

4th European Conference in Aerospace Medicine



MIND
THE GAP

CONFERENCE PROGRAMME

The programme will provide 10 hours of accredited continuing education, in accordance with EASA rules.

Friday 5th

10:00 - 13:00 Registration

13:30 Opening ceremony

14:00 - 16:10 **Promoting health in aviation.** Moderator Roland Vermeiren

Fly Safe, Fly Well'. The ESAM view.

Dr Kevin Herbert - President European Society of Aerospace Medicine

The ICAO view.

Dr. Tony Evans - Chief. Aviation Medicine Section. International Civil Aviation Organisation.

Mental Health Screening in Aviators – Asthma Recommendations

Philip J. Scarpa - Jr, MD, MS, President, Aerospace Medical Association

Panel Discussion

16:00 - 16:30 Tea/coffee break

16:30 - 17:30 Abstract presentations

Kniga, Bystrova et al. - *Conditions Threatening Flight Safety in Civilian Pilots in Russia: A Five-Year Review.*

Palumbo et al. - *Silent myocardial infarction: the importance of cardiologic screening in flight crews*

Drechsel & Maire - *Pilots with subclinical coronary artery disease detected by coronary computed tomography angiography (CCTA).*

Van Setten - *Flying with Glaucoma – non-penetrating glaucoma surgery: a promising alternative for pilots.*

20:00 Welcome Cocktail

Saturday 6th

09:00 - 09:05 Welcome speech: Cristian Panait

09:05 - 10:00 *Involving the aircrew. A partnership approach to risk assessment*

Stein-Erik Nodeland - Director. Norwegian Civil Aviation Authority

10:05 - 11:00 *Commercial Space flight. Medical assessment of pilots and passengers*

Dr Rupert Gerzer - Director DLR Cologne space centre

11:00 - 11:30 Tea/coffee break

05-07 September, Bucharest

- 11:30 - 12:30 **Workshop:** Mental health of aviators and challenges of the new era of commercial space flight. Is Partnership or more rules the best response?
Moderator Ries Simons + Introduction + presentation: Ageing Pilots: consider operational and psychological history together with medical history
Cataman et al. - Fatigue and Stress: Exposure levels.
Leonard Lupu - Operational fatigue management in case of military aircrew
- 12:30 - 12:50 Open session. Comments and conclusion from workshop
- 13:00 - 14:00 Lunch break
- Moderator to introduce two next keynotes Vincent Feuille**
- 14:00 - 14:50 New developments in Medicine and their impact on future aerospace medical decision making
Dr. Melchor Antunano - Director Civil Aerospace Medical Institute FAA
- 15:00 - 15:50 The Challenge of Screening for Aviation Relevant Cognitive Performance Deficits in Aircrew and ATCOs
Gary Kay. PhD
- 15:50 - 16:00 Open session, summary and comments.
- 16:00 - 16:30 Tea/coffee
- 16:30 - 17:30 **Workshop:** Screening for, and promoting, psychosocial and mental fitness, and the concept of 'wellness' in a time of rapid medical development. How good are the tools and the rules?
Moderator Hedi Ranfelt
Hedi Ranfelt - Care of the flyer- needs for new medical approach.
Truska - How to prevent health problems in aviation?

Saturday evening. Gala Dinner

Sunday 7th

09:00 - 10:00 Abstract presentations. Chair Claudia Stern

Maire et al. - It is time for a revision of the EASA medical requirements for pilots with coronary artery disease

Kuzmina - Screening Test of Ischemic Heart Disease in Civil Aviation Pilots of Senior Age Group

Stefanescu & Stefanescu - Puppilometry – Clinical aspects of aeromedical interest: a useful tool in somnology

Verde et al. - Metabolic syndrome prevalence among physically fit Italian Air Force pilots does not seem to exceed national standards.

10:00 - 10:15 **Cristian Panait** - Ebola Virus Infection – Contingency planning for Aviation Authorities. AME role in prevention of spreading disease to Cabin Crew and Flight Crew.

10:15 - 10:30 **Roland Vermeiren** - Policy of the Public Health Events and Pandemics working group of the EU Institutions medical services

10:30 - 11:00 **Anthony Evans** - Collaborative Arrangement for the Prevention and management of public health events in Civil Aviation (CAPSCA). Ebola epidemics considerations.

11:00 - 11:30 Tea/coffee

11:30 - 12:45 **Workshop:** 'Building partnership and prevention into aeromedical assessments. The next steps?'

Moderator + introduction: Anthony Wagstaff - Partnership and Prevention in aeromedical assessments – different aspects or mutually dependent?

12:45 - 13:45 Lunch break

13:45 - 14:00 Summary, close of ECAM and certificate award

14:00 - 16:00 General Assembly of European Society of Aerospace Medicine.

Poster session (on display for the duration of the congress)

Stefanescu Dragos - Aviation fatigue: Day surgery procedures for snoring.

Jayashri Devi Sharma - Perspectives in Evaluation of Respiratory Fatigue in Aviators; by Neuro-imaging along with, Digital Human Lung Airflows.

Kowalczyk, Gazdzinski et al. - Effect of combined Coriolis illusion and hypoxia on saccadic metrics during simulated flight.

Biryukbaeva et al. - Disorders of consciousness in the civil aviation personnel.

