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Poster Presentation Abstracts

P001

**U.S. AIR FORCE OPERATIONAL BASED VISION ASSESSMENT LABORATORY
(OBVA) DESIGNING THE OPTIMAL AERIAL REFUELING TANKER
STEREOSCOPIC REMOTE VISION SYSTEM BASED ON HUMAN VISUAL
PERFORMANCE RESEARCH**

*US LA FORCE AÉRIENNE LABORATOIRE D'ÉVALUATION DE LA VISION OPÉRATIONNELLE LA
CONCEPTION DU SYSTÈME STÉRÉOSCOPIQUE DE VISION À DISTANCE DE RAVITAILLEURS
AÉRIENS OPTIMAL BASÉ SUR LA RECHERCHE SUR LA PERFORMANCE VISUELLE HUMAINE*

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Introduction: The boom operator in next generation aerial refueling tanker is in the cockpit utilizing indirect three-dimensional remote viewing system (RVS) stereo display to “fly” the boom to the refueling aircraft. Current and future military aircraft using the RVS include Boeing KC-46 (USAF), Airbus KC-30 (RAAF, RSAF, UK, etc.), Boeing KDC-10 (RNLAf), KC-767 (JASDF, Italian AF) and Israeli IDF KC-707. The level of stereo acuity and oculomotor capabilities required to maintain fusion and avoid asthenopia with human vision limits was not addressed in the design and development of the RVS by any of the aircraft manufacturers.

Methods: OBVA completed five separate 3D remote vision system research projects and four questionnaires investigating aspects of vision and RVS configuration that may affect aerial refueling operator performance. Over 120 subjects completed the five air refueling tasks. All participants were tested with existing commercially available vision tests and OBVA developed computer-based vision tests. Two \$1M KC-46 panoramic training simulation systems including a VITAL six-channel image generator from Flight Safety International was used in all the experiments. Hyper-stereoscopic, normal stereo and no stereo image; toed in vs parallel cameras and dual display vs interlace displays were compared among the participants.

Results: Correlation between vision tests, aerial refueling performance on the five research projects and post refueling questionnaires can be used to identify the optimal 3D remote viewing system.

Conclusion Best industry practices that aircraft manufacturers should utilize to avoid human factors limits in all the current 3D RVS systems today will be discussed.

P002

THE ASSESSMENT OF THE IMPACT OF THE TRAINING PROCESS ON THE HABITUATION OF THE VESTIBULAR-VEGETATIVE SYSTEM, USING A SPECIAL TEST

L'ÉVALUATION DE L'IMPACT DU PROCESSUS DE FORMATION SUR L'ACCOUSTOMANCE DU SYSTÈME VESTIBULAIRE-VÉGÉTATIF, EN UTILISANT UN TEST SPÉCIAL

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Introduction: In the Polish Air Force, Special Air Gymnastic Instruments (SAGI) play a key role in shaping spatial orientation and increasing the tolerance to air sickness. They constitute an indispensable part of air training, which is responsible for flight safety on highly manoeuvrable aircraft with regard to the human factor. Training on SAGI has the effect of lowering the sensitivity of the vestibular-vegetative system. In order to evaluate the habituation level of the vestibular-vegetative system in the process of training, a rotation trial was used on the unlocked looping (the so-called Jedrys trial).

Objective: The aim of the paper is to assess the habituation of the vegetative-vestibular system in cadet pilots before and after the training.

Methods: 30 cadet pilots, on average 19 years of age, underwent examination on SAGI. The test included a trial on the unlocked looping, which made it possible to diagnose a tendency to vegetative disorders in cadet pilots. The trial was conducted at the beginning (examination I) and at the end (examination II) of the training process on SAGI.

Results: The examined group, undergoing an exercise programme on SAGI, on the unlocked looping, scored an average result (trial time) 510.2 s at the beginning of the training process, and 598 s on completion of the training process, which constitutes a statistically significant difference ($p < 0.0005$).

Conclusions: The exercises on SAGI exert a beneficial impact on improving the habituation of the vestibular organ in training cadets, expressed by a statistically significant extension of time of performing a rotational test on the unlocked looping. Thus, a significant improvement in the tolerance of angular accelerations and an increase in tolerance to airsickness were achieved.

P003

BIOMARKERS OF HYPOXIA AFTER HYPOBARIC CHAMBER TRAINING: EX VIVO STUDIES ON BLOOD OF MILITARY PILOTS

BIOMARKERS D'HYPOXIE PAR L'ENTRAÎNEMENT DANS LA CHAMBRE HYPOBARIQUE: ÉTUDES EX VIVO DANS LE SANG DES PILOTES MILITAIRES

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Introduction: Hypobaric chamber experience is fundamental for aviation training as it enables pilots to learn and recognize personal hypoxia symptoms. While physiological responses and cognitive impairment have been extensively studied to avoid in-flight hypoxia incident, biochemical effects of hypobaric-hypoxic environment in pilots have not equally investigated. Blood biomarkers of oxidative stress have been studied after hypobaric chamber training of healthy young military pilots.

Methods: We measured plasma total Antioxidant Capacity, F2-Isoprostane (IsoP), 3-Nitrotyrosine and Thromboxane B2 (TXB2) and whole blood and plasma metals (Ca, Cu, Fe, Mn, Zn) levels in 33 healthy military aviators (30m, 3f; 22.7 (21-24) yrs). Biomarker analysis were carried out at baseline and after exposure to hypobaric hypoxia at 25000ft and 18000ft.

Results: After hypobaric chamber, no changes in mean levels of all the proposed plasma biomarkers and whole blood metals were observed, nevertheless we found a slight but significant decrease (decrease of Zinc levels (29.6%, $p=0.0002$). Individual Zinc plasma decrease was correlated with basal IsoP levels ($r_s=0.58$, $p_{18000ft}$ ($r_s=-0.41$, $p=0.0122$) and at 25000ft ($r_s=-0.42$, $p=0.0660$), respectively.

