive, and recovered the normal status of working and living.

Conclusion: Systematic desensitization is an effective and steady treatment for flight phobia. Individual living experience and personality characters are the main reasons for flight phobia.