Cataman et al. - Input of preventive medicine to flight safety.

Kuzmina et al. - Endocrine pathology in civil aviation pilots senior age groups.

CONDITIONS THREATENING FLIGHT SAFETY IN CIVILIAN PILOTS IN RUSSIA: A FIVE-YEAR REVIEW.

Perspectives in Evaluation of Respiratory Fatigue in Aviators; by NeuroImaging along with, Digital Human Lung Airflows

Neuroimaging to measure psychophysiological changes in alertness and fatigue are reminiscent of the earliest recordings of pulsations from the brain by Mosso who tried correlating blood flow to Cerebral function with some resultant functional significance. In 1890, Charles Smart Roy and Charles Scott Sherrington suggested a link between brain circulation and metabolism (Sandrone S. 2014). More recently these have been extended to various Psychophysiological indexes to reflect changes caused by Mental Workload leading to fatigue and correlated it to more objective criteria (a standing-position balance test as well as a critical flicker fusion frequency (CFF) test) as were found more reliable for fatigue evaluations in aviators (Ma J. 2014).

Respiratory indicators of Fatigue in long-haul flights has become a very significant risk and its early indicators of immediate importance. Neuroimaging of Medullary and Non-medullary structures like the rostrocaudal and cortico-spinal may sculpt inspiratory motoneuronal outputs across parasternal intercostal muscles and human scalene muscles to produce lung volume changes and help retain eupnea during recovery to a restful state

(Gandevia SC 2012). Force development by the mechanoreflex is preceded by the Metaboreflex (Douglas 2001), and can aid with cyclical inspiratory recovery. The Patterns and Work of breathing in critical conditions during flight can best be imaged as an extension of The digital Human Lung Atlas which forms part of the Lung Physiome project and comprises of both structural and functional measures, and includes computational models derived to match individual subjects for personalized prediction of function (Tawhai MH 2009) including modeling turbulent flows in the airway.

Restful breathing cycles during long duration sustainable work in a "man--flying vehicle--environment", i.e. Psychophysiological ergonomics was suggested by Sechenov (1829-1905), (Berezovsky 1979). Training programs for aviators, astronauts and cosmonauts are the mainstay, for both good endurance performance and for rest and recovery. Neuroimaging for dynamic physiological functions adds significantly to the repertoire of better data interpretation and understanding.

SILENT MYOCARDIAL INFARCTION: THE IMPORTANCE OF CARDIOLOGIC SCREENING IN FLIGHT CREWS.

Fabrizio Palumbo, Guido Stivali, Claudio Frontali, Antonio Colaiacomo.

Aeronautica Militare, Istituto Medico Legale "Angelo Mosso", Centro Aeromedico Specialistico, Sezione Cardiologia 2

Silent myocardial infarction (SMI) is an ischemic necrosis of myocardial tissue that occurs in the absence of symptoms and correlates with high mortality rate. Flight Personnel affected by SMI are therefore considered to be at high risk for flight safety.

We present our experience of 10 asymptomatic subjects with no history of cardiovascular diseases, in which the diagnosis of transmural SMI was made in the 2nd Cardiology Section at the Italian Air Force Institute of Aero Space Medicine "A. Mosso" in Milan due to the evidence of changes in the electrical axis and the onset of Q-waves in 12-lead resting electrocardiogram (ECG) during the interval January 2004-January 2012.

Five out of ten (50%) of the subjects were air force military logistic; one out of ten (10%) which was a military flight crew; two out of ten (20%) were civilian private pilots; two out of ten (20%) were civilian professional pilots in passenger airlines. The 10 patients, all males, mean age was 56.0 ± 29.6 years, Body Mass Index (BMI) of 26 ± 4 , with mean values of PAs of 137 ± 28 mmHg and 83 ± 15 mmHg.

On average, each patient reported 2 ± 1 cardiovascular risk factors; in particular 8/10 (80%) reported cigarette smoke (from 15 to 40 cigarettes / day for a period from 10 to 40 years), 2/10 (20%) reported familiarity for hypertension, 1/10 (10%) reported family history of myocardial infarction, no patient reported dyslipidemia, family history of stroke or diabetes; None of the patients showed a $BMI > 30$. No patient took medical therapy.

In all cases the diagnosis of SMI was formulated after observation in a resting 12 leads routine ECG of Q waves indicative of previous myocardial necrosis stabilized, that weren't present in previous ECGs; the diagnosis was confirmed by color Doppler echocardiography m-2d (echocd) and by coronary angiography and ventriculography.

The ejection fraction of the left ventricle calculated with echocd was on average $48.6 \pm 15.0\%$.

After coronary angiography in 4 patients (40%) were not performed interventional revascularization procedures; in 5 patients (50%) was performed



percutaneous transluminal coronary angioplasty with coronary stenting; in 1 patient (10%) three coronary artery bypass grafts were performed; in all patients was established appropriate medical therapy.

In our experience the incidence of SMI in flying crews is very low.

We performed 84,681 12-lead resting electrocardiograms during the interval January 2004-January 2012, so the prevalence of SMI was 0.012% while in literature the prevalence in general population is 0.3-0.5%. No military pilot in the study interval showed SMI.