Conclusions: Our findings support the evidence that hypobaric chamber training induces an increase in IsoP and TXB2 only in subjects who experienced low %SatO₂, suggesting that hypoxia, oxidative stress and vascular response are correlated phenomena. The decrease in Zn plasma levels after hypoxia may be due to a cellular uptake in order to restore the redox equilibrium operated by enzymes with Zn ion on the active site, i.e. carbonic anhydrase and superoxide Dismutase. On this basis, in student pilots the effects of hypobaric-hypoxia could be counteracted by an efficient antioxidant Zinc-dependent mechanisms.

P004

EFFECT OF AERONAUTICAL ENVIRONMENT ON BIOCHEMICAL MARKERS OF BONE METABOLISM IN AIRCREW MEMBERS OF CIVIL AVIATION

EFFET DE L'ENVIRONNEMENT AERONAUTIQUE SUR LES MARQUEURS BIOCHIMIQUES DU METABOLISME OSSEUX CHEZ LES MEMBRES DE L'AVIATION CIVILE

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Introduction: To explore the effects of aeronautical environmental factors on bone metabolism in aircrew members of civil aviation, we analyzed the correlations between the level of biochemical markers of bone metabolism and flight duration in aircrew members of civil aviation.

Methods: 200 healthy male aircrew members of civil aviation (23~59 years) and 180 healthy male controls (23~60 years) were randomly selected and were divided into four different age groups (20~, 30~, 40~ and 50~60 years old). The levels of blood calcium (Ca), serum inorganic phosphorus (P), 25-hydroxyvitamin D [25(OH)D], bone alkaline phosphatase (BALP), N-terminal osteocalcin (N-MID), Procollagene C- and N-terminal propeptides (P1NP), Type collagen carboxy-terminal peptide (CTX) and Tartrate-resistant acid phosphatase (TRACP) were measured.

Results: The results showed that the N-MID was significantly higher in the aircrew members aged 30~39 and 50~60 than in the control groups ($P = 0.004$, $P = 0.036$), while there was no statistical difference between groups in 20~ and 40~ group ($P > 0.05$). There was no significant difference in the levels of Ca, P and 25(OH)D between the two groups. The levels of 25(OH)D, CTX, N-MID and P1NP decrease with age in both groups, in addition, all the above parameters in all ages were higher in the pilots than in the control group, however, this was not statistically significant. The cumulative flight duration was negatively correlated with bone metabolic parameters. Nevertheless, there was no significant correlation between flight duration and bone turnover markers after adjustment for age.

Conclusion: These results suggested that the aeronautical environmental factors have no effect on the bone metabolism biomarkers in aircrew members of civil aviation.

P005

ASSESSMENT OF GRAVITY INDUCED ORTHOSTATIC CHANGES IN THE CAROTID BLOOD FLOW USING ARDUINO-BASED SYSTEM

ÉVALUATION DES CHANGEMENTS ORTHOSTATIQUES INDUISÉS PAR LA GRAVITÉ DANS LE FLUX SANGUINE DE LA CAROTIDE À L'AIDE D'UN SYSTÈME À BASE D'ARDUINO

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Introduction: Carotid arteries are major contributors to cerebral blood flow and find an important place in many clinical conditions as well as in studying phenomena like +Gz induced loss of consciousness (G-LOC) in high performance fighter jet pilots. A constant change of carotid blood supply occurs to the brain with change in the posture from supine to sitting and sitting to standing erect. An effort has been made to record gravity-induced orthostatic changes in the carotid blood flow during different postures.

Method: A simple system has been designed and developed to record carotid blood flow changes in the human volunteers on a manually operated tilt table using piezoelectric sensors and an Arduino board. The volunteers were 20-25 years of age healthy subjects of both sexes. The subjects were rested for 15 minutes before commencing the test. The carotid artery running by lateral side of throat was palpated and the piezo sensor was placed over it and taped in place with medical adhesive tape. The pulse signals were acquired by the Arduino board and sent to a laptop connected to Arduino board via USB port.

Results: Average Carotid values (\pm SD) for peak-to-peak voltage for Supine, Vertical and Recovery states were 1.900 ± 0.794 , 1.133 ± 0.615 and 2.402 ± 0.788 volts respectively. The corresponding values for Dorsalis pedis artery noted as above were 0.651 ± 0.482 , 1.086 ± 0.978 and 0.532 ± 0.347 volts respectively. The changes were found to be significant when comparing Supine vs Vertical ($p < 0.05$), Vertical vs Recovery ($p < 0.05$) and Recovery vs Supine ($p < 0.05$) positions. More interesting is the behavior of carotid flow on active rising from a sitting position.

Conclusion: A very simple and inexpensive system can sensitively record and analyze the carotid blood flow data non-invasively with minimal interference with subject's physiology.

P006

THE INFLUENCE OF THE CENTRIFUGE TEST ON CHANGES IN THE VALUE OF THE BIO-ELEMENT INDEX IN THE BLOOD SERUM OF WOMEN CADET PILOTS BEFORE AND AFTER THE TRAINING PERIOD

L'INFLUENCE DU TEST DE CENTRIFUGATION SUR LES VARIATIONS DE LA VALEUR DE L'INDICE DE BIO-ÉLÉMENT DANS LE SÉRUM SANGUIN DES FEMMES PILOTES DE CADETS AVANT ET APRÈS LA PÉRIODE DE FORMATION

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Introduction: The aim of the study was to examine the impact of 45-day targeted physical training of female cadet officer-pilots on changes in the value of the bio-element indicator under the influence of centrifuge test.