PILOTS WITH SUBCLINICAL CORONARY ARTERY DISEASE DETECTED BY CORONARY COMPUTED TOMOGRAPHY ANGIOGRAPHY (CCTA)

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¹Division of Cardiology, Hospital Davos, ²Cardiological and Aviation Medicine Practice, Maennedorf; Switzerland

Background: 45% of premature deaths are due to cardiovascular diseases. Within the last few years CCTA, with or without determination of calcium score, became the gold standard for the diagnosis of coronary artery disease in asymptomatic persons. With this method we can detect coronary artery disease in an early subclinical stage. We learned that calcium score and CCTA are better predictors of cardiac events than the calculation of risk factors. Common risk scores like Euro- or Procam-Score are vague in predicting sudden incapacitation. Despite the broad availability of CCTA this method is not mentioned in the guidance material of the EASA-Medical-requirements. Nevertheless, because many pilots undergo CCTA or calcium score scanning by their own, we must also make decisions based on the results of these tests.

Methods: We report cases of pilots of our daily practice who are asymptomatic and who have no previous cardiovascular events. They all had an abnormal CCTA. Based on these cases we did a literature review in respect of the accuracy and the prognostic significance of CCTA.

Results: CCTA is a powerful tool to exclude coronary artery disease. However there are some limitations like in defining the need for revascularization (low specificity) related to image quality and/or severe calcification. An abnormal CCTA is frequent in an asymptomatic middle- and older-aged person. But there is a wide range between a single minor coronary lesion and multiple, partly calcified coronary alterations. The declaration of unfitness to fly or of an operational multi-pilot limitation (OML) in class 1-pilots or of an operational safety pilot limitation (OSL) in class 2-pilots is only justified in those cases where the coronary lesions are severe.

Conclusion: 1) Nowadays, CCTA and calcium score scanning are frequently used in asymptomatic persons. 2) Coronary lesions are often found with these methods, and the range of these alterations is broad. 3) In pilots, such abnormal coronary findings must strictly be analysed in terms of their severity and their prognosis. The result of this analysis and the additional consideration of other parameters like age, classical risk factors, lifestyle etc. allow a clear assessment of fitness to fly.

FLYING WITH GLAUCOMA. NONPENETRATING GLAUCOMA SURGERY A PROMISING ALTERNATIVE FOR PILOTS

Van Setten

Introduction: As a multicultural disease glaucoma still is one of the main causes leading to blindness in man. Pilots are no exception. This the more, as the mandatory measurement of pressure in the eye as key indicator of potential glaucoma risk, has been more and more eliminated from the list of required investigations for a medical . This may lead to late detection of glaucoma with a high demand on immediate improvement of the situation once identified. The hallmark of glaucoma, which is visual field loss, is not compatible with many flying ambitions and often brings with it restrictions of flying privileges. This far of the risks of conventional glaucoma surgery has been a big drawback. Today new techniques of non-penetrating glaucoma surgery has emerged and does open new perspectives. This option should be known by the community of AMEs and flight surgeons.

Methods: The characteristics of conventional glaucoma surgery (CGS) will be compared to the so-called non-penetrating glaucoma surgery (NPGS). Advantages and principles will be outlined. The delicacy of the NPGS surgery technique does allow investigation and improvement of the eyes' own intraocular pressure regulating capacities. Compared to other

techniques risks are lower and rapid return to duty much more likely. Examples of own surgery will be presented and illustrated.

Discussion: The advantage in NPGS is mainly the quick recovery rate, the better postoperative intraocular pressure, the decrease of enhanced sensitivity to g-forces following the operation and the option to adjust pressure after the initial surgery. The visual acuity often is regained within days after surgery and not after weeks as with the CGS. The availability of this technique should encourage the aviation community to seriously consider this surgical option as soon as visual field loss becomes a real threat to the future of the pilot.

Conclusion: Early diagnose and good knowledge of the newest treatment options could help to maintain vision and prevent increased loss of visual field in the pilots community. The NPGS hence will play a major role in the future healthcare of aviators.

AGEING PILOTS: CONSIDER OPERATIONAL AND PSYCHOLOGICAL HISTORY TOGETHER WITH MEDICAL HISTORY

Ries Simons

Consultant Aerospace Medicine

The course of physical and cognitive changes due to ageing shows considerable inter-individual variations. Although there is a decline in the level of functioning of higher age groups as a whole, ageing is accompanied by an increase in the individual variation. Group averages are therefore a poor basis for predicting the individual health and performance of older people. Pilots with critical impairment of cognitive and coping capacities should be identified to guarantee optimal flight safety. This would require psychological screening of individual cases. While it is not possible to decide solely on the basis of the score achieved in a psychological test, the results of tests can provide useful information for the aeromedical examiner (AME). When cognitive functioning of individuals is evaluated, it is important to have information about the occupational history. Relevant information concerns functioning of the pilot in the event of incidents/accidents and during simulator sessions, proficiency checks, and training courses. Such data are an important aid in detecting deterioration of cognitive functioning. If the data are systematically examined over a longer period, the AME may be alerted by a

structural impairment of functioning, which can be further evaluated by specific additional screening. This procedure enables identification of a deterioration of relevant cognitive functioning, no matter what its cause. In order to determine the risk of dementia, metabolic, psychiatric, and psychological disorders, the standard history should be expanded with questions concerning coping ability with job stresses, use of alcohol, psychological and relational problems, and sleeping disorders. Cases will be presented to illustrate above considerations.



FATIGUE AND STRESS: EXPOSURE LEVELS

E. Cataman, S. Zidu, N. Netrebciuc, L. Sicanova

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Introduction: Fatigue and stress are the most dangerous contributory human factors to incidents and accidents in aviation. Flight crew members and aeromedical specialists are well aware that efficiency of performance under these conditions is significantly decreased and presents high threat to flight safety. Avoidance, identification and coping with fatigue and stress in aviation are inevitable.

Methods: A random psychological study of flight crew members has been done in the Medical Center of Civil Aviation within the aeromedical examination in 2013. Total number of investigated among Class 1 applicants constituted 134 persons (80 CPL and ATPL pilots, 41 flight engineers, 13 navigators). Observation, interview, standardised tests, projective methods were used for the psychological evaluation. Assessment of stress and fatigue in flight crew members has been performed based on physical, emotional, behavioral and cognitive manifestations.

Results: 46,27% (N=62) from investigated persons were found being under stress and/or fatigue. The biggest

rate was revealed among pilots – 52,5% (N=42) from 80 assessed. In most cases organizational stress prevailed. Fear of employment loss, bad scheduling and rostering associated with maximum permitted flight hours were the main reasons for stress and fatigue in flight crew members. The sources of stress for the crew members flying shift duties abroad are related to unusual surroundings and risks while staying and working in so called “hot spots” with armed conflicts. Personal factors are often associated with organizational stress, but the rate of pure non-professional stress is much smaller.

Conclusion: The high rate of stress and fatigue identified in flight crew members is a warning sign. Factors predisposed to professional stresses should be considered mainly by the management of aviation industry. Coping with stress became sole responsibility of the crew member. Majority of air operators do not provide any helpful psychological assistance for flight personnel subjected to stress and fatigue.

CARE OF THE FLYER- NEEDS FOR NEW MEDICAL APPROACH.

Hedi Ranfelt



Introduction:

As Aviation Medicine professionals our main task is to contribute to safety and efficiency in aviation by optimizing the functionality of the aircrew. Many years' statistics on aviation incidents and accidents underline the human factor as a main contributor. Human factors includes a wide range of factors involved in the safety of flight. Stress, fatigue, psychosocial well-being and mental health issues are some examples. This fact has led us to refocus on the content of the annual examination. Physical diagnoses alone cause a very small portion of aviation accidents. This is one reason to question if the current health controls of aircrew will predict health risks in flight sufficiently. As representatives of the Aviation Medical community, it is our opinion that the present screening tools and methods for follow-up have missed the mark regarding efficacy in promoting flight safety.

Methods:

The Norwegian Institute of Aviation Medicine has started a revision of its current screening tools and methods for follow up of air crew. Improvement of the medical self-report and medical examination forms includes an increased focus on mapping of mental health and overall well being. We carried out in-depth interviews of squadron leaders and allocated flight surgeons as well as operational aircrew before we produced an additional self report questionnaire. The intention was to offer a new screening tool focusing specifically on mental health and well being at work as well as in private.

The test period was limited to three months before evaluation.

Results:

Over 90 % of the aircrew involved in the study scored that this study was relevant.

About the same percentage estimated the focus to be right. Almost 70% of the aircrew think that the aviation medical examiner/flight surgeon can be of assistance regarding these issues. The flight surgeons' subjective feedback stated that this questionnaire was a valuable tool as a reminder to cover mental health as a topic, to talk about difficult aspects in their life and to formalize the focus on this matter. The questionnaire contributes to normalization when applied as regular topic during examination.

Discussion:

The focus on mental health as a topic and contributor to aviation safety is seen as useful to increase safety and reduce risk.

The majority of both flight surgeons and aircrew give a positive score to an additional questionnaire used as a screening tool to improve the focus on mental health. There is a necessity for further improvement of the questionnaire before final implementation in our health records.



HOW TO PREVENT HEALTH PROBLEMS IN AVIATION ?

Oldrich Truska

Institute of Aviation Medicine, Prague, the Czech Republic

The list of examination mentioned in EU regulation 1178/2011 cannot play the preventive measure. If we take into account that the five most frequent diseases in population are: 1) Diabetes; 2) Heart Diseases; 3) Osteoporosis; 4) Gastric Ulcers and 5) Cancers, how we can prevent them if we do ECG examination any 5 years in the young group of pilots (till age 30)? What about myokarditis, cardiomyopathia?

When we have to examine mandatory only haemoglobin, not the blood count, how to discover leukaemia, chronic infections, lymphomas? From our point of view if we do not biochemistry screening one time per 5 years, it is difficult to evaluate the liver, renal, and lipid profile.

The regulation says that AME can extend the examination any time when he has a clinical suspicion to any pathological condition or if he finds more than 3 risk factors of the ischemic heart disease but AMEs are not only internists, they are different medical specialists - are they aware of these internal issues?