Material and Methods: Seven female cadet-pilots, aged 20 years, in the 1st year of study at the Polish Air Force Academy (PAFA) in Deblin, were subjected to research. The tests were carried out twice during the centrifuge training, at the beginning (TEST I) and the end (TEST II) of 45-day training period. The test used a load of interval type accelerations. The cadets were twice drawn blood from the elbow vein before and after centrifugation, at the beginning and end of the training period. The following bio-elements were determined in the blood serum: K, Na, Mg, Fe, P, Ca with Roche reagents on the Integra 400/800. The bio-element index was calculated from the Wochynski formula.

Results In TEST I, a statistically significant decrease in the concentration of K, P, Fe, Ca / P and P / Mg after centrifugation successively at $p < 0.02$, $p < 0.02$, $p < 0.05$, $p < 0.05$ and $p < 0.05$ in relation to the value before centrifugation have been recorded. In TEST II, in the determined bio-elements, no significant differences were found after centrifugation in relation to the value before centrifugation. However, the index of bio-elements used shows a statistically significant increase in value before centrifugation at $p < 0.002$ and after centrifugation at $p < 0.0005$ in TEST II in relation to TEST I.

Conclusion: It was shown that the period of targeted training significantly increased the value of the bio-elemental index in the blood serum of female cadet-pilots under the influence of centrifugation.

P007

THE INFLUENCE OF EXERCISES ON SPECIAL AVIATION GYMNASTIC INSTRUMENTS ON THE PHYSICAL FITNESS OF CADETS- PILOTS OF POLISH AIR FORCE ACADEMY IN DEBLIN

L'INFLUENCE DES EXERCICES SUR LES INSTRUMENTS SPÉCIAUX DE GYMNASTIQUE DE L'AVIATION SUR LA CONDITION PHYSIQUE DES CADETS-PILOTES DE L'ACADÉMIE DE LA FORCE AÉRIENNE POLONAISE À DEBLIN

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Methods: The study involved cadets in the 1st year of study, aged 19, major in pilotage, divided into two groups. Group I (N=20) implemented the SAGI physical education program, and Group II (N=10) standard physical education. All cadets' physical fitness were assessed using the following physical fitness tests: Aviation Synthetic Efficiency Test (ASET), forward bends, pull-up on the stick, 16.5m run, and 10x10m run. The preparatory process included 20 2-hour training units, which were completed within 70 days. Results of all tests were converted into points to determine the level of overall (total) physical fitness.

Results: The obtained research results show that group I of cadets before and after the training period obtained a statistically significant improvement in physical fitness measured by ASET ($p < 0.05$), and in total physical fitness ($p < 0.01$). There was a significant correlation between the total physical fitness and the pull on the high bar $r = 0.66$ ($p < 0.001$), 10x10m $r = -0.65$ ($p < 0.02$), 16.5m $r = -0.69$ ($p < 0.005$), ASET $r = -0.62$ ($p < 0.03$). In Group II, a statistically significant difference in total physical fitness was observed at $p < 0.01$, after the training period in relation to the value before the training period. There was a statistically significant correlation between the total efficiency and 16.5 m run $r = -0.71$ ($p < 0.05$).

Conclusion: The results of the study showed a statistically significant improvement in general physical fitness and ASET in Group I exercising on the SAGI. In Group II, improvement was found only in general physical fitness.

P008

ASSESSMENT OF PHYSICAL FITNESS OF CANDIDATES FOR PAFA USING THE ROHRER INDEX IN THE RECRUITMENT PROCESS IN 2007-2008

ÉVALUATION DE L'APTITUDE PHYSIQUE DES CANDIDATS À PAFA EN UTILISANT L'INDICE DE ROHRER DANS LE PROCESSUS DE RECRUTEMENT EN 2007-2008

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Introduction: The aim of the study was to examine the dependence of motor skills of candidates examined in the recruitment process for PAFA on the Rohrer index.

Methods: Candidates for PAFA were tested during recruitment in 2007 (Group I n=72) with the average age 21.6 years and in 2008 (Group II n=98) with an average age of 20.4 years. All candidates were subjected to a fitness test (100m, 1000m, pull-up on the stick, swimming 50m). Obtained results converted into points gave a comprehensive (total) assessment of the candidate's physical fitness. In both study groups, the body height was divided into 175 cm, from 176 to 186 cm and above 186 cm.

Results: In the adopted body height classification, a comparison was made between the subjects in both groups and a statistically significant difference was found in the Rohrer index in groups I and II, successively at $p < 0.001$ and $p < 0.002$. Candidates with a height up to 175cm showed the highest efficiency in both groups, then 176-185 cm and the lowest number of points obtained candidates above 186 cm. It was found that in group II from 176-185 cm, the Rohrer index correlates significantly with the total number of physical fitness points $r = -0.29$ ($p < 0.05$), with the number of points from 1000m run $r = -0.40$ ($p < 0.005$) and from the number of points obtained from 100m run $r = -0.28$ ($p < 0.05$).

Conclusion: It was found that in Group II, the overall fitness, speed and endurance of candidates depend on the Rohrer index when classifying the body height from 176-185 cm.

P009

CHANGES IN PARAMETERS OF BODY AND PHYSICAL EFFICIENCY BEFORE AND AFTER PROCESS TRAINING CADETS POLISH AIR FORCE ACADEMY IN DEBLIN

CHANGEMENTS DANS LES PARAMÈTRES DU CORPS ET DE L'EFFICACITÉ PHYSIQUE AVANT ET APRÈS LA FORMATION DES CADETS DE L'ÉCOLE DE LA FORCE AÉRIENNE POLONAISE À DEBLIN:

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Introduction: The purpose of the study was to determine the impact of the training process on the parameters of body composition and physical fitness of cadets.