We know that there are arguments about the prize of the examination and its diagnostic value. The aeromedical assessment is based on giving the



guarantee for a short period of time (usually 1 year) that the airmen's health will be stable and there is minimised the risk of sudden incapacitation. On the other hand what is the price of the pilot's flying training, what is the price of the premature ending of the airmen career? If bus drivers are examined more often and more deeply than commercial pilots, there is something not normal!

We would recommend the current European regulation as the basic mandatory regulation and to improve also the preventive measure, we would suggest to issue a guidelines material for the prevention of the health problems in aviation.

IT IS TIME FOR A REVISION OF THE EASA MEDICAL REQUIREMENTS FOR PILOTS WITH CORONARY ARTERY DISEASE

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⁴Federal Office of Civil Aviation (FOCA), Bern; Switzerland

Introduction: Pilots who have had a coronary artery intervention like percutaneous transluminal coronary angioplasty (PTCA) with or without stenting or coronary artery bypass grafting (CABG) can be declared fit to fly six months after the intervention if they have fulfilled several tests showing the absence of coronary ischemia and a satisfactory left ventricular function. Pilots with a class 1-Medical Certificate regain fitness to fly only for multi pilot operations (restriction OML = operational multi pilot limitation) irrespective of the kind of the undergone intervention. This restriction is not a problem for an airline pilot but it can be the end of the flying career in case of commercial single pilot operations mainly in commercial helicopter operations. A differentiation of the various scenarios of coronary artery treatments should be undertaken in order to define a subgroup of class 1-pilots who are at a lower risk for major adverse cardiac events (MACE), and who therefore, could be declared fit to fly without OML-restriction.

Methods: We performed a literature research focussing on papers which analyzed the outcome of patients (pts) after different settings of coronary artery interventions, particularly on those which

describe independent prognostic risk factors by using multivariate analysis or similar methods. They were used to define a subset of pts with a low long term risk for MACE.

Results: The following factors were found to be of prognostic importance: Age, previous myocardial infarction, left ventricular function, amount of cardiovascular risk factors, extent of coronary artery disease (1-, 2- or 3-vessel disease), number of stents, location of stent within the coronary artery tree, kind of treated plaque (calcified or not), completeness of revascularization, kind of used stents, kind of used vessels in case of CABG. - Pts who have only a few of the negative factors have a significant better outcome than those with several or multiple negative factors.

Conclusions: 1) It is possible to define a subgroup of pilots who have undergone a coronary artery intervention as a lower risk group. 2) These pilots should be declared fit to fly without any restriction except for cardiological reviewing at certain intervals. 3) The EASA Medical requirements should be revised in this respect.

SCREENING TEST OF ISCHEMIC HEART DISEASE IN CIVIL AVIATION PILOTS OF SENIOR AGE GROUP

A.Kuzmina

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Cardiovascular diseases are of great importance not only in the structure of morbidity and mortality in general population but also are of great importance in medical support of flight safety. The problem of timely diagnostics of cardiovascular diseases (first of all CAD) is important for the persons of senior age group.

Research group: Examined 1189 pilots age 54-68 yrs during 2009-2010 years in the department of medical examination and rehabilitation treatment at Central Civil Aviation Hospital, Moscow (cross-sectional study). Bicycle ergometry was performed in 979 persons (82.5%). The pilots and didn't have any complaints were examined at regular bases (after reaching the age of 55 years).

Objective: assessment of obtained in screening test ECG-criteria of ischemia during bicycle ergometry in civil aviation pilots of senior age group.

Results: Standard submaximal cycle protocols include progressive uninterrupted exercise with increasing loads step by step (90 – 120 – 150 W) every 3 minutes. If the workload of 150 W didn't cause sub-max HR for 3 minutes the additional stage would be performed (170 – 180 W), and then 200 W.

ST ECG-criteria of ischemia were considered negative in 913 persons (93.3%), positive in 11 pilots (1.1%), equivocal in 34 (3.5%) and equivocal by criteria of arrhythmia in 8 (0.8%), and the result isn't estimated in 13 cases (1.3%).

Delay in conductivity along His bundle was observed in 25 cases (2.6%), ectopic focuses in 102 cases (10.4%) (most often in form of ventricular and supraventricular extrasystoles). There were registered: in 6 cases - possible WPW complexes, in 3 cases shortening of PQ to 0.15-0.16 s, in one case of the paroxysm of atrial fibrillation, unstable paroxysm of supraventricular tachycardia, and the syndrome of premature repolarization of ventricles.

Additional examinations include 24-hour ECG-monitoring, BP-monitoring, myocardial perfusion scintigraphy with ^{99m}Tc, coronary angiography/ multislice spiral computed tomography of coronary arteries.

Conclusions. CAD diagnosis was established in 16 pilots (1.6%), 15 of them had silent ischemia and in one - atherosclerotic combined aortal valve disease, and exertion-induced angina of the 1-st functional class.

METABOLIC SYNDROME PREVALENCE AMONG PHYSICALLY FIT ITALIAN AIR FORCE PILOTS DOES NOT SEEM TO EXCEED NATIONAL STANDARDS

Verde Paola*, Morgagni Fabio*, Piccolo Francesco*, Cresta Raffaele** and Strollo Felice ^

*Flight Experimental Centre, Pratica di Mare, Rome, Italy, **Institute of Aerospace Medicine, Rome, Italy, ^ INRCA-IRCCS, Endocrinology and Metabolism Unit, Rome, Italy

Background: Air Force pilots have often to face high stress-dependent cortisol levels which might increase many cardiovascular risk factors contributing to the diagnosis of the metabolic syndrome (MetS). Regular exercise, in turn, has been reported to reduce all such factors.

Aim of the study: to verify whether MetS prevalence is higher within Italian Air Force physically fit pilots as compared to that reported in the general population (ranging from 15 to 35% depending on age and areas within Europe and Italy).

Methods: we analysed data recorded from 97 physically fit male pilots aged 19-55 years consecutively referring to our AME office. We classified as physically fit those who had been exercising regularly within at least the last three months (summing up more than 20 METs / week at the Minnesota LTPA questionnaire) and defined the metabolic syndrome according to the updated, wider NCEP ATP III guidelines (at least three of the following: glucose > 100 mg/dL, total cholesterol > 199 mg/dL, triglycerides > 150 mg/dL, HDL-C < 50 mg/dL and arterial blood pressure \geq 130/85 mmHg).

To rule out the possibility that results might reflect a selection bias we further recorded the data coming from 30 physically fit Italian Air Force non-pilot officers aged 23-36 years and compared them to those coming from as many age-matched subjects from the pilot group.

We ran statistics on IBM SPSS ver. 20 for descriptive analysis, chi-square and one way analysis of variance, choosing $p < 0.05$ as the least accepted significance level.

Results: MetS prevalence was 25.8%, similar to the one reported in the literature for the general age-matched population. When comparing pilots to their ground-bound controls we could detect no differences at all in either MetS prevalence (16.7% in both groups) or in single components contributing to the diagnosis of MetS (with slightly, non-significantly more prevailing high fasting blood glucose and waist girth in ground-personnel vs blood pressure and lipid levels in pilots).

Discussion: we found no exceeding prevalence of MetS in physically fit pilots

with respect to currently reported national and European standards. On the other hand, when analysing single MetS components we noticed some slight differences among pilots and their age-matched controls, which might well be eventually amplified and reach statistical significance with larger numbers.

Conclusions: in line with our expectations young-middle age Air Force pilots proved to develop the MetS at the same rate as published in the general population to date. It might be explained

by on the their good level of physical fitness as well as on the fact that piloting enthusiasm might contribute to their overall satisfaction and dampen stress effects. Nevertheless we are now extending our study to the whole database to detect any eventually occurring slighter differences between Air Force pilots and ground-based personnel.



AVIATION FATIGUE: DAY SURGERY PROCEDURES FOR SNORING

Dr. Cristian | Dragos STEFANESCU M.D., Ph.D.

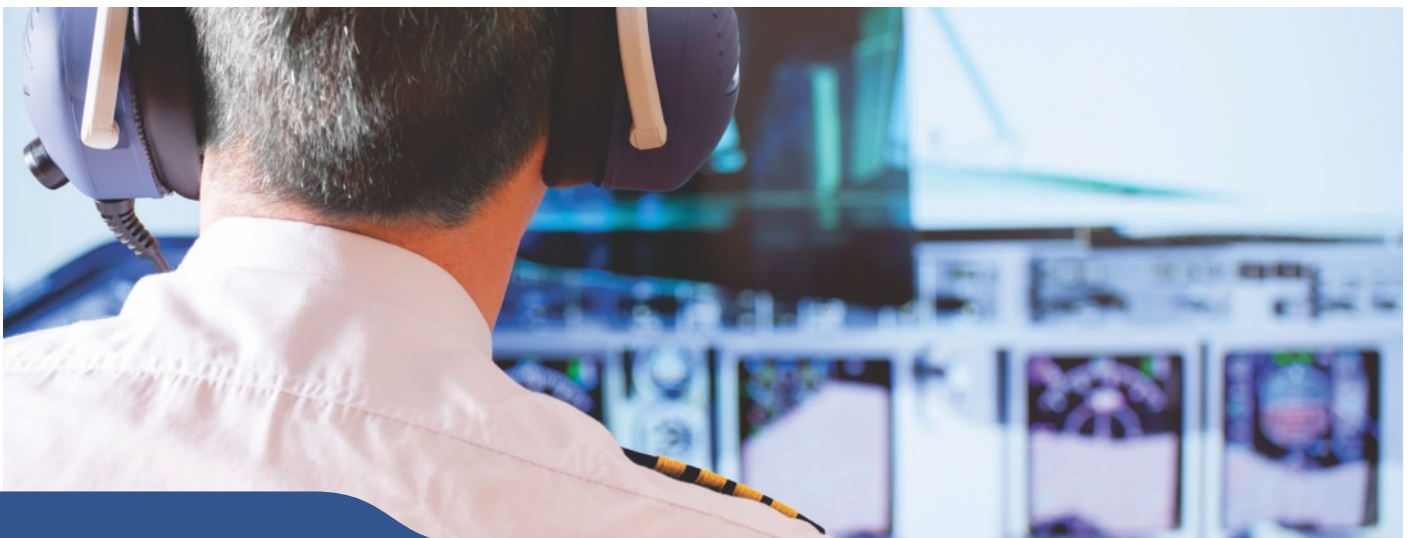
Introduction: Screening for sleepiness and for sleep apnea among aviators needs to be seriously evaluated. A patient tailored diagnosis and treatment protocol for sleep disorders is the best way to preserve the flying aptitude. Every surgeon should customize treatment of snoring and obstructive sleep apnea in accordance with the patient's anatomy and with his own practice parameters. We present our experience with day surgery procedures for snoring.