Methods: The study was attended by 29 first-year Cadets around 20 years-old attending the Polish Air Force Academy (PAFA) in Deblin. The pilots were divided into four groups: jet aircraft pilots- group I (N = 7), helicopter pilots- group II (N = 14), ground handling- group III (N = 8), all cadets- group IV (N=29). The research was carried out twice, at the beginning (study I) and at the end of the training period (study II). Completed fitness tests (Aviation Synthetic Efficiency Test (ASET)), 40m, 100m, 1000m run, Wingate test) and body composition by means of bioelectrical impedance analysis on the AKERN-101 apparatus.

Results: There was a statistically significant improvement in the efficacy results between the I and II tests in group I: in LSTS, in 100m, 1000m, and pull-up. In group II: 1000m and Wingate test, in group III: in 40m, 100m, 1000m and pull-up, and in group IV: LSTS, 100m, 1000m, pull-up. In the parameters of the body composition, a significant difference was found between the first and the second test in groups III and IV in ECW, ICW.

Conclusion: The training process used for cadets in the studied groups significantly influenced the improvement of physical fitness and body composition parameters.

P010

THE MEANING OF ARRHYTHMIA OCCURRED IN CENTRIFUGE TRAINING

LA SIGNIFICATION DE L'ARYTHMIE S'EST PRODUITE DANS LA FORMATION DE CENTRIFUGEUSE

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Introduction: We routinely monitor electrocardiogram (ECG) during the centrifuge training. However, the meaning of arrhythmia occurring in this environment for aviation safety has not been determined. We therefore investigated the relationships between types of arrhythmia and symptoms in this training.

Methods: Of the cases during centrifuge training at JASDF Aeromedical Laboratory until June 2018, those who had the decision of training breakdown and received the precision inspection for arrhythmia were extracted. Based on the recorded ECG waveform, we grouped them into the following three groups; supraventricular arrhythmia (SA: narrow QRS tachycardia), ventricular arrhythmia (VA: wide QRS tachycardia) and bradycardia arrhythmia (BA).

Results: There were 46 cases with arrhythmia in the training. We detected 26 cases (56.5% of total arrhythmia) of SA, 15 cases (32.6%) of VA, and 5 (10.9%) of BA, respectively. In them, 8 cases (17.4%) were symptomatic during arrhythmia [SA 4 cases (15.4% of total SA), VA 1 case (6.7% of total VA), BA 3 cases (60% of total BA), $P=0.02$]. According to the detail of the symptoms, loss of consciousness was observed in 3 cases (6.5 % of total arrhythmia) [SA: 2 cases (7.7% of total SA), BA: 1 case (20.0% of total BA), $P=0.27$]. Those who had gray-out were 2 cases (4.3 %) [SA: 1 case (3.8% of total SA), BA: 1 case (20.0% of total BA), $P=0.16$]. Also, those who had visual symptoms was 1 case (2.2 %) [BA: 1 case (20.0 % of total BA), $P=0.02$] and those who had palpitation was 1 case (2.2 %) [SA: 1 case (3.8 % of total SA), $P=0.62$].

Conclusions: Bradycardia during the centrifuge training was not common, but was more frequently accompanied by syncope-related symptoms. On the other hand, further accumulation of data is necessary to elucidate the significance of supraventricular and ventricular arrhythmia detected in the training.

P011

**AN EXPERIMENTAL STUDY ON THE MECHANISM OF SALIDROSIDE INHIBITING
CARDIOMYOCYTE APOPTOSIS INDUCED BY HYPOXIA**

*UNE ÉTUDE EXPÉRIMENTALE SUR LE MÉCANISME DE SALIDROSIDE INHIBANT L'APOPTOSE
CARDIOMYOCYTE INDUITE PAR L'HYPOXIE*

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Introduction: To investigate the effects of hypoxia on the opening function of mPTP and its role in salidroside-induced anti-apoptosis effects in hypoxia-treated cardiomyocyte.

Methods: The cultured primary rat cardiomyocytes were divided into 6 groups: control, hypoxia, 30 μ M salidroside+hypoxia, 60 μ M salidroside+hypoxia, 120 μ M salidroside+hypoxia and 25 μ M CsA+hypoxia group. The cells were stained by Annexin V-FITC and early cell apoptosis were detected by flow cytometry. NAD⁺ concentration, the opening marker of mPTP, was measured by NAD⁺ assay kit. The protein expression of Bcl-2 and Cyto C in cytoplasm and mitochondria were detected by western blot.

Results: Hypoxia increased the apoptosis rate in cardiomyocytes and decreased the concentration of NAD⁺. Pretreated with salidroside significantly inhibited hypoxia-induced apoptosis and increased the NAD⁺ concentration in dose-dependent manner. CsA, the inhibitor of mPTP opening, also significantly inhibited apoptosis and decrease of NAD⁺ concentration induced by hypoxia. Western blot results showed that salidroside and CsA obviously inhibited decreased Bcl-2 expression and increased Cyto C expression in cytoplasm, and reversed the decreased expression of Cyto C in mitochondria induced by hypoxia.

Conclusion: Salidroside protects hypoxia-induced cardiomyocyte apoptosis by inhibiting the opening function of mPTP.

P012

CERTIFICATION OF NURSES AND MID-LEVEL PROVIDERS TO SUPPORT SPACE TOURISM AND COMMERCIAL SPACE OPERATIONS

CERTIFICATION DES INFIRMIÈRES ET DES FOURNISSEURS DE NIVEAU INTERMÉDIAIRE POUR SOUTENIR LE TOURISME SPATIAL ET LES OPÉRATIONS SPATIALES COMMERCIALES

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Introduction: Commercial space flight, including tourism, is in the initial stages of development and marketing to the public. Space tourism success will depend upon travelers' positive space experience. Positive travel experiences begin with appropriate medical screening, risk stratification and risk mitigation of commercial passengers. Though regulations regarding commercial space travel are evolving, one gap to be addressed is certification of properly trained medical professionals to screen tourists regarding risks: - FAA 14 CFR Part 460, Subpart B. § 460.45 does not address medical issues: "An operator must inform each space flight participant in writing about the risk of the launch and reentry, including the safety record of the launch or reentry vehicle type." - However, the literature indicates "Space doctors are finding that the most significant barrier to flying ordinary people may not be their physical ailments but something that is much less understood: anxiety."

Background: Key to space tourism will be risk assessments by trained providers (e.g., converging indicators for assessing individual differences in adaptation to extreme environments) with individualized mitigation of anticipated psychological/physiological events during space travel. A space travel case management team would be comprised of registered nurses, a mid-level medical provider (Advance Practice Nurse/Physician Assistant) and a clinical psychologist knowledgeable of a traveler's medical/psychological condition to:

1. Review medical records and quantify initial assessments
2. Coordinate evaluations to evaluate psychological and physical risk stratification
3. Provide coaching for the evaluation experience (example: centrifuge) and flight experience
4. Monitor for changes in medical/psychological status prior to flight
5. Follow up medically and psychologically post flight.

Summary: Propose that a Commercial Space Travel Medical Training Program and Certification be developed and offered at the IAASM Annual International Congress to train registered nurses and midlevel providers to the appropriate level of operational medical knowledge regarding the exposures and risks of commercial space operations and travel.

P013

ADVANTAGES OF PHOTOPLETHYSMOGRAPHY FOR IN-FLIGHT MEASUREMENTS

AVANTAGES DE PHOTOPLETHYSMOGRAPHY POUR LES MESURES EN VOL

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Introduction: Based on a steady upward trend in inexplicable physiological events in the latest generation of high-performance aircraft, medical monitoring of pilots under real flight conditions becomes increasingly urgent and worthwhile. However, employing the eligible techniques common in clinical use is often difficult under these extreme conditions. The aim of our studies was to evaluate whether circulatory function parameters obtained through photoplethysmography under simulated operational flight conditions can be robustly recorded, most accurately represented and used as reliable information on the pilot's health.

Methods: The pulse waves of pilots (N=59) undergoing gradual and rapid onset runs in the human centrifuge at the German Air Force Center of Aerospace Medicine in Königsbrück and of volunteers (N=26) performing parabolic flights were continuously recorded. The filtered photoplethysmogram provided the nonpulsatile (PPGDC) and pulsatile (PPGAC) components.

Results: Recording the pulse wave in the human centrifuge with good signal quality was possible under any condition. Minor interferences during the parabolic flights were usually caused by motion artifacts. The nonpulsatile components increased during the hyper-G phases in parabolic flight and during +Gz loads in the centrifuge. This must be interpreted as blood distribution to the lower body regions. In contrast, the decrease of nonpulsatile components during zero-g indicated a blood volume distribution towards the head. While the AC components initially increased with growing acceleration in the human centrifuge and decreased again as the Gz load further increased, a significant increase in pulsatile components in general could be observed under zero-g.

Conclusions: Recording the pulse wave during simulated high-agile flights in the human centrifuge and during parabolic flights was possible without any technical problems. Due to the simple application of the measuring technology and the measuring procedure itself as well as the low costs, these examinations pose a viable option for in-flight measurements.

P014

PNEUMOMEDIASTINUM AFTER RAPID DECOMPRESSION TRAINING IN HYPOBARIC CHAMBER: A CASE REPORT

PNEUMOMEDIASTINUM APRÈS LA ENTRAÎNEMENT DE LA DÉCOMPRESSION RAPIDE DANS LA CHAMBRE HYPOBARE: UN RAPPORT DE CAS

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Background: We present a case of flight surgeon primary course attendant, admitted following a rapid decompression in hypobaric chamber, leading to uncomplicated pneumomediastinum (PM). There was no history of airway injury and respiratory problems including asthma and with no esophageal perforation on investigations. The diagnosis and management is discussed which will help prevent this rare complication but may be serious to make RD training safe.

Case report: A 34-year-old male student flight surgeon with no significant medical problems presented with epigastric pain and dyspnea worsened with lying, nausea and vomiting 10 minutes after RD training. He sought medical attention and was diagnosed a pneumomediastinum. After a few days of conservative treatment, the symptoms completely disappeared. The followed-up was uneventful.

Discussion: From the search of database on incidence of pneumomediastinum caused by training in hypobaric chamber, no data was available to confirm the diagnosis. Hence, it could not be concluded on how many injuries or illnesses were caused by various training profiles to determine whether the training for such specific purpose is worthwhile. Also, in the event that injuries occur, how to diagnose and manage promptly to make the training safe and to optimize benefits for the trainees.

P016

AN OVERVIEW OF NECK PAIN IN U.S. AIR FORCE FIGHTER PILOTS

UN APERÇU DE LA DOULEUR AU COU DANS LES PILOTES DE CHASSE USAF

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Introduction: Fighter pilots flying currently fielded high performance aircraft experience a litany of physiologic stressors during flight. These unique stressors including neck pain contribute to a unique set of physiological problems.

Methods: The U.S. Air Force (USAF) School of Aerospace Medicine (USAFSAM) is conducting a number of intra- and extramural research projects focusing on the epidemiology, etiology, and potential therapeutic practices available for neck and back pain in aviators. This presentation is intended to provide a snapshot of the impact neck pain has on fighter pilots with substantial responses from a questionnaire developed by USAFSAM distributed to significant number of pilots across the Combat Air Forces.

Results: 86.9% of the respondents reported experiencing neck pain due to flying. One-third (63%) reported suffering neck pain during sorties in the previous 90 days. Neck pain adversely affected the mission for 78.3% of respondents. Even though 14.3% have been placed on "duties not to include flying" due to neck pain, 26.8% of the respondents reported that they removed themselves from the flight rotation due to neck pain. Respondents reported 42.6% knew other pilots who were receiving medical and therapeutic treatment outside of USAF medical services.

Discussion: The increased interest in neck and back pain expressed by Air Force leadership and from flight crew shows a need for deeper investigation into this topic and requires a systematic approach. These data were collected to understand the basic epidemiology and operational impact for high-performance aircrew and to collect data on solutions that pilots are utilizing; these data may help to quickly identify what therapies are most effective. The data demonstrate that pilots experience a substantial amount of neck pain and suggest that the high G-force environment, burden from aircrew flight equipment, and the physical demands of flight all play a role.

P017

THAILAND STUDENT PILOT SELECTION, RISK AND OPPORTUNITY OF TRAINING MARKET

THAÏLANDE SÉLECTION PILOTE ÉTUDIANT, RISQUE ET OPPORTUNITÉ DU MARCHÉ DE LA FORMATION.

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Introduction: In Thailand, student pilots training required initial medical examination carried out for a commercial pilot CPL medical class I standard. The medical administrative procedure could be provided only in two Institutes, Bangkok Civil Aeromedical Center and Institute of Aviation Medicine Royal Thai Air Force IAM-RTAF. Most aviation companies in Thailand required medical license CPL class I from IAMRTAF. Waiting list of administrative procedure at the institute nowadays is more than one year duration. In this study medical standards not met will be explored, including somatic, psychometric or aptitude and mental limitation. This is in order to improve both quality and number of trainees to supply to training market.

Method: Data was collected from the Medical Standard Division, Institute of Aviation Medicine, RTAF from 2011 to 2017 (6 years). The cases from each institute could be divided into Civil and Military groups. The Civil group could be subgrouped into training institute, airline student pilots, and license conversions groups.

Result: The total number of trainees was 6992, of which 5379 were compatible with medical class I CPL to study--1613 failed to pass the medical check-up process. Civil student pilots and military student pilots were included. Three main Civil group differences were that the experienced airline aviation company converted license group had higher percentage that passed successfully, and the training institute had more than half failed. The main causes to fail on medical test were Psychometric and Aptitude tests, compared to somatic limitation, (96.22% and 38.90%, respectively). Major medical cause from somatic disease was ophthalmological problem (67.96%).

Discussion: This study could provide information for trainee and training institutes to prepare the administrative process. Future develop of selection system to train or acclimatize while in training institute setting could increase in number of medical class I CPL students.

P018

AIRCREW HEALTH SURVEY- CARDIOMETABOLIC RISK FACTORS

*French: ENQUÊTE SUR LA SANTÉ DES AÉRONEFS - FACTEURS DE RISQUE
CARDIOMÉTABOLIQUES*

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Introduction: The health of aircrews is critical to maintaining their fitness for flight. Since the Israeli military air force population is a selected population for good physical fitness, we can assume that the rates of excess weight and obesity in this population are lower than that of the general population. Studies comparing the rate of obesity among civil pilots to the rate in the general population found various findings in different countries. To date, no study has been conducted to examine the rate of obesity and other risk factors for cardiovascular disease among Israeli Air Force aircrew.

Methods: A cross-sectional database study was conducted. We examined the following data among aircrew population examined during five consecutive years in the Aero-Medical Center: height and weight, blood pressure, blood lipid levels, and fasting plasma glucose, service status and flying platform.

Results: The population examined consisted of 98% men and 2% women. 51% of the participants were career personnel, and 49% reserve. 40% were fighter pilots, 20% fixed wing transport aircrew, 20% helicopter pilots and the rest could not be defined. 32% were overweight, 3% were obese, 4.3% were hypertensive, 0.3% were diabetic, 3.9% were pre-diabetic, 16.5% had low HDL and 21.2% had high cholesterol. Among the reserve population, there was significantly higher rates of overweight and hypercholesterolemia than among career personnel. Fixed-wing transport aircrews had significantly lower HDL values than other platforms' aircrew. Women were less likely to be hypercholesterolemic. Age was a significant factor for all risk factors.

Conclusions: Aircrews' prevalence of overweight, obesity and hyperlipidemia was meaningful, but less than the general population. As expected, hypertension and diabetes rates were low in this population. Weight loss should be advocated in order to reduce risk factors that may endanger their health and impair their fitness to fly.

P019

BDMS ECMO TRANSPORT SERVICE

SERVICE DE TRANSPORT BDMS ECMO

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Introduction: In Thailand, healthcare service is composed of government and private sectors. There are approximately 1,200 hospitals in Thailand, with 34,644 licensed beds (approx. 900 government hospitals and 343 private hospitals). About 40% of licensed beds are located in central area of Thailand. Super tertiary centers mostly are located in Bangkok (104 of 343 hospitals or 40% of licensed beds (13,935 of 34,644 licensed beds). Bangkok Dusit Medical Service Public Company (BDMS) is the largest private healthcare service provider in Thailand, comprising 47 hospitals and the Bangkok Heart Hospital (BHT), which is a part of Bangkok Hospital Headquarters (BHQ) the super tertiary hub operating and managing case referrals to other BDMS network hospitals.

Extra Corporeal Membrane Oxygenation (ECMO) or extracorporeal life support is a technique of providing prolong heart & lung support to a patient who is suffered from a severe condition. This complex treatment needs a multimodality team approach and sophisticated medical equipment in central area (super tertiary centers), so transportation with ECMO to higher facilities level is crucial part of higher survival patient group. The BDMS ECMO program with certified team has been set up since 2014 and improved gradually with experience.

Methods: Records of patients treated with ECMO were reviewed.

Results: In the program, 56 patients were assisted by ECMO machine, conducting Veno – Venous (VV) ECMO to treat for severe lung disease (55%) and others were treated by Veno – Atrial (VA) ECMO to treat for severe heart disease (45%). 25 ECMO cases were transported from non-BDMS local hospitals to super tertiary centers in central area to seek for higher level facilities; most of transported cases were by ground transportation (17 trips). Another way is air transportation, which is transported by fixed-wing aircraft (5 trips) or helicopter (3 trips). Overall survival is about 76%-77% for VV group, 71% for VA group which is compatible to ELSO standard result. Complications were found in about 22% on VA cases and 19% on VV cases, but there was no occurrence related to transportation.

Conclusion: The key success factors for ECMO transport service depended on team & equipment readiness, continuous working process improvement, effective communication and collaboration.

P020

OPERATIONAL MODEL AND LAWS FOR PRIMARY MISSION OF PUBLIC HELICOPTER EMERGENCY MEDICAL SERVICE IN THAILAND

MODÈLE OPÉRATIONNEL ET LOIS POUR LA MISSION PRINCIPALE DE L'HÉLICOPTÈRE PUBLIC SERVICE MÉDICAL D'URGENCE EN THAÏLANDE

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Introduction: This research mainly focused on the improvement of the operational model and regulatory topics for primary mission of public helicopter emergency medical services suited for Thailand. Secondary objectives were to study (1) the problematic circumstances of the current operational model and laws for such mission in Thailand, and (2) the factors influencing the adoption of the model and regulatory topics, which were good practices from the case studies of Germany, United Kingdom, Japan and South Africa.

Methods: These were reviewed by applying a research methodology of qualitative research that consisted of studying documents, collecting the data from experts & operational personnel by both interview and communication via electronic mail (for the experts overseas) in order to design the conceptual framework, then applying an in-depth interview method to the sample. 18 persons were selected from the stakeholder populations, including pilots and quality assurance manager from Helicopter Emergency Medical Service (HEMS) Operators, medical crews, Civil Aviation Authority of Thailand (CAAT), air traffic controllers, 1669 center coordinating staffs, Narethorn center coordinating staffs and personnel from the Institute of Aviation Medicine, for supporting the conceptual framework and report the results.

Results: (1) The operational model suitable for Thailand consisted of Mission Operations, Helicopter Requirements and Aviation Management, regarding the regulatory topics suitable for Thailand that must cover the organizational structure of air operators, tools & equipment, infrastructure needed for the mission, flight operations in several conditions, personnel, management system, practice against patients and infection control from mission operations; and (2) The problematic circumstances of the current model and laws are the infrastructures (such as permission time for site-landing), the operational guidelines (such as unclear decision guidelines to choose a helicopter to perform the mission), and the performance and safety of the helicopters (such as lacking of proper emergency medical equipment onboard).

P021

A COMPARISON OF ELEMENTARY FLIGHT NURSES AND NURSE INSTRUCTORS KNOWLEDGE AFTER SCENARIO TRAINING

UNE COMPARAISON DES INFIRMIÈRES DE VOL ÉLÉMENTAIRES ET DES INSTRUCTEURS DE L'INFIRMIÈRE CONNAISSANCES APRÈS LA FORMATION SCÉNARIO

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Introduction: The nurse instructors of the Royal Thai Air Force Nursing College play a vital role in teaching theory and practice to the Air Force Student Nurses, studying Bachelor of Nursing Science Program. The identity of the program is to train the student nurses to become a well-prepared Air Force nurse, equipped with basic aeromedical evacuation (AE) capability. Basic knowledge of elementary flight nurse must be taught and integrated to related subjects in the program. The nurse instructors needed to develop and update knowledge consecutively. Scenario is one of the methods that can assist the nurse instructors to improve their knowledge before teaching the students.

Objective: To compare pre-test and post-test scores of knowledge related to elementary flight nurse by using scenarios.

Method: The population was 30 nurse instructors serving at the Royal Thai Air Force Nursing College, Academic year 2018. One group pre-post test design. The research tool used in the study was four scenarios related to adult nursing, obstetric nursing, psychiatric nursing and paediatric nursing. Knowledge test with 40 items was employed to evaluate knowledge levels of the nurse instructors. Data were analyzed by t-test.

Results: Average scores of knowledge related to elementary flight nurse pre-test was 22.4. After using the four scenarios, average post-test scores was 35.23. The study revealed the scores of pre-test and post-test were significantly different at 0.05 level ($t= 13.46$, $p < 0.05$)

Conclusion: The study indicated that teaching by using scenarios can enhance knowledge, and better understanding of the various elementary flight nurse situations related to the nurse instructors.

P022

HELICOPTER EMERGENCY MEDICAL SERVICES IN SOUTHERNMOST THAILAND

SERVICES MÉDICAUX D'URGENCE EN HÉLICOPTÈRE EN THAÏLANDE MÉRIDIONALE

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Introduction: Conflict in Southernmost Thailand has caused injuries to the officers and people since 2004. This has resulted in the shortage of emergency medical systems. Necessary Helicopter Emergency Medical Services (HEMS) had not been created appropriately in this vulnerable area. Southern Border Provinces Army Medical Center: SAMC is the forward military medical team working for Forward Internal Security Command Region 4, and takes responsibility for improving the health care system, especially in vulnerable area. SAMC has started HEMS with all agencies since 2012.

Background: The objectives were to: 1. Create HEMS in Southernmost Thailand by all agencies and people; 2. Practice, make exercises and create HEMS local/regional plan; 3. Create tele-medicine conference with all agencies to share real time patient status information and flight information to make right decisions and plan further responses; 4. Make trust through responsiveness that results from the local/regional plan.

As a result, annual integration exercises and local plan-making has occurred since 2012. Approximately 40 successful HEMS missions (3 at night) have been completed, most of which were trauma cases (only 3 were medical emergencies). The National Institute of Emergency Medical Services (NIEMS) has approved this regional plan for Southernmost Thailand.

Summary: To integrate coordination with all sectors, it is necessary to solve problems and improve quality of life in all aspects. The harmonious integration between military medical agencies and the others can develop the regional plan that is the appropriate way to improve standard HEMS, even in this vulnerable area.

P023

FACTORS RELATED TO FATIGUE IN AIR TRAFFIC CONTROLLERS (ATCS) OF THAILAND

FACTEURS LIÉS À LA FATIGUE DANS LES CONTRÔLEURS DE LA CIRCULATION AÉRIENNE (ATCS) DE LA THAÏLANDE

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Introduction: The objective of this study is to survey the factors related to fatigue in ATCs of Thailand in order to achieve maximum efficiency for aviation resource management and preparing for readiness of ATCs.

Methods: The sample in this study were 480 ATCs from Aeronautical Radio of Thailand Ltd. and the data was collected from a personal data questionnaire, ATCs' working factors questionnaire, cause of stress questionnaire, and IAM-Fatigue Assessment Scale (IAM-FAS). Statistics used to analyze the data and test the hypothesis are percentage, average, analysis of variance (T-Test and ANOVA), Pearson correlation methods and multiple regression analysis.

Results: The percentage of fatigue in ATCs calculated from IAM-FAS is 42.50. First 3 factors regarding in operations of ATCs are: 1. Controlling, 2. Fatigue and shift work patterns, and 3. Responsibility and decision making. First 3 causes of stress among ATCs are: 1. Demand, 2. Working environment, and 3. Working organization. The result of scores comparison from IAM-FAS revealed that there were significant differences in the position of control; fatigue scores of Area Control are higher than Aerodrome Control and Approach Control. The result of studying of the relationships between personal data and fatigue score showed that age, experience, and hours of sleep were significantly correlated with the scores from IAM-FAS. Moreover, hours of sleep can be used for predicting the fatigue score.

Conclusion: Hours of sleep can be used to predict fatigue in ATCs.

P024

JOB SATISFACTION AS AN INDICATOR OF STRESS IN THE SERVICE OF AIR TRAFFIC CONTROL

LA SATISFACTION AU TRAVAIL EN TANT QU'INDICATEUR DU STRESS PROFESSIONNEL AU SERVICE DU CONTROLE DU TRAFIC AERIEN

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Introduction: Being effective in a profession requires well-being on the day of work and satisfaction with the tasks performed. The group of such professions includes the pilot and the air traffic controller. These aviation jobs are often executed in conditions of time and information deficits. For this reason, employees of these professions are subject to chronic professional stress. Satisfaction from work is an indicator of experienced occupational stress. The aim of study was to check the relationship between job satisfaction and the level of stress perception.

Methods: The Maudsley Personality Inventory, the scale of Stress Factors, Questionnaire Minnesota Satisfaction, were used to assess 50 air traffic controllers. The obtained data was subjected to statistical analysis with the "Statistica" program.

Results: There was a statistically significant positive correlation between motivation achievements and the following styles of coping with stress: task style ($p = 0.001$), emotional style ($p = 0.04$), avoiding style ($p = 0.029$), replacement activities ($p = 0.05$).

Conclusion: The research shows that the motivation of achievements as a personality dimension influences styles of coping with stress. It is also worth noting that with the increase of achievements motivation, the subjects use more and more effective styles of coping with stress (task style). It should be noted that high motivation of achievement fosters effective problem-solving.

P025

COMPARISON OF OCCUPATIONAL STRESS BETWEEN CIVILIAN FLIGHT CREW AND AIR TRAFFIC CONTROLLERS IN IRAN

COMPARAISON DU STRESS PROFESSIONNEL ENTRE L'ÉQUIPAGE DE CONDUITE CIVIL ET LES CONTRÔLEURS DE LA CIRCULATION AÉRIENNE EN IRAN

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Background: Flight crew and air traffic controllers (ATC) have high level of occupation stress due to their job nature and unusual job scheduling. The combination of high workload, high responsibility for safety, personality traits and shift work makes air traffic control a stressful job. The source of stress for flight crew may be due to flight environment stressors, and unexpected weather or mechanical problems while in flight. The purpose of this research is to compare occupational stress between civilian flight crew and air traffic controllers in Iran.

Material and Methods: This is a descriptive – correlation (cross-sectional) study. 300 males were included in this study, including 150 air traffic controllers and 150 pilots. Pilots were all applicants for the renewal of their certificates and were selected using stratified random sampling method. A combination of questionnaires Flip L.R, Osipow and Berger were used in this study. Data were analyzed using SPSS software and regression tests; correlation analysis was performed.

Results: The age of both groups participated in the study ranged from 26-54 years with a mean of 38.4. Their length of work experience from 5-26 years with a mean of 12.2. The marital status of both groups participated in this study were for ATC, 98 married, 52 single and for pilot 85 married and 65 single. Based on the questionnaire results, 52% of ATC had moderate and higher stress levels and 34.5% of pilots had mild to moderate stress levels. Also physical and psychological problems were seen 42.9% in ATC but among pilots is less 15%.

Discussion and Conclusion: The results showed that there is difference in occupational stressors between ATC and pilots, because ATC work is different from pilot working conditions. The results of this study show the most important work stressors among ATC and pilots, and uncovered the relative contribution of each. Keywords: occupational stress, civilian flight crew.