Materials and methods: When an aviator is diagnosed with a sleep disorder that can result in sleepiness, a discussion of flying aptitude is always in order. The study is a retrospective case series of 119 adult patients who underwent day surgery procedures for snoring management. All patients were evaluated at the somnology department of The National Institute of Aerospace Medicine.

Results: Outcomes of interest included rate of snoring improvement, final bed partner snoring satisfaction, change in Epworth score, and change in FOSQ score, and procedure-related complications.

Conclusions: No one is immune from fatigue. Fatigue has been, and continues to be, a contributing factor in aviation accidents. Day surgery procedures (upper airway radiofrequency ablation combined with nasal surgery) are considered safe and effective treatment for patients with anatomic nasal obstruction with socially disruptive snoring.

Key words: somnology, snoring surgery, aviation fatigue.



PERSPECTIVES IN EVALUATION OF RESPIRATORY FATIGUE IN AVIATORS; BY NEUROIMAGING ALONG WITH, DIGITAL HUMAN LUNG AIRFLOWS

Jayashri Devi

Neuroimaging to measure psychophysiological changes in alertness and fatigue are reminiscent of the earliest recordings of pulsations from the brain by Mosso who tried correlating blood flow to Cerebral function with some resultant functional significance. In 1890, Charles Smart Roy and Charles Scott Sherrington suggested a link between brain circulation and metabolism (Sandrone S. 2014). More recently these have been extended to various Psychophysiological indexes to reflect changes caused by Mental Workload leading to fatigue and correlated it to more objective criteria (a standing-position balance test as well as a critical flicker fusion frequency (CFF) test) as were found more reliable for fatigue evaluations in aviators (MaJ.2014).

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by the mechanoreflex is preceded by the Metaboreflex (Douglas 2001), and can aid with cyclical inspiratory recovery. The Patterns and Work of breathing in critical conditions during flight can best be imaged as an extension of The digital Human Lung Atlas which forms part of the Lung Physiome project and comprises of both structural and functional measures, and includes computational models derived to match individual subjects for personalized prediction of function (Tawhai MH 2009) including modeling turbulent flows in the airway.

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EFFECT OF COMBINED CORIOLIS ILLUSION AND HYPOXIA ON SACCADIC METRICS DURING SIMULATED FLIGHT

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Introduction: Coriolis illusion involves the stimulation of at least two semicircular canals and is associated with e.g. sudden tilting (forward or backwards) of the pilot's head while the aircraft is turning. Studies reported increase in frequency and amplitude of saccades due to pitch forward motion of the pilot in rotating frame. However, it is not known if the effect is present under hypoxic conditions simulating flights at 5000m and 6000m.

Methods: Fourteen male flight instructors (25 - 45 yo.) performed a simulated flight in an Integrated Physiological Trainer (GYRO-IPT, ETC, Southampton, PA, USA) consisting of three parts (course change and ascent over 180 sec, head turn down, straight flight) under conditions of lowered O₂ pressures corresponding to altitudes of 5000m and 6000m. The air was supplied by a mask. The simulator rotated with sub-threshold angular acceleration of 0.20/s² in yaw over the first 180 sec of the flight, reaching angular velocity of 360/s at the moment of pitch forward of the head. Mean saccadic amplitudes, mean saccade duration, mean fixation time and saccade frequency were calculated over the

period preceding and following the head turn setting off Coriolis illusion.

Results: No effects of altitude were detected before the Coriolis illusion. At 5000m and with Coriolis illusion, mean saccade amplitude, mean saccade duration increased respectively by about 30%, 40% ($p < 0.005$), and there was a trend for 20% increase in saccade frequency ($p = 0.08$). At 6000m, only trends for 14% increase in mean saccade duration and 30% increase in saccade frequency (both $p = 0.08$) were noted. No differences were recorded in the parameters between 5000m and 6000m, except for a trend for 17% shorter saccade duration at the latter altitude ($p = 0.06$).

Discussion: We have observed effects of Coriolis illusion on saccadic movements under hypoxic conditions. Fewer significant effects at 6000m than at 5000m likely reflect larger variability of saccadic metrics at the former altitude.

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DISORDERS OF CONSCIOUSNESS IN THE CIVIL AVIATION PERSONNEL

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A high probability of sudden disturbances of consciousness (convulsive attack, fainting fits, sharp violations of cerebral circulation of blood and other) is absolutely incompatible with the work of aviation personnel.

Material and methods: 192 aviation personnel of Civil Aviation were observed for a long time after transient disturbances of consciousness. All persons were examined in the department of medical examination and rehabilitation treatment at Central Civil Aviation Hospital (Moscow) after registering brief episode of loss of consciousness. Examination included a complete clinical examination with evaluation of neurological, physical status, conducting EEG and neuroimaging. All persons were disqualified in the observation period.

Results: The structure of the short-term

loss of consciousness was presented epileptic seizures - 29.2% (n = 56; female - 2 and male - 54) and transient disturbances of consciousness non-epileptic origin - 70.8% (n = 136; female - 40 and male - 96). More often short-term disturbances of consciousness were registered in stewardess - 22.4%, air traffic controller - 18.2%; co-pilots 17.7% and rarely in pilots - 5.2% and other categories of aviation personnel. Prevalence (1/1000) of short-term disturbances of consciousness prevails also among air traffic controller, compiled from epileptic seizures - 0.24, and attacks on other genesis - 0.41.

Conclusions: Short consciousness disorders of various origins require individual assessment in each clinical case according to the genesis of paroxysm, risk factors for recurrence.



INPUT OF PREVENTIVE MEDICINE TO FLIGHT SAFETY

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Introduction: The main scope of aeromedical certification is the assessment of fitness to fly or to execute the duties of the aviation personnel license. Minimum periodic requirements for the examination and investigations that are performed only on clinical indications not always permit to reveal some pathology on time. That could further present risks to flight safety or lead to suspension or loss of license due to medical reason. The actual control over the possible development of such diseases as diabetes mellitus, hepatitis, gall or kidney stones, cancer and other medical conditions could be done during the aeromedical certification itself. Decrease of medical risks to flight safety and the extended carrier of aviation personnel are evident if the onset of the complicated medical conditions are delayed and even eliminated. Timely identification and further compliance with preventive measures apparently are preferable for personnel's health and the flight safety.

Methods: We have performed the actual and retrospective health status analysis

of the aviation personnel (flight and cabin crew members, ATCOs) that have been examined in the Medical Center of Civil Aviation of Moldova during the period of 2009-2013. Pathologies unexpectedly revealed with the help of additional investigation methods like biochemical analysis, ultrasound diagnostics, fasting glucose level, specific laboratory tests like PSA and the results of the timely medical intervention have been analyzed. Diseases that were diagnosed during the standard routine examination were not taken into consideration.

Results: We present the data of the yearly examined personnel with impaired glucose tolerance who then is monitored and controlled during regular aeromedical examinations. The measures for the weight, dyslipidemia and hypertension corrections in this group, when needed, are analyzed. Data of full recovery or stable remission of infected persons with viruses of hepatitis B, C or D after the antiviral therapy was administered at the early stages of the disease is given. Presentation also shows the cases of gall stones and kidney cysts



and stones, hydatid disease of liver, thyroid gland adenoma and cancer, prostate cancer and kidney adenocarcinoma that were revealed with the help of additional investigations. Timely treatment and its effectiveness, special approach in aeromedical assessment of the cases are disclosed.

Conclusion: Adding several investigations to the standard aeromedical examination could help to

diagnose on time some serious medical conditions in aviation personnel. Treatment and preventive measures that could be recommended by AMEs and followed by applicants help to slow down the onset of such diseases like diabetes mellitus, progression of hepatitis, some types of cancer. These measures could keep licensed aviation personnel engaged in their carrier for much longer and definitely reduce the risks to flight safety.

ENDOCRINE PATHOLOGY IN CIVIL AVIATION PILOTS SENIOR AGE GROUPS

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The endocrine system plays an important role in maintaining homeostasis regulation of many body systems (cardiovascular, metabolism and other), which is very important for the health of aviation personnel.

Material and methods. Examined 338 pilots hospitalized in the first half of 2009 year in the department of medical examination and rehabilitation treatment at Central Civil Aviation Hospital, Moscow at regular bases (after reaching the age of 55 years). The pilots and didn't have any complaints (screening). Mean age was $56 \pm 0,35$ years. Total flight time was $15\,269 \pm 204,91$ hours. Methods: ultrasound of the thyroid gland and adrenal gland, thyroid hormones (T3, T4, thyroid –stimulated hormone, antibodies to thyroglobulin and microsomal fractions) and general clinical examination methods, including determining BMI and neurological inspection.

Results: The most frequently detected thyroid disease - 37.9% of the cases (128 persons), 8 of them previously had surgical treatment of thyroid cancer (in 4 of them - nodular goiter and on one

occasion - a colloid goiter, cancer and thyroid adenoma). Nodular goiter was diagnosed in 8.9% of cases ($n = 30$), multinodular goiter I-II – 6.8% ($n = 23$), diffuse euthyroid goiter I-II – 12.1% ($n = 41$), mixed euthyroid struma I-II – 4.4% ($n = 15$), autoimmune thyroiditis – 1.2% ($n = 6$), diffuse change in the structure of thyroid – 0.3% ($n = 1$). Thyroid dysfunction was observed only in one case - hypothyroidism, in others - euthyroid.

Another common problem - disorders of fat metabolism - 36.1%. The most commonly diagnosed overweight – 19.5% ($n = 66$), obesity degree I – 15.7% ($n = 53$), degree II – 0.6% ($n = 2$). Rare endocrine diseases include pituitary adenoma – 0.8% ($n = 3$), hormonally inactive focal adrenal changes and type 2 diabetes - on one occasion.

Conclusions. The most frequently endocrine pathology in civil aviation pilots senior age groups are thyroid disease - 37.9% and disorders of fat metabolism - 36.1%, rarely led to medical disqualification.

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“Them that asks no
questions isn't told a lie”

Rudyard Kipling

With the kind support of:

