# INTERNATIONAL CONGRESS of AVIATION and SPACE MEDICINE



CONGRÉS INTERNATIONAL de MÉDECINE AÉRONAUTIQUE et SPATIALE

Final Programme

Programme Final



Madrid, SPAIN. October 5-9, 2003 Madrid, ESPAGNE, Octobre, 5-9, 2003

Under the auspices of:

The International Academy of Aviation And Space Medicine

Organised by:

The Spanish Society Of Aerospace Medicine



Sous les auspices de:

L'Académie Internationale de Médecine Aéronautique Et Spatiale

Organisé par:

La Societé Espagnole de Médecine Aéroespatiale



**Cellebrating 100 years of flight and Aerospace Medical Support** 



www.icasm2003.org





they have



bo. 73/03

> S.M. el Rey, accediendo a la petición que tan amablemente Le ha sido formulada, ha tenido a bien aceptar la

## **PRESIDENCIA DEL COMITÉ DE HONOR**

del **\*51 CONGRESO INTERNACIONAL DE MEDICINA DE AVIACIÓN Y DEL ESPACIO**", que tendrá lugar en Madrid del 5 al 9 de octubre próximo.

Lo que me complace participarle para su conocimiento y efectos.

PALACIO DE LA ZARZUELA, |9| de febrero de 2003

EL JEFE DE LA CASA DE S.M. EL REY,

fluio An Anis

SEÑOR PRESIDENTE DEL COMITÉ ORGANIZADOR

MADRID

# CONTENT

	Taye
Members & Ex-members of the Council	5
International Academy of Aviation and Space Medicine	6
Academy President's Address	7
Welcome to Madrid	8
Committees	9
General Information	12
Excursions	14
Technical Tours	15
Social Programme	16
General Programme	17
Scientific Programme	18
Abstracts Panel presentations	25
Abstracts of oral presentations	32
Abstracts poster presentations	51
Index of Authors	76
Exhibitors profile	77
Sponsors profile	79
Acknowledgements	80

# SOMMAIRE

	La Charles and A and A have been
Membrers de l'Académie ayant assumé les charges d'un management mandat au sein du Conseil	5
Academie International de Medicine Aeronautique et Spatiale	6
Le Mot du President de L'academie	7
Bienvenue a Madrid	8
Comités	9
Informations Generales	13
Excursions	14
Visites Techniques	15
Programme Social	16
Programme General	17
Programme Scientifique	18
Resumés de Panel presentations	25
Resumés des presentations orales	32
Resumés presentations affichées	51
Index des auteurs	76
Presentations des Exposants	77
Presentation des Sponsors	79
Reconnaissances	80
的复数形式 化基金化物 化合物物 化合物物 化合物物 化合物物 化合物物 化合物的 化合物的 法保证 化合物 化合物化合物 化合物化合物 化合物化合物 化合物化合物 化合物化合物 化合物	C. THE SALE STOLENESS OF ON

## **MEMBERS & EX MEMBERS OF THE COUNCIL**

## MEMBRES DE L'ACADEMIE AYANT ASSUME LES CHARGES D'UN MANDAT AU SEIN DU CONSEIL

PRESIDENT/PRÉSIDENT		Dr. Stanley WHITE	
		(USA/EUA)	1993-1995
Dr. Francis N. KIMBAL		Dr. John ERNSTING	
(USA/EUA)	1955-1959	(UK/RU)	1995-1997
Dr. Armand ROBERT		Dr. Robert AUFFRET	
(France/France)	1959-1961	(France/France)	1997-1999
Dr. Robert GRANDPIERRE		Dr. Claude THIBEAULT	
(France/France)	1961-1964	(Canada/Canada)	1999-2001
Dr. Armand MERCIER		Dr. Ulf BALLDIN	
(France/France)	1964-1966	(Sweden/Suède)	2001-2003
Dr. Jan H TILLISCH			
(USA/EUA)	1966-1968	SECRETARY GENERAL/ SECRÉTAIRI	e général
Dr. G Earle WIGHT			
(Canada/Canada)	1968-1971	Dr. Thomas H SUTHERLAND	
Dr. André ALLARD		(USA/EUA)	1955-1956
(Belgium/ Belgique)	1971-1973	Dr. Frans de IAVEL	4054 4050
Dr. Charles BERRY		(Switzerland/Suisse)	1956-1958
(USA/EUA)	1973-1975		1050 1070
Dr. E A LAUSCHNER		(Beigium/Beigique)	1959-1970
(Germany/ Allemagne)	1975-1977		1070 107/
Dr. Kenneth G BERGIN			1970-1976
(UK/RU)	1977-1979	Dr. Peter VAUGHAN	1076 1000
Dr. Eugene LAFONTAINE			1970-1980
(France/France)	1979-1981		1000 1000
Dr. Earl CARTER		(UN/RU)	1900-1902
(USA/EUA)	1981-1983	DI. Antonie Santi-Fierre	1002 1000
Dr. Luis AMEZCUA-GONZALES		Dr. Claudo THIREALILT (Acting)	1702-1700
(Mexico/Mexique)	1983-1985	(Canada/Canada)	1007 1000
Dr. Antonio CASTELO-BRANCO		Dr. Antonio CASTELO-BRANCO	1707-1700
(Portugal/Portugal)	1985-1987	(Portugal/Portugal)	1088-1002
Dr. N J NIEUWOUDT			1700 1772
(South Africa/Afrique du Sud)	1987-1989	(New Zeland/Nouvelle Zélande)	1992-1995
Dr. Jean LAVERNHE		Dr Alexander G DAWSON	1772 1775
(France/France)	1989-1999	(New Zeland/Nouvelle Zélande)	1996-1998
Dr. Silvio FINKELSTEIN		Dr. George TAKAHASHI	
(Argentina/Argentine)	1991-1993	(Canada/Canada)	1998-

## INTERNATIONAL ACADEMY OF AVIATION AND SPACE MEDICINE

## ACADEMIE INTERNATIONAL DE MEDECINE AERONAUTIQUE ET SPATIALE

### Le Conseil Executif/The Executive Council

President/President Dr. Ulf BALLDIN, USA/Sweden Ancien Président/Past President Dr. Claude THIBEAULT, Canada Président du Comité de Nominations/Chairman **Nominating Committee** Dr. Claude THIBAULT, Canada Premier Vice-President/First Vice-President Dr. Eric DONALSON, Australia Deuxieme Vice-President/Second Vice-President Dr. Frank PETTYJOHN, USA **Directeurs/Directors** Dr. Jean Pierre CRANCE, France Dr. Pekka OKSANEN, Finland Dr. Daniel LESTAGE, USA Dr. Lutz BERGAU, Germany Chancelier/Chancellor Dr. Frank PETTYJOHN, USA Secrétaire Général/General Secretary Dr. George TAKAHASHI, Canada Secrétaire Géneéral Adjoint/Deputy Secretary General Dr. Leonard THOMPSON, New Zealand

STANDING COMMITTEES Selectors'Committee/Comité de Selection Chair/President: Dr. Frank Pettyjohn, USA Nominating Committee/Comité de Nomination Chair/President: Dr. Claude Thibeault, Canada Scholarship Committee/Comité de Education Chair/President: Dr. Claus Curdt-Christiansen, Canada/Denmark Scientific Committee/Comité Scientifique Chair/President: Dr. Yehezkel Caine, Israel **REUNIONS DE LÁCADEMIE** 

## ACADEMY MEETINGS

Madrid Medical Association/Association Medicale de Madrid (CongresVenue).

Dimanche/Sunday 5 Octobre/October, 2003

**08:00 am-09:00 am** Comité de Nomination/Nominating Committee Room: Sala de Prensa

**09:00 am-10:00 am** Comité des Bourses/Scholarship Committee Room: Pequeño Anfiteatro

**10:00 am-11:00 am** Comité Scientifique/Scientific Committee Room: Sala de Prensa

11:00 am-12:00 pm Comité des Sélecteurs/Selectors Committee Room: Pequeño Anfiteatro

12:30 pm-13:30 pm Déjeneur/Lunch

**13:30 pm-04:30 pm** Conseil Executif/Executive Council Room: Sala de Prensa

## Mardi/Tuesday 7 Octobre/October, 2003

04:30 pm-06:00 pm Assemblé Générale/General Assembly Room: Pequeño Anfiteatro

## ACADEMY PRESIDENT'S ADDRESS

On behalf of the Academy it is with great delight I welcome you to the 51st International Congress of Aviation and Space Medicine. The beautiful Madrid, capital of Spain and rich of old tradition and history, should be inspiring to every participant.

The congress will be in very good hands, organized by the Spanish Society of Aerospace Medicine. I am sure the congress will be most rewarding both in terms of the scientific information and the social program. Also, you will have rich opportunities to create good international scientific as well as social contacts and to discuss or generate new scientific ideas during the congress.

A warm welcome to participate in the International Congress of Aviation and Space Medicine in Madrid.

Ulf I. BALLDIN, M.D., Ph.D., Dr. h.c. President of the International Academy of Aviation and Space Medicine

## LE MOT DU PRESIDENT DE L'ACADEMIE

A u nom de l'Académie, c'est avec grand plaisir que je vous souhaite la bienvenue au 51ème Congrès International de Médecine Aéronautique et Spatiale. La magnifique ville de Madrid, capitale de l'Espagne et riche de tradition et d'histoire anciennes va enthousiasmer chaque participant.

Le congrès sera dans de très bonnes mains, organise par la Société Espagnole de Medecine Aeroespatiale. Je suis assuré que ce congrès sera extrêmement attractif tant pour l'information scientifique que pour le programme social. Vous aurez également pendant le congrès de précieuses occasions de nouer de nombreux et excellents contacts internationaux tant scientifiques que sociaux, et de discuter ou élaborer beaucoup de nouvelles notions scientifiques.

Chaleureuse bienvenue au Congres International de Médecine Aéronautique et Spatiale de Madrid.

Ulf I. Balldin, M.D., Ph.D., Dr. h.c. Président de l'Academie Internationale de Médecine Aéronautique et Spatiale

## WELCOME TO MADRID

Welcome to Madrid where we are delighted to invite you to the 51st International Congress of Aviation and Space Medicine.

The 2003 MADRID I.C.A.S.M. will allow us to address the current events on topics of the aviation and space world, concerning military and civil aviation, medical transportation, light aviation, spatial trips and training aspects and occupational health medicine. The scientific program will try to cover the latest medical, technical and administrative developments. To meet this objective we particulary call for original scientific papers which we hope will be largely discussed, thus generating new fields of research, but medical practice and expertise will not be forgotten.

MADRID is a perfect combination between cultural richness and its extensive business and leisure offerings. This magnificent town is situated in a very advantageous geographical location, and plenty of historic, artistic and cultural life and close enough to worldwide places such Toledo, Segovia, El Escorial, Salamanca and Avila. We are certain that apart from the working sessions and profitable scientific meetings, members as well as accompanying persons will appreciate the numerous landmarks sites of the city, the sourrandings locations and, why not, any other part of Spain easily communicated with Madrid, if you prolong your stay. The famous gastronomy and the mildness of the climate in October will be graetly enjoyed. A variety of tours will be organized during the congress. For participants wishing to extend their stay, excursions can be offered on request.

The Illustrious Medical Association of Madrid, where the congress will be held, is a very privileged place in the heart of the city center, close to Thyssen Museum, the Prado Museum and Queen Sophia Art Centre National Museum. This XVIII century building houses historical halls such the « Grand Amphitheatre », main venue of the Congress.

> Francisco RIOS TEJADA President of the 51st I.C.A.S.M.

## **BIENVENUE A MADRID**

Bienvenue à Madrid où nous avons le plaisir de vous inviter pour le 51ème Congrès International de Médecine Aéronautique et Spatiale qui se tiendra du 5 au 9 octobre 2003.

Le C.I.M.A.S. de MADRID 2003 permettre da faire le point sur tous les sujets d'actualité touchant au monde aéronautique et spatial, qu'il s'agisse des aspects militaires, de transports civils, de transports médicalisés, d'aviation légère, de séjours spatiaux, de formation et de médecinedu aeroportuaire. Ce programme scientifique s'efforcera de couvrir les développements médicaux, techniques et administratifs les plus récents. Dans ce but, nous appelons tout particulièrement les communications scientifiques originales que nous souhaitons voir largement discutées, suscitant ainsi de futures recherches. La practique médicale et l'expertise ne seront pas oubliées pour autant.

MADRID est l'un des vielles capitaux d'Europe et porte pour l'Iberoamerique. Cette magnifique ville est située dans Castille, une région riche d'histoire, d'art, de vie culturelle et de tres jolies paysages, à une heure et demi seulement de Salamanca ou Avila. Nous sommes certains qu'autour des séances de travail et des rencontres fructueuses des réunions scientifiques, les congressistes comme les accompagnants apprécieront les nombreux sites touristiques de Madrid et l'Espagne, la célèbre gastronomie et la douceur du climat du octobre. Des excursions seront organisées pendant le Congrès, en Madrid et a la ville de Toledo et Segovia. Pour les participants désirant prolonger leur séjour, des excursions peuvent être proposées sur demande a quelque autre location de l'Espagne.

Le lieu du Congrès, l'Association Medicale de Madrid, est situé dans un endroit très privilégié, a coté de les principaux musées de la cité, face aujet d'eauet à quelquespas de la vieille ville. Travail et détente pourront ainsi être harmonieusement conjugués.

> Francisco RIOS TEJADA Président du 51ème C.I.M.A.S

## HONOUR COMMITTEE

JUAN CARLOS I The Roi d'Espagne The King of Spain

#### Federico TRILLO FIGUEROA Mr. Le Ministre de Defense Ministry of Defense

Franciso ALVAREZ CASCOS Mr. Le Ministre de Transportation Ministry of Transportation

Victor TORRE DE SILVA Sous Secretaire au Ministre de Defense Ministry of Defense Subsecretary

I. ESTAUN Y DIAZ DE VILLEGAS Directeur Gral de la Aviation Civile General Director DGAC

Antonio PEREZ PEÑA Inspecteur General de la Santé Militaire General Inspector HealthServices

Alfredo MACHO FERNANDEZ Conseiller de Santé Health Services Counselor

1000多个性心的第三人称单数

Pedro L. CALVO POCH Conseiller Executif de Sureté et Services de la ComunitéMunicipal Executive Counselor of Safety and Community Services

STERN MARKEN

Jose L. LOPEZ VILLA Ancient President de S.E.M.A. Past President of S.E.M.A.

José LAREO CORTIZO Membre de l'Academie Member of the Academy

#### Ana PASTOR JULIAN Mme. Le Ministre de Santé Ministry of Health

Alberto RUIZ GALLARDON Maire de Madrid Major of Madrid

E. GONZALEZ-GALLARZA MORALES Chef de l'Etat Mayeur de l'Air Air Force Chief of Staff

# and a start and a second of the

The state of

21.3.46 A. U.S. 63

Jose E. SECO DOMINGUEZ Directeur General AENA General Director AENA

Vicente NAVARRO RUIZ Dir.Gral. Logistique Sanitaire Militaire General Military Health Logistic Directorate

Carlos BERZOSA ALONSO-MARTINEZ Recteur de l'Université Complutense Dean Complutense University

Juliana FARIÑA GONZALEZ President Association Medicale de Madrid President of the Madrid Medical Association

a contract of the second second second

Feliciano MERAYO MAGDALENA Ancient President de S.E.M.A Past President S.E.M.A.

#### 1000 (111) (111) 1110 (111)

## **COMITE D'HONNEUR**

## **ORGANIZING COMMITTEE**

## COMITE D'ORGANISATION

The 51st ICASM is organized by: The Spanish Society of Aviation and Space Medicine (S.E.M.A.). Le 51<sup>ème</sup> CIMAS est organisé par: La Société Espagnole de Médecine Aéronautique et Spatiale S.E.M.A.

### PRÉSIDENT

Francisco RIOS TEJADA Centre d'Instruction de Medecine Aeroespatial (C.I.M.A.) Defence Aeromedical Center (C.I.M.A.)

## **Co-PRESIDENT**

Jose L. GARCIA ALCON Centre d'Instruction de Medecine Aeroespatial (C.I.M.A.) Defense Aeromedical Center (C.I.M.A.)

### Ramón DOMINGUEZ MOMPELL

Service Medical de IBERIA Ligne Aerienne IBERIA Airways Medical Service

### **MEMBRES**

Beatriz ESTEBAN BENAVIDES	Centre d'Instruction de Medecine Aeroespatial (C.I.M.A.)
Francisco J. TORRENTS ARNALDICH	Defense Aeromedical Center (C.I.M.A.) Société Espanole de Medicine Aeroespatiale (S.E.M.A.)
	Spanish Society of Aerospace Medicine (S.E.M.A.)
Jose B. del VALLE GARRIDO	Centre d'Instruction de Medecine Aeroespatiale (C.I.M.A.)
	Defense Aeromedical Center (C.I.M.A.)
Pilar VALLEJO DESVIAT	Centre d'Instruction de Medecine Aeroespatiale (C.I.M.A.)
	Defense Aeromedical Center (C.I.M.A.)
Francisco MARTINEZ SABORIDO	Hôpital Central de la Defense
	Defense Central Hospital
Fabriciano MARIAM PEREZ	Societé Espagnole de Medecine Aeroespatiale (S.E.M.A.)
	Spanish Society of Aerospace Medicine (S.E.M.A.)
Pedro ORTIZ GARCIA	Service Medical de IBERIA Ligne Aerienne
	IBERIA Airways, Medical Service
Tomás MARTIN ROBLEDO	Office Medical de l'Avitation Civile Espagnole
	Medical Office Civil Aviation Authority
Jose A. LOPEZ LOPEZ	Centre d'Instruction de Medecine Aeroespatiale (C.I.M.A.)
	Defense Aeromedical Center (C.I.M.A.)
Juan C. SALINAS SANCHEZ	Médecine Aeronautique de Sanitas
	Aviation Medicine Sanitas

## PROGRAMME SCIENTIFIQUE / SCIENTIFIC PROGRAMME

## PRESIDENT / CHAIR

Carlos VELASCO DIAZ Centre d' Instruction de Medecine Aeroespatial (C.I.M.A.) Defense Aeromedical Center (C.I.M.A)

## CO-PRÉSIDENT / CO-CHAIR

Jose A. AZOFRA GARCÍA Centre d'Instruction de Medecine Aeroespatiale (C.I.M.A.) Defense Aeromedical Center (C.I.M.A.)

### **MEMBRES**

Alfredo GOITIA GOROSTIZA

Jose L. ZAMORANO MARIN

Angel GONZALEZ SISTAL

Luis CALLOL SANCHEZ

José RODRIGO GARCIA

Jose M. LORENTE TORTOSA

Francisco J. GOMEZ DE TERREROS

Cesar ALONSO RODRIGUEZ

Societé Espagnole de Medecine Aeroespatiale (S.E.M.A.) Spanish Society of Aerospace Medicine (S.E.M.A.) Université Complutense de Madrid University Complutense of Madrid Université de Barcelone University of Barcelone Université Complutense de Madrid University Complutense of Madrid Conseil Superieur de Recherche Cientifique Cajal Institute (Scientific Research Council) Centre de'Instruction de Medecine Aeroespatiale (C.I.M.A.) Defense Aeromedical Center (C.I.M.A) Université Complutense de Madrid Complutense University of Madrid Hôpital Central de la Defense Defense Central Hospital

### PROGRAMME SOCIAL / SOCIAL PROGRAMME

Beatriz PUENTE ESPADA Centre d'Instruction de Medecine Aeroespatial (C.I.M.A.) Defense Aeromedical Center (C.I.M.A)

### **EXPOSITION / EXHIBITION**

Javier DOADRIO MARSAL Centre d'Instuction de Medecine Aeroespatial (C.I.M.A) Defense Aeromedical Center (C.I.M.A)

### **TRÉSORIER / TREASURER**

Mario MARTINEZ RUIZ Société Espagnole de Médecine Aéroespatiale (S.E.M.A.) Spanish Society Of Aerospace Medicine (S.E.M.A.)

## SECRÉTAIRE GÉNÉRAL / GÉNÉRAL SECRETARY

Alvaro HEBRERO ORIZ Centre de Medecine Aeroespatiale (C.M.A) (Palma de Mallorca) Centre of Aviation Medicine (C.M.A) (Palma de Mallorca)

## SECRETARIAT DU CONGRES

Mrs. Marisa de TORIBIO Y JIMENEZ VIE-CONGRESOS

## **CONGRESS SECRETARY**

## **GENERAL INFORMATION**

### • DATES:

The 51<sup>st</sup> Congress of Aviation and Space Medicine will be held in Madrid from Sunday 5 October till Thursday 9 October 2003

### • VENUE:

All of the Congress activities and the Exhibition will take place at the Medical Association of Madrid Santa Isabel 51 280012 Madrid. SPAIN Tel. 34-915385100/FAX. 34-915396974 E-mail: <u>congresos@icomem.org</u>

#### • ORGANISING SECRETARIAT OF the 51st I.C.A.S.M.

VIE Viajes-Congresos Hermosilla 30. 28001 Madrid. ESPAGNE Tél: 34-914264750 Fax: 34-914316417 e mail: <u>icasm03@vie.es</u> Web SITE: <u>www.icasm2003.org</u> The organising Secretariat will be located at the Congress Venue at the room, and operating as follow: Sunday 5 October: 14:00-18:00 Monday 6 October: 08:00-18:00 Tuesday 7 October: 08:00-16:30 Wednesday 8 October: 08:00-18:00 Thursday 9 October: 08:00-12:00

#### • LANGUAGES

The official languages of the Congress are English and French. Simultaneous translation will be provided.

#### • EXHIBITION

The exhibition are is hel in Sala. All coffee breaks will be served in the exhibition area.

#### • BADGES

The badge provides entry to all scientific sessions and the exhibition, and should be worn at all times.

#### • OFFICIAL CARRIER

SPANAIR, member of the Star Alliance is the official carrier of the Congress.

#### MOBILE PHONES

Delegates are kindly requested to keep their mobile phones in the off position in the rooms where scientific sessions are being held.

#### • HOTELS and TOURS

Viajes VIE in charge of hotel accomodation and tours operates a desk at the registration area during the official opening hours.

#### CERTIFICATE of ATTENDANCE

A certificate of attendance is included in the Congress Bag.

#### • WEATHER AND CLOTHING

October in Madrid is generally warm during the day (24°C/70°F) but evenings may be cool. Dark suit is recommended for the farewell diner.

### WEAR OF FOREIGN MILITARY UNIFORM

You are allow to wear a military uniform during the congress, but we suggest to consult your military attaché or your embassy/consulate for customized advise according to visiting country regulation.

#### CURRENCY AND EXCHANGE

The national currency is the Euro ( $\in$ ). Currency system in the EU are decimal. Bank notes are 5,10,20,50,100,200 and 500  $\in$ . Most foreign currencies, major credit cards and cheques are accepted. The majority of shops, hotels and restaurants accept traveller's cheques and major credit cards (American Express, Diners, Eurocard/Mastercard and Visa).

#### • BANKS

Banks in Madrid are open from 8:30 am till 14:30, Monday to Friday. Most banks are closed weekends and public holidays. Automatic teller machines are open 24 hous and are located throughout the city and surrounds. Facilities for exhange of currency are available at the airport, larger hotels and banks.

#### • CAR RENTAL

Cars can be rented from local or international companies at the airport of Madrid.

#### • DISABLED FACILITIES

If you require disabled facilities, please notify the seretariat by indicating on your registration form

#### DISCLAIMER

In the event of industrial disruptions, the Congress Organizers cannot be held responsible for any losses incurred by delegates. The program is correct at the time of the printing but the organisers reserve the right to alter the program if and as is deemed necessary.

#### • ELECTRICITY

The electrical supply is 220 volts, 50 Hz. The connection for appliances is a flat 2 pin plug.

#### HEALTH

Vaccinations are not required unless you have come from a yellow fever-infected country zone within six days prior to your arrival. You do not need any other health certificate to enter Spain. Spain has a high standard of hygine and doctors and dentists are higly trained and hospitals are well equipped. In the event of illness, hotel staff and Congress organizers can arrange a doctor for you.

In the case of emergency you can dial 112 and ambulace a emergency medical team will be available.

#### INSURANCE

It is strongly recommended that delegates take out adequate travel and health insurance prior to commencement of travel. Further information can be obtained from your travel agent.

#### ORGANIZATION

VIE VIAJES-CONGRESOS Hermosilla 30. 28001 Madrid. ESPAGNE Tél: 34-914264750 Fax: 34-914316417 e mail: <u>icasm03@vie.es</u> Web SITE: <u>www.icasm2003.0rg</u>

## **INFORMATIONS GENERALES**

### • DATES:

Le 51ème Congrès International de Médecine Aéronautique et spatiale se tient à Madrid due Dimanche 5 au Jeudi 9 Octobre 2003.

### SIÈGE DU CONGRÈS

Colegio Oficial de Médicos de Madrid Santa Isabel 51 28012 Madrid. ESPAGNE Tel. 34-915385100/FAX. 34-915396974 E-mail: <u>congresos@icomem.org</u>

#### • SECRETARIAT du 51ème C.I.M.A.S.

VIE Viajes-Congresos Hermosilla 30. 28001 Madrid. ESPAGNE Tél: 34-914264750 Fax: 34-914316417 e mail: <u>icasm03@vie.es</u> Web SITE: <u>www.icasm2003.0rg</u> Le comptoir d'accueil est situé à le Congrès Venue, au Salle et ouvert comme suit: Dimanche 5 Octobre: 14:00-18:00 Lundi 6 Octobre: 08:00-18:00 Mardi 7 Octobre: 08:00-16:30 Mercredi 8 Octobre: 08:00-12:00

#### • LANGUES

Les langues officielles du Congrès sont le francais et lánglais. Une traduction simultanée est offerte dans ces deux langues

#### • **EXPOSITION**

Léxposition se tient dans la salle. Toutes les pauses café seront prises dans léxposition.

#### BADGES

Le badge du Congrès donne accès à toutes les sessions scientifiques et léxposition pour lesquelles son port est obligatoire.

#### TRANSPORTEUR OFFICIEL

La Cmpagnie officielle du Congrès est SPANAIR member of the Star Alliance.

#### • TELEPHONE PORTABLE

Les participants sont pries d'éteindre leur tellephone dans les salles où se déroulent les sessions.

#### • HOTELS et EXCURSIONS

Viajes VIE est en charge de reservations d'hôtels et des reservations des excursions. Un guichet concernant les hotels et excursions se trouve dans la zone d'inscription durant les heures officielles d'overture.

#### CERTIFICAT DE PARTICIPATION

Un certificate de participation est inclus dans le sac du Congrès.

#### • TEMPS ET HABILLEMENT

Le mois de Octobre à Madrid est généralement doux dans la journée (24°C/70°F) mais les soirées peuvent être fraîches. Tenue sombre pour le dîner de clôture recommandée.

#### PORT DE L'UNIFORME MILITAIRE

La demande peut être adressée soit par votre attaché militaire à Madrid soit par votre ambassade/consulat en Espagne.

#### DEVISE ET CHANGE

La devise nationale est le Euro (€), on utilise pour la monnaie le système décimal et les unités sont le Euro et les cents. Les billets sont de 5, 10, 20, 50, 100, 200 et 500 €. Toutes les devises, cartes de crédit et chèques sont acceptés. La majorité des magasins, hôtels et restaurants acceptent les traveller's chèques et les principales cartes de crédit (American Express, Diner's, Eurocard/Mastercard et Visa).

#### BANQUE

In Madrid, les banques sont ouvertes de 08:30 à 14:30 du lundi au vendredi. La plupart des banques sont fermées le week-end et les jours fériés. Des distributeurs automatiques sont ouvertes 24 heures sur 24 et sont situés partout en ville et en banlieue. Des bureaux de change sont disponibles a l'aéroport, dans les grands hôtels et les banques.

#### LOCATION DE VOITURE

Des voitures peuvent être louées auprès de compagnies locales ou internationales a l'aéroport.

#### HANDICAP

Si vous avez besoin de dispositions particulières pour handicapés, veuillez le notifier au secretariat en l'indiquant sur votre formulaire d'inscription.

#### DECHARGE

En cas de grave perturbation, les organisateurs du congrès ne peuvent être tenus pour responsables de toute perte financière encourue par les participants. Le programme est conforme à ce qui est annoncé à ce jour, mais les organisateurs se réservent le droit de le modifier si cela s'avère nécessaire.

#### • ELECTRICITE

La courant est du 220 volts, 50 Hz. Les prises sont d'un modèle de 2 broches plates. La plupart des hôtels fournissent du 110 volts pour rasoirs.

#### • SANTE

Aucune vaccination n'est exigée sauf si vous venez d'une zone d'endémie amarile où vous avez séjourné dans les six jours précédant votre arrivée. Vous n'avez besoin d'aucun autre certificat de santé pour entrer dans l'Espagne. L'Espagne et Madrid a un très haut niveau d'hygiène, les médecins et dentistes sont hautement compétents et les hôpitaux sont bien équipés. En cas de maladie, le personnel de l' hôtel peut vous trouver un medecin.

Le numero 112 c'est le centralisé pour les urgences medicals.

#### • ASSURANCE

Il est vivement recommandé aux participants de prendre avant le début de leur déplacement une assurance adéquate couvrant les problèmes de voyages et de santé. Les informations peuvent être obtenues auprès de votre agence de voyage.

#### ORGANISATION

VIE VIAJES-CONGRESOS Hermosilla 30. 28001 Madrid. ESPAGNE Tél: 34-914264750 Fax: 34-914316417 e mail: <u>icasm03@vie.es</u>

## **EXCURSIONS/EXCURSIONS**

#### MONDAY 6 OCTOBER

#### MADRID CITY TOUR

#### Depart:

At 12:30 hrs. (Meeting point at Atocha Railways Station Clock Tower).

The aim of this private sightseeing tour in a open upper deck bus is to show you all diferents and interesting views of Madrid from the Moorish Quarter and Cathedral to the Austrias quarters, and enjoying watching the most important landmarks of the city such as the Oriente Square and Royal Palace, España Square where the famous sculture of Don Quixote and Sancho is located, the Cibeles Square, Alcalá Gate, Retiro Park, Neptuno Square, Atocha,... and many more buildings, squares and gardens that make Madrid becomes a beautiful and cultural city.

*Price:* €55 *i*(*free for registered delegates and partners*)

#### • TUESDAY 7 OCTOBER

#### El Escorial-Segovia. (Full day)

Depart:

At 09:00 hrs. (Meeting point at Atocha Railways Station Clock Tower)

Segovia is Spain at its best, twisting alleyways, the highest concentration of Romanesque churches in all Europe, pedestrian streets where no cars are allowed, the aroma of roast suckling pig around every corner, all sourounded by the city's medieval wall which itself is bordered by two rivers and an extensive green belt park with miles of shaded waalk. On the north west extreme of the wall is the famous Alcazar castle, source of inspiration to Walt Disney, and where Queen Isabel promised Columbus the financial backing he needed to discover America. On the south east extreme is the world renowned Roman Aqueduct, the largest and best preserved of its kind anywhere, which served as the mintmark on all coins struck in the city from 1455 to 1864. The tallest building in Segovia is still the 16<sup>th</sup> century Cathedral, a promiment landmark as one approaches from any direction. In 1985 UNESCO declared Segovia « heritage of the Mankind ».

The city elevation is 3.280 ft, and the 54 mile drive is done in less than one hour via the twin-bore tunnel going under the Guadarrama Mountains.

Only 60 Km away from Madrid, it has a very well preserved old town, where the gothic cathedral and the castle are landmaks in the Spanish history. On the way to Segovia it will be the chance to stop by in the monastery of EL Escorial, masterpice of arquitech Juan de Herrera, built in square shapes and burial site of the Spanish Crown.

### El Escorial.

Escorial, since long time ago considered the eighth Wonder of the World, was conceived by Philip II, as a Monastery and Royal Pantheon, becoming the symbol of the greatness of the Spanish Empire. We'll visit: The Basilica.

14.00h. Lunch Restaurant Cándido.16.00h. Segovia.

During the tour we will visit: the Cathedral (the last gothic cathedral built in Spain. Its grace and style have won the nickname of "Queen of Cathedrals") and the Alcázar (the most spectacular castle of the country).

19.30h. Return at the hotel.

Price: €142 including lunch.

#### WEDNESDAY 8 OCTOBER

#### Toledo (Full day)

Depart:

At 09:00 hrs. (Meeting point at Atocha Railways Station Clock Tower)

Toledo is a museum city with a great artistical beauty. It was the Capital of the Kingdom and it is one of the oldest cities of Europe. Toledo has great examples of different ages architecture; that made Toledo be recogniced as one of the first monumental cities of Spain and be considered as Humanity Patrimony by The UNESCO.

Toledo, having been declared « National Monument », by the Spanish State, seems to be one large museum. Hardly another town is so well preserved in its historical style. Titus Livius described the Roman « Toletum ». Later on when the Goths conquered Spain in the 6<sup>th</sup> Century they made Toledo capital of their empire. Remind of this epoch is the fortess of San Servando. During the 10<sup>th</sup> Century the moors settle in Toledo and builted the Mosque « Mezquita del Cristo de la Luz » and the Old main Gate called « Puerta de Bisagra » (12-13<sup>th</sup> Century). The reconquest of Toledo was made by King Alfonso VI in 1085, becoming the capital of the Kingdom of Castilla-Leon. During the 15-16<sup>th</sup> Century the « School of Translators of Toledo » cultivated clasical and oriental knowledge and exported to all occidental world. Many churches were built during this time, one of the most famous one Santo Tomé Church, inside you can see the most famous paintings « The funeral of Count of Orgaz ». Two synagogues are conserved in Toledo « santa Maria la Blanca » and « Synagogue del Tránsito », built by Samuel Ha Levi. The cathedral built beteen 1226 and 1492, with massive lines and decorations in Mudejar Style is certainly the most interesting gothic building in town, hold a great collection of Gre-

## **EXCURSIONS/EXCURSIONS**

cos, Goya and Van Dyck. The mightly 2Bridge of San Martin over the Tajo river is of gothic style as well. The Church of san Juan de los Reyes is late gothic style and the cloister is of extraordinary beauty.

In 1560 the Capital of spain were moved to Madrid, but still Toledo remainded as the Cultural Capital of Spain.

We will visit there the following famous monuments: The Cathedral ( the first one of Spain ), Saint Tome's Church in wich is shown " El entierro del Conde Orgaz"; one of the best pictures of El Greco, Sinagoga de Santa María and San Juan de los Reyes church. We also be able to see the famous ethnic " Damasquinado" that is a hand made technique wich consist in incrustate gold an silver into steel.

#### 14.00 HRS.

The lunch will take place in la Venta de Buenos Aires restaurant. After the lunch we will go to see a wonderful landscape of the city. Then we will visit Tavera's museum.

#### 18.00 HRS.

Once the excursion is over we will return to the Palace's hotel.

Price: € 139 including lunch.

## **TECHNICAL TOURS**

### • THURSDAY 9 OCTOBER (3 groups).

- **IBERIA**: Maintenance and simulator facilities of the company. It is located nearby Madrid-Barajas iInternational Airport (La Muñoza).

- CASA-EADS (Getafe). An aircraft factory located in the vicinity of Madrid. Main assembly factory for parts of the A-340 and the new EF-2000 (Eurofighter).

- **TORREJON AIR FORCE BASE.** Host of the 12<sup>th</sup> Air Wing and many other Escuadrons. We will have the oportunity to visit the Test Escuadron (CLAEX).

**NOTE:** The technical tour to IBERIA and CASA-EADS has some limitation due to the areas to visit, and the number of participants cannot exceed the number of 50. For Torrejon AFB the number of visitors will be limited to 100.

Transportation will be provided for all tours. Departure from Atocha Railways Station Clock Tower.

Invitations for technical tours can be picked up at the registration desk.

## **VISITES TECHNIQUES**

### • JEUDI 9 OCTOBRE (3 groupes).

- **IBERIA**: Le plus important instalations pour le maintenement des aeroplanes et simulateurs de la compagnie. Il est localise a l'aeroport de Madrid-Barajas (La Muñoza).

- **CASA-EADS (Getafe).** Il sagit de la principal usine aeronautique dans l'Espagne. Ce le lieu de fabrication et assemblage de part de le A-340 et le nouvel EF-2000 (Eurofighter).

- **BASE AERIEN DE TORREJÓN.** Chez de la Aile de Chasse numero 12 et plusieurs Escadrons Aériens. Nous visitaron le Centre de Recherche et Experimentation en vol (CLAEX). **NOTE:** Pour la visite a IBERIA et CASA-EADS, nous avons des limitation dans le nombre de participants (50). Pour la visite a la Base Aerien de Torrejón la limitation de places será de 100. Transportation será disponible pour toutes les visites.

Departure de la Gare de Atocha a coté de la tour avec l'horloge.

Les invitations pur les visites techniques, peuvent être retirée à le bureau de inscription.

## SOCIAL PROGRAMME

# SUNDAY 5 OCTOBER -14.00-18.00 Welcome drink

### MONDAY 6 OCTOBER

-12.30-14.00. Madrid sightseeing tour A visit of the main tourist sites and of the historical Old Town

(free for accompanying persons,  $\in$  55 for other participants)

-20.30-22.00. Welcome cocktail at the Air Force Headquarters (open for all participants). C/ Princesa-Moncloa Square, Madrid.

### TUESDAY 7 OCTOBER

-20.30-23.00. Academy Diner at Casino de Madrid (Only for Academiciens and guests). C7. Alcalá 15, Madrid. Tel. 91-5211735

### WEDNESDAY 8 OCTOBER

-21.00-23.30 Gala Dinner at Hotel Villamagna. Paseo Castellana 22. Tel. 91-5871234

**NOTE:** Transportation will be available for the Wellcome Cocktail, Academy Diner, Gala Diner and Technical Tours. Depart from hotels, except for technical tours (see invitation).

## **PROGRAMME SOCIAL**

DIMANCHE 5 OCTOBRE
 -14.00-18.00 Verre d'accueil

### LUNDI 6 OCTOBRE

-12.30-14.00 Tour de Ville de Madrid Visite des sites principaux de Madrid et de la Vieille Ville historique.

Inclus dans le programme des accompagnants, € 55 pour les autres participants.

-20.30-22.00 Cocktail de bienvenue à le Quartier General de l'Armée de l'Aire (Pour toutes les participants). C/ Princesa-Moncloa Place.

#### • MARDI 7 OCTOBRE

 - 20.30-23.00. Dîner de l'Académie à Casino de Madrid (Seulement pour les Academiciens et participants invitées). C/. Alcalá 15, Madrid. Tel. 91-5211735

#### MERCREDI 8 OCTOBRE

- 21.00-23.30 Dîner de Clôture à Hotel Villamagna. Paseo Castellana 22, Madrid. Tel. 91-5871234

**NOTE:** Transportation será disponible pour le Cocktail de Bienvenue, Dîner de l'Académie, Dîner de Clôture et Visites Techniques. Depart des hôtels, mais les visites techniques (regardez les invitations)

# GENERAL PROGRAMME

SUNDAY 5 OCTOBER -Registration and Welcome drink -Meetings of Academy Committees	14.00-18.00 08.00-16.30
MONDAY 6 OCTOBER -Registration -Opening Ceremony -Allard Lecture -Exhibition Inauguration -Working session and exhibition -Welcome Cocktail at Air Force Headquarters	08.30 09.30 10.00 11.00 11.30-19.00 20.30-22.00
TUESDAY 7 OCTOBER -Working sessions and exhibition -Academy General Assembly -Academy Dinner at Casino de Madrid	08.00-16.30 16.30-18.00 20.30-23.00
WEDNESDAY 8 OCTOBER -Working sessions and exhibition -Farewell Dinner at Hotel Villamagna	08.00-19.00 21.00-23.30
THURSDAY 9 OCTOBER -Technical visits	09.00-13.30

# PROGRAMME GENERAL

DIMANCHE 5 OCTOBRE -Inscription et verre d'accueil -Réunions des Comités de l'Académie	14.00-18.00 08.00-16.30	
LUNDI 6 OCTOBRE -Inscription -Cérémonie d'ouverture -Conférence Allard -Inauguration de l'exposition -Séances de travail et exposition -Reception de bienvenue: ( à Quartier General de l'Armée de l'Aire )	08.30 09.30 10.00 11.00 11.30-19.00 20.30-22.00	
MARDI 7 OCTOBRE -Séances de travail et exposition -Assemblée Générale de l'Académie -Dîner de l'Académie à Casino de Madrid	08.00-16.30 16.30-18.00 20.30-23.00	
MERCREDI 8 OCTOBRE -Séances de travail et exposition -Dîner de clôture à Hotel Villamagna	08.00-19.00 21.00-23.30	
JEUDI 9 OCTOBRE -Visites techniques	09.00-13.30	

## SUNDAY, 5 OCTOBER / DIMANCHE, 5 OCTOBRE

8.00 -16.30.- Meetings of the Academy Commitees Réunions des Comités de l'Académie

14.00 - 18.00.- Registration and Welcome Drink Inscription et verre d'accueil

## MONDAY, 6 OCTOBER/ LUNDI, 6 OCTOBRE

8.30 - 9.30.- Registration / Inscription

9.30.- Opening Ceremony / Céremonie d'ouverture

### 10.00.- André Allard Memorial Lecture / Conférance André Allard

The André Allard Memorial Lecture will be delivered by Professor JUAN PÉREZ-MER-CADER, Director of the National Astrobiological Center, (CSIC/INTA). Associated to the NASA Astrobiology Institute

# "Astrobiology: the search of life in the Universe"

La Conference André Allard sera prononcée par Monsieur le Professur JUAN PÉREZ-MER-CADER, le Directeur du Centre National d'Astrobiologie (CSIC/INTA)

"Astrobiologie: la recherche de la vie dans l''Universe"

11.00.- Coffee break / Pause café Proudly Sponsored by Wyle Laboratories

## 11.30.- Scientific Sessions / Sessions Scientifiques Panel: Space Medicine / Médecine Aérospatiale

Coordinator: Dr. G. Gray Co-chair: Dr. S. Pool Presentations:

- "International Space Station –ISS- Medical Operations: a model for medical cooperation in space" *Dr. C.L. Fischer.* (Panel 1)
- "The International Space Station and the Canadian Space Agency- medical operations overview" *Dr. J.M. Comtois.* (Panel 2)
- "Across the divide: multilateral medical operation bridging the technology gap" *Dr. V .Damann.* (Panel 3)
- "Japanese medical operations for the International Space Station" *Dr. K. Shimada.* (Panel 4)

12.30.- Break / Pause

## Scientific Sessions : Oral Presentations Sessions Scientifiques: Presentations Orales <u>Human Factors / Facteurs Humains</u>

Chair: Dr. J.L. García-Alcón / Dr. A. Ruge

- 12.40.- (1) BELLENKES A.H. "The workload-technology paradox: human factors in the modern automatic cockpit". U.S.A.
- 12.55.- (2) LEON G.R. " Personality influences on work performance in a space analog environment". USA
- 13.10.- (3) SCHROEDER D.J. "Air Traffic controllers – shiftwork, fatigue, stress and well-being". USA
- 13.25.- (4) McCARTHY G.W. "Aviation safety for patient safety". USA
- 13.40.- Lunch / Déjeuner
- 14.45.- Panel: Aeromedical aspects of modern Kerato-Refractive Surgery Aspects aéronautiques de la chirurgie

Aspects aeronautiques de la chirurgie refractive

Co-ordinator: Col.D.J. Ivan Co-chair: Dr. A.D.B. Evans Presentations:

- "Clinical and operational issues related to kerato-refractive surgery: an aeromedical up-date" *Col. D.J. Ivan.* (Panel 5)
- "The ophthalmological JAR-FCL Standards – does refractive surgery makes you fit to fly?" *Dr. C. Stern.* (Panel 6)
- "The measurements of scattered light and visual performance" *Dr. J.L. Barbur.* (Panel 7)
- "Conventional vs. wavefront-guided treatments – effects on visual performance" *Dr. C.M. Chisolm.* (Panel 8)
- 15.45.- Coffee break / Pause café Proudly sponsored by S.E.M.A.
- 16.15.- Panel: Colour vision requirements for pilots: contemporary issues Requeriments de la vision de couleur dans les pilots: aspects actuels Coordinator: Dr. A.D.B. Evans Co-chair: Col. D.J. Ivan

Presentations:

- "The history of international colour perception requirements" *Dr. C.Curdt-Christiansen.* (Panel 9)
- "A comparison of the colour characteristics of the Beyne, Holmes-Wright A and Spectrolux lanterns" *Dr. A.D.B.Evans.* (Panel 10)
- "A comparison of four JAA approved colour vision tetsts" *Dr. T.J.Squire.* (Panel 11)
- "An overview of information colour coding in the cockpit and associated analysis of visual fitness for the task" *Dr. C. Roumes.* (Panel 12)
- "Colour assessment and diagnosis the new CAD test that measures and quantifies congenital and/or acquired loss of chromatic sensitivity" *Prof. J.L. Barbur.* (Panel 13)
- "Colour vision and colour vision testing recommendations of the NATO RTO WG 24" Col. D.J. Ivan. (Panel 14)

### 17.45.- Break / Pause

## Scientific Sessions: Oral Presentations Sessions Scientifiques: Presentations orales Aviation Psychiatry / Psychiatrie Aéronautique

Chair: Dr. D. Jones / Dr. J. Medialdea

- 18.00.- (5) MEDIALDEA J. "Fear of flying in Spanish aircrews. Epidemiological aspects and comorbidity". Spain
- 18.15.- (6) KADOKURA M. "Acute stress disorder and post-traumatic stress disorder in flight attendants". Japan
- 18.30.- (7) IRELAND R.R. "Managing aeromedical risk in aviators using serotonin reuptake inhibitors (SRIs)". USA
- 18.45.- (8) JONES D.R. "Aeromedical waiver criteria for pilots taking serotonin reuptake inhibitors (SRI s): has the time come?". USA
- 19.00.- End of Working Sessions
- 20.30.- Welcome Reception at Air Force Headquarters Réception de Bienvenue au Quartier Général de l'Armée de l'Air

### TUESDAY, 7 OCTOBER / MARDI, 7 OCTOBRE

### Scientific sessions: Oral Presentations Sessions scientifiques: Presentations Orales <u>Travel Medicine – Passenger Health / Santé des</u> passagers

Chair: Dr. J. Azofra / Dr. M. Bagshaw

- 8.00.- (9) AUFRET R. "Santé des passagers. France
- 8.15.- (10) RAYMAN R. "Guidelines for inflight medical care". U.S.A.
- 8.30.- (11) LIM M.K. "SARS: Ensuring passenger and aircrew safety". Singapore
- 8.45.- (12) SINGH B.K. "Epidemiological study of frequencies and pattern of sickness among air travelers passing through Delhi airport". India
- 9.00.- (13) SINGH J. "Ultra long range (ULR) flights: A consultative and scientific approach". Singapore
- 9.15.- (14) PENG C.M. "Circadian rhythm pattern and mental health". Singapore
- 9.30.- (15) BEAUMONT M. "Cycle veille-sommeil et vol de long durée: gestion physiologique et pharmacologique". France
- 9.45.- (16) LEBUISSON. M.C. "Pneumonie atypique et poursuite de l'activité aérienne d'Air France en zones d'épidemie: une equation difficile". France
- 10.00.- Coffee break / Pause café Proudly sponsored by S.E.M.A.

### Scientific sessions: Oral Presentations Sessions scientifiques: Presentations Orales <u>Aircrew Health /Santé des equipages aériennes</u> Chair: Dr. F. Pettyjohn / Dr. J.B. del Valle

- 10.30.- (17) WAGSTAFF A.F. "A health, environmental and safety (HES) system for military flight operations – an overview of the RNO-AF experience". Norway
- 10.45- (18) SMITH R.L. "Cockpit environmental cancer risks in commercial pilots fact or fiction". USA

- 11.00.- (19) RAFNSSON V. "Risk factors for malignant melanoma among aircrews and a random sample of the population". Iceland
- 11.15.- (20) CARBAYO J.A. " Cervical mobiliy and X-ray modificationin Spanish fighter pilots". Spain
- 11.30.- (21) CHAPNIK L. "Magnetic resonance imaging screening of lumbar and cervical spine in 30 pilots". Israel
- 11.45.- (22) SCHRAMM D. "Aeromedical disposition of aviators with dizziness". Canada
- 12.00.- (23).- HEMOUS J. "The aircraft manufacturers response to the challenges of in-flight medical care". *France*
- 12.15.- (24) FERGUSON E.B. "Medical qualification of 44.000 airport security employees". USA
- 12.30.- Break / Pause
- 12.40.- *Ernsting Panel*: Cardiology / Cardiologie Coordinator: Dr. R. Hickmann Co-chair: Dr. C.V. Navarro Presentations
  - "The natural history of asymptomatic coronary artery disease: long-term follow-up of 1487 male aviators" *Dr. W.B. Kruyer.* (Panel 15)
  - "Patent foramen ovale: aeromedical implications" *Dr. G.W. Gray.* (Panel 16)
  - "Typical Brugada syndrome—Type EKG in an aeromedical population: epidemiological data, clinical and aeromedical concerns" *Dr. P. Doireau.* (Panel 17)
  - "Long QT interval in aircrew" Dr. M. Joy. (Panel 18)
- 13.45.- Lunch / Déjeuner
- 15.00.- Panel: Air Sports Medicine Médecine des sports aériens Coordinator: Dr. P. Ortiz Co-chair: Dr. J.P. Crance
  - "Introduction to Air Sports Medicine" Dr. P.Ortiz. (Panel 19)

- "The impementation of the UK National Private Pilot's License" *Dr. S. Janvrin.* (Panel 20)
- "Experience of the British Gliding Association" *Dr. P. Saundby.* (Panel 21)
- "The effects of negative to positive Gz in aerobatic flight" *Dr. G.W. McCarthy.* (Panel 22)
- "Human Factor trends in glider accidents in Japan" *Dr. K. Shimada.* (Panel 23)
- 16.30.- Academy General Assembly Assamblée Générale de l'Académie
- 20.30 Academy Dinner at the Casino de Madrid Dîner de l'Académie au Casino de Madrid

### WEDNESDAY, 8 OCTOBER / MERCREDI, 8 OCTOBRE

Scientific sessions: Oral Presentations Sessions Scientifiques: Presentations Orales Policy / Réglamentation Médicale Chair: Dr. B. Esteban / Dr. H. Pongratz

- 8.00.- (25) JONES R.F. "Administration of the FAA Medical Examiner (AME) Program". USA
- 8.15.- (26) JONES R.F. "FAA AME performance evaluation tools". USA
- 8.30.- (27) RUGE A. "The future of European aviation requirements". The Netherlands -JAA-
- 8.45.- (28) ANTUÑANO M. "Alcohol & drug testing programs for FAA personnel in safetyrelated positions" & "Alcohol & drug testing programs for industry personnel in safetyrelated positions". USA
- 9.00.- (29) ANTUÑANO M. "Post-mortem findings of alcohol and drugs in specimens from pilots involved in civil aviation accidents". USA
- 9.15.- Break / Pause

## Assessment / Évaluation médicale

Chair: Dr. D. Gradwell / Dr. P. Vallejo

9.25.- (30) SIMONS M. "Fit to fly checklist: A tool to improve flight safety. The Netherlands

- 9.40- (31) ARVA P. "Changes in disqualification rates among professional pilots due to JAR-FCL 3 implementation". Norway
- 9.55.- (32) PUENTE-ESPADA B. "Professional, demographic and clinical characterization of the members of the Spanish Armed Forces with responsibilities in flight, that passed medical examinations in the Defense Aeromedical Center (CIMA) during 2002". Spain
- 10.10.- (33) POMBAL R. "Causes of definitive incapacity to fly in TAP Air Portugal crew – a 10 year retrospective study". Portugal
- 10.25.- (34) WIELGOSZ A. "Canadian guidelines for the assessment of the medical fitness of licensed aviation personnel". Canada
- 10.40.- *Coffee break / Pause café* Proudly sponsored by Environmental Tectonics Corporation ( E.T.C.)

### Scientific sessions: Oral Presentations Sessions scientifiques: Presentations Orales Aerospace Physiology / Physiologie Aérospatiale Chair: Dr. R. Rayman / Dr. J.L. Zamorano

- 11.10.- (35) NEUWIRTH F. "Correlation of oxygen pressure in aircraft cabins with resulting arterial oxygen saturation. Possible reasons for gender differences". Germany
- 11.25.- (36) HINKELBEIN J. "Influence of sensor site location for the accuracy of pulse oxymetry. Germany
- 11.40.- (37) TE-SHENG W. "The effects of acute hypoxia on anaerobic work capacity". Taiwan
- 11.55.- (38) NEWMAN D.G. "The relationship between flying experience and cardiovascular adaptation to Gz acceleration". Australia
- 12.10.- (39) BALLDIN U.I. "Is there still a need for improvements in G-tolerance/endurance for pilots in future high performance fighter aircraft?". USA
- 12.25.- Break / Pause

- 12.35.- (40) KOWALCZUK K.P. "Use of infrared oculography and posturography in spatial disorientation training assessment". Poland
- 12.50.- (41) ROUMES C. "Vision binoculaire dans les equipements de tête en aéronautique". France
- 13.05.- (42) CHAPNIK L. "Night vision goggles adjustment surveys in the Israeli Air Force". Israel
- 13.20.- (43) LOLIC Z. "Heat stress in helicopter pilots during low-altitude flights". Croatia
- 13.35.- Lunch / Déjeuner

## Scientific sessions: Oral Presentations Sessions scientifiques: Presentations orales <u>Clinical Aviation Medicine I / Médecine Clinique</u> <u>Aérospatiale I</u>

Chair: Dr. Dr. L. Callol / Dr. M.K. Lim

- 14.45.- (44) PREITNER C.G. "Spontaneous pneumothorax: When is it safe to fly again?". New Zealand
- 15.00.- (45) EVANS S. "Certification to fly after lymphoid malignancy". United Kingdom
- 15.15.- (46) KRUYER W.B. "The natural history of lone atrial fibrillation in 279 male aviators". USA
- 15.30.- (47) KRUYER W.B. "Natural history of new left bundle branch block in 135 asymptmatic male military aviators". USA
- 15.45- (48) MUMENTHALER M.S. "Does nicotine deprivation affect pilot performance? - Preliminary results of an ongoing study". USA
- 16.00.- (49) BERTRAN P-E "Tumeurs de system nerveux central en medécine aéronautique". France
- 16.15.- Coffee break / Pause café Proudly sponsored by S.E.M.A.

## Scientific sessions: Oral Presentations Sessions scientifiques: Presentations Orales <u>Clinical Aviation Medicine II / Médecine Clinique</u> <u>Aerospatiale II</u>

Chair: Dr. C. Alonso / Dr. A. Martin-St.Laurent

- 16.45.- (50) CIMA M. "Silent abdominal aortic aneurism in pilots". USA
- 17.00.- (51) SHERER Y. "Combat jet flying is not associated with development of hypertension – results from a 22 year follow-up". Israel
- 17.15.- (52) MONTEIL M. "La dietetique chez les personnels navigants". France
- 17.30.- Break / Pause

## Medical Air Evacuation / Transport Aérien Sanitaire

Chair: Dr. J.I. Peralba / Dr. F. Ríos

- 17.40.- (53) NYQVIST A. "Things are getting sma-Iler and better". United Arab Emirates. Oral
- 17.55.- (54) BAR DAYAN Y. "Medical evacuation by a fixed wing secondary transportation missions – a flight team physician or paramedic?". Israel. Oral

## Aircraft Accidents / Accidents Aériens

Chair: Dr. Peralba / Dr. Ríos

- 18.15.- (55) ORTIZ P. "Airline medical department role in aviation emergencies". Spain
- 18.30.- (56) CROWLEY J.S. "Injury trends in U.S. Army helicopter accidents 1995-1999". USA

## Ending presentation / Presentation Finale

- 18.45.- (57) SUNDARESAN A. "Adaptational response of human lymphocyte genes in microgravity". USA
- 19.00.- End of the Scientific Sessions / Fin des Sessions Scientifiques

21.00.- Gala Dinner at Hotel Villamagna Dîner de Clôture à l'Hôtel Villamagna

## THURSDAY, 9 OCTOBER / JEUDI, 9 OCTOBRE

### 9.30 - 13.30: Technical visits / Visites techniques

- Iberia LAE: Maintenance & Simulator facilities (La Muñoza)
- CASA-EADS (Getafe): Aircraft Factory
- CLAEX (Torrejón AFB): Test Squadron

## **POSTERS**

## <u>MONDAY. 6<sup>th</sup> OCTOBER</u> <u>MORNING SESSION (9.30 –13.30)</u>

### HUMAN FACTORS

**1.-** KHANUJAS.S. " Human error analysis of Indian Naval Aviation Accidents (1990-2001) – The application of human factors analysis and classification systems (HFACS)". India

**2.-** KRAFT N. "Types of relationships formed by a multicultural crew while in isolation for 264 days". USA/Japan/Canada

**3.-** BINDER H. "Attribution theory and intercultural conflicts in an isolated environment". USA/Japan-/Canada

### **SPACE**

**71.-** PÉREZ-POCH A. "Ulrasound image processing: application to diagnose diffuse hepatopaties in space". Spain

## **BASICS**

**66.-** RISIN D. "MG-induced inhibition of adoptosis: molecular mechanisms in possible consequences for the long-term space missions". USA

**67.-** SZABO S. "Evaluation of autonomous dystonia and assessment of endothel dysfunction in the aero-medical evaluation process: posibilities of drug treatment". Hungary

**68.-** SHU Z. "Effects of simulated weightlessness on MAPK/ERK signal pathway in osteoblastic Ros 17/2.8 cells induced by BMP-2" P.R. China

**69.-** CASTRO.BLANCO S. "Expression of nitric system and protein nitration in adult rat brains submitted to hypobaric hypoxia". Spain.

**70.-** KAUR C. "Activation and response of neurons in the hippocampus following exposure to hyopbaric hypoxia". Singapore

## <u>MONDAY. 6<sup>th</sup> OCTOBER</u> <u>AFTERNOON SESSION (14.30 –19.00)</u>

## **PSYCHIATRY**

**4.-** PATTYN N. "Introducing a new approach to the operational evaluation of cognitive performance: the results of two validation studies". Belgium

5.- CARBAYO J.A. "Associated variables to anxiety disorders in professional airmen candidates". Spain
6.- JIMENEZ-PRADA L. "Associated variables related to changes from anxiety to non-anxiety during the basic training period of professional airmen". Spain

## **MISCELLANEA**

**72.-** DOJCINOVSKI N. "Blood trace elements before and after flight". Slovenia. Poster

**73.-** BARTOS D. "Institute of Aviation Medicine in Prague: 50<sup>th</sup> aniversary of he establishment of the Institute of Aviation Medicine in Prague and 80<sup>th</sup> anniversary of the beginning of Aviation Medicine in Czech (Czechoslovak) Republic". Czech Republic. Poster

**74.-** JACUBOVICH R.M. "Analysis of occupational health referral patients in the IAF occupational health consult service clinic". Israel. Poster

## TUESDAY, 7<sup>th</sup> –MORNING SESSION (8.30 –13.30)

## **TRAVEL**

7.- MISSONI E. "Can SARS be transferred by aircraft ?". Croatia

**8.-** SIMONS M. "In flight medical incidents: the need for prevention". The Netherlands

**9.-** SINGH B.K. "Understanding stress of air traveller: a new insight". India

**10.-** MIYAMOTO A. "Crew healthcare with high definition TV images". Japan

**11.-** LINDGREN T. "Use of recirculated air in commercial aircraft on intercontinental flights: cabin air pollutants and climate". (CANCELLED)

**12.-** STEVENS S. "Suivi d'un équipage potentiellement exposé au SARS". France

**13.-** CIMA M. "Medical assistance to airline crews away from the home base: unusual situations, comments and implications for future incidents". USA

**4.-** POMBAL R. "Organisational procedures for dealing with suspected exposure to disease on board –three case studies from UCS 's experience". Portugal

### AIRCREW HEALTH

**15.-** PÉREZ-SASTRE J.M. "Medical assessment of Iberia pilots acute sick leaves". Spain

**16.-** EREMINAS D. "The analysis of flight personnel sick leaves of Lithuanian airlines". Lithuania

**17.-** TRUSKA O. "Sudden (non-accidental) death among czech military and professional civilian pilots in the period 1992 – 2002". Czech Republic **18.-** DE OLIVEIRA C.G. "Back muscular activity of pilot's, helicopter vibration and exposure limits of ISO 2631". Brasil

**19.-** DE OLIVEIRA C.G. "Effect of helicopter pilot's posture on back muscle activity". Brasil

**20.-** DE OLIVEIRA C.G. "Back muscle fatigue of helicopter pilots during flights". Brasil

**21.-** CARBAYO J.A. "Radiological modifications in thoracic and lumbar spine and lumbar mobility in spanish fighter pilots". Spain

**22.-** JAHR K.I. "Air combat efficiency for fighter pilots suffering from cervical spine symptoms in the Royal Nowegian Air Force". Norway

**23.-** JACUBOVICH R.M. "Occupational morphea due to epoxy resin exposure". Israel

**57.-** MAIRE R. "Heart diseases and fitness to fly – two cases presentations". Switzerland

**58.-** MAIRE R. "Can a pilot fly with a 50 % coronary lesion? A case presentation". Switzerland

### WEDNESDAY, 8<sup>th</sup> OCTOBER MORNING SESSION (8.30 – 13.30)

### POLICY

24.- MEIJER H.J. "Variations, exemptions and deviations in the Netherlands". The Netherlends
25.- ANTUÑANO M. "Use of adulterants and and specimen substitution to avoid detection during drug testing among aviation personnel". USA

### ASSESSMENT

**26.-** BECKRÖGE J. "Ocular health profile of the Norwegian profession a pilot population". Norway **27.-** ROUMES C. "Expertise médicale aéronautique: un concept évolutif". France

## **PHYSIOLOGY**

28.- ASHRAF–SALA "Effects of rapid decompression changes in the atmospheric pressure on the inner ear of guinea pig: histopathological study". Egypt
29.- LI M.H. "Preconditioning attenuated high G induced behaviour disturbance in the rat". Taiwan

**30.-** ZAWADZKA-BARTZAK E. "Blood pressure and centrifuge examination". Poland

**31.-** ZAWADZKA-BARTZAK E. "The usefulness of the LBNP test in the diagnosis of ischemic heart disease in aircrew". Poland

**32.-** DOSEL P. "Comparisson of cardiovascular response to positive and negative Gz load changes at safe and low altitude level during real flight". Czech Republic

**33.-** YI-WEN S. "Incidents of anti-G suit failure during human centrifuge training". Taiwan

**34.-** TE-SHENG W. "Comparison of physical fitness for centrifuge rider matched with similar conditions". Taiwan

**35.-** GROSZ A. "Experience with a time and movemnt anticipation test in hypobaric hypoxia". Hungary

**36.-** MIKULISZYN R.S. "G-LOC: promises for a new predicion method?". Poland. CANCELLED

**37.-** SAZEL M. "Spatial disorientation and posturography". Czech Republic

**38.-** ESTEBAN-BENAVIDES B. "Results of Computarized Dynamic Posturography in cadets versus experienced SPAF pilots". Spain

**39.-** NANCHEVA R.L. "Physical work capacity evaluation in Bulgarian Air Force pilots – a review". Bulgaria

**40.-** HINKELBEIN J. "Is nail poilish riskful for pilots when using pulse oxymetry to measure oxygen saturation?". Germany

**41.-** HINKELBEIN J. "Nail polish and aviation: evaluation of a method to eliminate faulty results of oxygen saturation determined by pulse oxymetry". Germany

**42.-** LASZYNSKA J. "Rapid decompression profiles for polish aircew SANAG 3114 implementation". Poland

**43.-** ILIUTA C. " The effect of anticyanosides-mirtilene sifi- on retinal sensibility at health subjects. Romania

**44.-** KHANN M. "Computer simulation to optmize the performance of an anti-G-suit". India

**45.-** BALAZS L. "Hypoxia and the frontal brain". Hungary

**46.-** DE ANGELIS C. "The contribution of neuovegetative modulation to rehabilitation from air sickness". Italy **47.-** DERK M. "The influence of isotonic strength training of fitness level of military aircaft pilots". Poland

**48.-** ELIASZ J. "Estimation of the press-force values of lower limbs of the rudder bar during G-tolerance investigation". Poland

**49.-** BALOESCU V. "The tonus of the Central Nervous System, evaluation and prognosis of the flight aptitude". Romania

**50.-** CASAGRANDE M. "Individual differences in the adaptability to irregular rest-work rhythms in military personnel". Italy

**51.-** CASAGRANDE M. "Sleep during alternating monophasic and polyphasic rest-activity cycles: effect of phototherapy". Italy

**52.-** CASAGRANDE M. "Bright light exposure as an alertness management strategy during poliphasic rest-activity operation". Italy

## WEDNESDAY, 8<sup>th</sup> OCTOBER AFTERNOON SESSION (14.30-19.00)

## <u>CLINICAL</u>

**53.-** MACRI M. "The prevalence of osteoporosis in military aeronautical personnel". Romania

**54.-** KOUTIDOU-PAPADELI C. "The effect of CPAP treatment on cognitive performance in aviators with obstructive sleep apnoea syndrome". Greece

**55.-** LUCERTINI M. "On the pharmacological prevention of symptoms evoked in a spatial disorientation demostrator". Italy

**56.-** KOVAEVI S. "Transport of the patient after pars plana vitrectomy". Croatia

**59.-** RAK R. "Interet de l'examen de la thyroide au cours des visites médicales systematiques". France **60.-** BARTOS D. "The Heidelberg retina tomograph and flowmeterin the diagnosis of glaucoma in flying personnel". Czech Republic

61.- PICHEREAU P. "Dépistage des dyslipidemies chez le personnel navigant technique". France62.- CIMA M. "Lower back syndromes: a vexing

problem in the airline industry". USA. Poster

63.- AZARIA-SOFER "Hemoglobin levels among candidates for aircrew members". Israel. Poster64.- SHERER Y. "A 20-year follow-up of cholestero-

llevels in 3 groups of pilots". Israel

**65.-** SIMON. "Importance of the anterior chamber depth for LASIK surgery". Spain

#### SPACE MEDICINE PANEL

#### PANEL 1. INTERNATIONAL SPACE STATION (ISS) MEDICAL OPERATIONS: A MODEL FOR INTERNATIONAL MEDICAL CO-OPERATION IN SPACE

CL FISCHER\*, VV BOGOMOLOV\*\*, A SARGYSAN\*\*\*

\* NASA Johnson Space Center – ISS Multilateral Medical Operations Panel Co-Chair. \*\* RSA Institute for Biomedical Problems – ISS Multilateral Medical Operations Panel Co-Chair. \*\*\* Wyle Laboratories, Houston – ISS Multilateral Medical Operations Panel Secretary.

The Memorandum of Understanding which committed the participating international partner agencies to build and operate the International Space Station included the requirement to develop an international medical support system. Participating Agencies include the US National Aeronautics and Space Administration (NASA), the Russian Space Agency (RSA), the European Space Agency (ESA), the National Space Development Agency of Japan (NASDA), and the Canadian Space Agency (CSA). Medical support for the ISS Program is organized through the activities of three boards; the Multilateral Medical Policy Board (MMPB), the Multilateral Space Medicine Board, and the Multilateral Medical Operations Panel (MMOP). The MMOP is the working level body for co-ordinating the input of ISS participant agencies (Partners) into ISS medical operations. Responsibilities of the MMOP include the development of medical selection and certification standards, medical care requirements, preventive medicine guidelines, crewmember medical training, operational countermeasures, medical hardware, medical and environmental monitoring requirements, psychological support, emergency medical support, and operational procedures. The MMOP also develops guidelines for training and certification of ISS Flight Surgeons and other medical support personnel, and assigns flight surgeons to specific mission increments. The MMOP forms specialty Working Groups to address specific operational problems. Current Working Groups include Human Behavior and Performance, Radiation Health and Protection, Medical Standards and Monitoring, Extravehicular Activity, Communications and Telemedicine, Countermeasures, Environmental Monitoring, and Nutrition. This presentation will provide an overview of the organizational support for ISS and highlight the current operational support activities...

#### PANEL 2. THE INTERNATIONAL SPACE STATION AND THE CANADIAN SPACE AGENCY - MEDICAL OPERATIONS OVERVIEW:

JM COMTOIS BENG, MD

Director Operational Space Medicine, Canadian Space Agency, St-Hubert, Quebec, Canada

In 1993, the Operational Space Medicine (OSM) program was created at the Canadian Space Agency (CSA) with the mandate to ensure the Health and Safety of Canadian Astronauts through all phases of training and mission. Furthermore, Memoranda of Understanding (MOU) between all Partners provide for a common system of medical management and support for the International Space Station (ISS). As the ISS Program has determined that all crewmembers will function as an integrated crew onboard the ISS, the ISS medical authority structure established by the MOU ensures top-level multilateral coordination and working-level handling of all crew health issues. For all phases of flight, the ISS Medical Operations is responsible for medical care including diagnostic capabilities, development of crewmember medical standards, preventive medicine including operational countermeasures and monitoring crewmember health and environmental parameters that may impact crew health.

This presentation will describe the CSA OSM program and how it integrates within the ISS Medical Organization. Two examples will be used to demonstrate ongoing International cooperation thus assuring the unequivocal success of the International Space Station to date. It will describe the "Human Performance and Behavior" Working group, some of the problems facing the International Partners in the support of ISS Increments and solutions proposed by International Partners. As a second example, it will describe some of the work done by the EVA Working Group and the Pre-Breathe protocol developed to support Extra-Vehicular Activities from the International Space Station.

The ISS is truly an International effort and only through ongoing International Partnership and compromise will its continued success be assured. This presentation will be complemented by presentations from the other ISS Partners.

# PANEL 3. ACROSS THE DIVIDE: MULTILATERAL MEDICAL OPERATIONS - BRIDGING THE TECHNOLOGY GAP

V. DAMANN<sup>1</sup>, F. DE JONG<sup>1</sup>, G. WEERTS<sup>1</sup>, J. DARCY<sup>2</sup>

<sup>1</sup> European Space Agency/European Astronaut Centre, Crew Medical Support Office, Cologne, Germany. <sup>2</sup> Wyle Laboratories GmbH, Cologne, Germany

The European Astronaut Centre (EAC) of the European Space Agency (ESA) in Cologne, Germany is considered the homebase of the European astronauts. Along with training facilities and the astronaut office, it accommodates the Crew Medical Support Office (CMSO). The prime responsibility of the CMSO is to ensure the health and well being of the European astronauts throughout all mission and training phases.

Since all crewmembers coming from all international partners (USA, Russia, Canada, Europe, Japan) function as an integrated crew onboard the International Space Station (ISS), medical support to the astronauts has to be provided in a multilateral effort, based upon mutually agreed medical standards, processes, and command and communication structures.

This presentation will describe the ESA CMSO program, how it integrates with the ISS Medical Organization and and on the communication philosophies and technologies necessary to support a distributed medical support concept.

The ISS Medical Organization is unique in that it must move data across many international boundaries, not only bridging the technological differences but also bridging the inherent practical differences in medical care among the ISS Partner Agencies. During the assembly phase of the ISS, the medical community will explore new telemedicine concepts, establish standardized means of medical data exchange, and implement rigid data security, encryption, and authentication processes to enable a global exchange of data. It is expected that the ISS medical community will heavily rely on already existing telemedicine applications. However, further refinement of such technologies and validation of security schemes will have a beneficial impact on terrestrial medical information services and will positively affect the public acceptance of electronic media in common medical practice. Therefore, ISS will be utilized as testplatform for information technologies, providing appropriate tools for space flight physicians entering the era of future space explorations.

The ISS is truly an international effort and only through ongoing International Partnership and compromise will its continued success be assured. This presentation will be complemented from the other ISS Partners.

# PANEL 4. JAPANESE MEDICAL OPERATIONS FOR THE INTERNATIONAL SPACE STATION

K. SHIMADA, S. TACHIBANA

Tsukuba Space Center, Japan Aerospace Exploration Agency, 305-8505 Japan

#### INTRODUCTION:

Japanese participation in the multilateral medical operations for the International Space Station (ISS) started in 1985 when medical screening for three Japanese science crew candidates were completed for a Space Shuttle Spacelab mission. Today we run interwoven support activities with American, Canadian, European, and Russian ISS partner, who is also to present in this panel.

#### **RESULTS:**

Successful international medical support was provided to the crew of Shuttle flights STS-47, 65, 72, 87, 95, 99, and 92; these included five Japanese astronauts. Besides flight support, medical supervision was conducted at various overseas training, e.g., spacesuit water diving at Tsukuba, Star City, and Houston; hypobaric chamber flights; water and winter survival training, as well as centrifuge run in Russia.

In the ground research arena, Japanese collaboration with IBMP, Moscow on 268-day chamber confinement, trial of pamidronate with 90-day bed rest at MEDES, Toulouse are noted. The onboard medical system suites on ISS are growing and we actively discuss on these at the ISS Multilateral Medical Operations Panel (MMOP).

Another example of large scale international research cooperation is in radiation monitoring. Because radiation protection is not only for crew safety but also for science, material engineering, and computer operation, there have been numerous measurements. Among them were Japanese active dosimeter on Mir4/6 as Japan-Russia joint program, and sensor-embedded torso phantom flying on STS-91 as Japan-US venture. On ISS are active environment and passive personal dosimeters from US and Russia. Actual failure of an apparatus onboard had been covered by another. One of topics for the Radiation Health Working Group under MMOP is how biodosimetry by chromosomal aberration could be applied to multilateral radiation control.

#### CONCLUSION:

ISS medical operations symbolizes there is no border for human health care. Experience we accumulated in building the scheme could be shared by other entities.

Kazuhito Shimada, M.D., Ph.D. Medical Operations, Tsukuba Space Center Tsukuba 305-8505 Japan

### AEROMEDICAL ASPECTS OF MODERN KERATO-REFRACTIVE SURGERY PANEL

#### PANEL 5. CLINICAL AND OPERATIONAL ISSUES RELATED TO KERATO-REFRACTIVE SURGERY: AN AEROMEDICAL UPDATE

#### D.J. IVAN MD

Chief, Aerospace Ophthalmology Branch. USAF School of Aerospace Medicine. Brooks City-Base, Texas. USA

Several modern kerato-refractive surgical procedures have emerged as safe and viable surgical means of safely reducing dependence on traditional optical eyewear, such as spectacles and contact lenses. These post-operative results, have in theory, broadened the potential candidate pool previously unavailable to some candidates, based on aeromedical standards and the functional and clinical limitations of uncorrected visual requirements and baseline refractive errors. New procedures, such as PRK and LASIK, are far superior to earlier procedures such as RK, with respect to safely achieving the goal of reducing dependence on traditional eyewear. However, quality of vision and other potential operational issues, introduced by these procedures in post-refractive eyes, raise concerns that are functionally more important in certain career fields when compared to most civilian surgical outcomes. This presentation will address the current and future aeromedical concerns of refractive surgery, especially as related to PRK and LASIK, with respect to both civil and military aviation applications.

#### PANEL 6. THE OPHTHALMOLOGICAL JAR-FCL 3 STANDARDS – DOES REFRACTIVE SURGERY MAKES YOU FIT TO FLY?

#### C. STERN, M.D.

Institute of Aerospace Medicine. German Center of Aerospace. 51170 Cologne. Germany. Claudia.Stern@dlr.de

To fulfill the JAR-FCL 3 standards class 1, distant visual acuity must be 0.7 in each eye and 1.0 in both eyes. Ametropias shall not exceed +3 diopters, the astigmatism and anisometropia shall not exceeded 2.0 diopters. The applicant shall read Ishihara plated correctly without hesitation or shall be a normal trichromat that means a Nagel's anomalquotient of 0.-1.4, or shall pass a lantern-test. Status after cataract, glaucoma or retina surgery entails unfitness, a waiver can be asked for after 2 to 6 months, depending on the surgery. Status after refractive surgery entails unfitness. After 12 months the applicants or pilots can apply for a waiver. The preoperative refraction shall not have exceeded 5,0 diopters in class 1.

Also the national German requirements entailed unfitness for flying after the status of refractive surgery. In an 8 year period the data of all pilots and initial applicants who underwent refractive surgery and applied for a waiver were analyzed. The aim was to obtain the possibility of estimating the chance for the individual to receive a waiver depending on preoperative refractive status and the performed procedure.

Good results were taken of up to –5 diopters in LASIK and PRK. It can be shown that the risk of waiver denials raises with myopia and that the 5,0 diopter preoperative limit is a good decision for the applicants.

# PANEL 7. THE MEASUREMENT OF SCATTERED LIGHT AND VISUAL PERFORMANCE

J L BARBUR<sup>1</sup>, C CHISHOLM<sup>1</sup>, J KVANSAKUL<sup>1</sup> & ADB EVANS<sup>2</sup>

<sup>1</sup>Applied Vision research Centre, City University, London, United Kingdom <sup>2</sup> Civil Aviation Authority, Gatwick, United Kingdom

Corneal refractive surgery can cause some degradation or retinal image quality as a result of increased aberrations and / or scattered light. It is therefore of interest to measure aberrations and the scatter function of the eye and to relate these parameters to some relevant measure of visual performance. The assessment of ocular aberrations is easy to carry out as a result of recent advances in instrumentation for wavefront measurement. The light scatter (LS) function of the eye remains difficult to measure. Clinical methods assume a fixed pattern for the angular distribution of LS. This incorrect assumption has the great advantage of making it possible to estimate the amount of LS using a single-ring source. The purpose of this study was twofold:

 First, we wanted to evaluate the variation in the angular distribution of LS in the eye and to establish the errors involved when the measurement of LS assumes a fixed angular distribution, as in current clinical tests.

• Second, we wanted to develop an appropriate measure of visual performance that reveals the effects of increased LS and aberrations in the eye.

The LS test used in this study employs either a single, extended annulus of fixed eccentricity or 5 discrete annuli of varying eccentricity. The results reveal significant variation in the angular distribution of scattered light in the normal population. As a consequence, the single-ring test produces large errors in the estimated LS in the eye.

A new test of visual performance that is sensitive to retinal image degradation and is relevant to functional visual tasks in the cockpit environment will also be described. The test is based on photopic and mesopic contrast acuity assessment and identifies subjects with visual performance outside the "normal range", as a result of degraded retinal image or diseases of the retina and / or the visual pathways (*Aviat. Space. Environ. Med.* 74: 551-559, 2002).

#### PANEL 8. CONVENTIONAL VS WAVEFRONT-GUIDED TREATMENTS – EFFECTS ON VISUAL PERFORMANCE

C.M.CHISHOLM<sup>1</sup>, J. KVANSAKUL<sup>1</sup>, J.L. BARBUR<sup>1</sup>, D.F. ANDERSON<sup>2</sup>, A. KHAN<sup>2</sup>, D.S. GARTRY<sup>2</sup>

<sup>1</sup>Applied Vision Research Centre, City University, London, UK. <sup>2</sup>Moorfields Eye Hospital, London, UK

#### INTRODUCTION:

Claims have been made that customised ablations based on wavefront data will allow the average refractive surgery patient to achieve 20/10 vision by reducing their preoperative aberrations. Conventional ablations have been shown to induce higher order aberrations, in particular spherical aberration and coma (Oshika et al. Am.J.Ophthal 121:1-7, 1999), leading to a reduction in visual performance. Previous studies comparing the two techniques suggest little difference in high contrast visual acuity for the average patient. This study uses the Contrast Acuity Assessment test (Chisholm et al. Aviat. Space Environ. Med. 74:551-559, 2003) to more accurately assess differences in visual performance between the two techniques.

#### METHODS:

A prospective randomised double-masked pilot study was designed in which 10 patients (preoperative MSE -4.6±0.2D) underwent conventional LASIK one eye (VISX Star S4) and wavefront-guided LASIK the other (Wavescan v3.0). Monocular contrast acuity thresholds were measured under both photopic and mesopic conditions, before and at 1 and 3 months after surgery. Forward light scatter was also assessed using the City University Scatter Program.

#### **RESULTS:**

At 1 month, both conventional and wavefront-guided LASIK led to a reduction in visual performance, indicated by a statistically significant increase in CAA thresholds under both photopic and mesopic conditions. On average, there was no significant difference between those eyes undergoing a conventional ablation versus a wavefront-guided ablation. Some patients did demonstrate lower contrast acuity thresholds in the eye that had undergone the wavefront-guided ablation compared to the conventional ablation, associated with either a smaller increase in surgicallyinduced higher order aberrations or a decrease in aberrations compared to preoperative levels. Levels of forward light scatter did not differ between the two surgical techniques. Three month data will also be presented.

#### CONCLUSIONS:

This pilot study suggests that wavefront-guided ablations may not be necessary for the average refractive surgery patient (low/medium myopes).

### COLOUR VISION REQUIREMENTS FOR PILOTS: CONTEMPORARY ISSUES PANEL

# PANEL 9. THE HISTORY OF INTERNATIONAL COLOUR PERCEPTION REQUIREMENTS.

#### CURDT-CHRISTIANSEN C.

ICAO - Chief of Aviation Medicine Section

An outline of the history of the international colour perception requirements for pilots in international aviation is given. Many changes have taken place during the 80 years of their existence, but the initial and the most recent requirements are remarkably alike. Implicit in both the past and the present colour perception requirements is the presumption that some degree of defective colour perception may on its own impair the ability of affected pilots to fly safely. This presumption is primarily based on common sense and operational experience, not on scientific research. The ICAO Vision and Colour Perception Study Group, active from June 1997 to May 1998, concluded its review of the colour perception requirements with a recommendation that scientific research be conducted in order to identify the colour critical tasks in aviation, define the acceptable limits for colour perception deficiencies, and device adequate testing procedures. In 2000, on ICAO's request, three Contracting States, Canada, the Netherlands and the United Kingdom initiated relevant research programmes from which final results are expected to be ready in the near future.

#### PANEL 10. A COMPARISON OF THE COLOUR CHARACTERISTICS OF THE BEYNE, HOLMES-WRIGHT 'A' AND SPECTROLUX LANTERNS

ADB EVANS  $^{\rm 1},$  TJ SQUIRE  $^{\rm 2},$  M RODRIGUEZ-CARMONA  $^{\rm 2},$  JL BARBUR  $^{\rm 2}$ 

<sup>1</sup> Civil Aviation Authority, Gatwick, United Kingdom

<sup>2</sup> Applied Vision research Centre, City University, London, United Kingdom

#### INTRODUCTION

The Joint Aviation Authorities (JAA) require applicants to undertake the Ishihara pseudoisochromatic colour plates test for colour deficiency. Those who fail this test may nevertheless be certificated to fly as a pilot if they pass one of three lantern tests, namely the Beyne, Holmes-Wright Type A or Spectrolux. They may also be certificated if they pass a Nagel anomalscope assessment. A study was undertaken to compare the specification of the three lantern tests.

#### METHODS

A Minolta CS-1000 array telespetroradiometer was used to measure the spectral radiance of each light and to compute its integrated luminance and *Commission Internationale de l'Eclairage* (CIE) (x,y 1931) chromaticity coordinates (CIE Proceedings, Cambridge University Press, England (1932)). These were compared to the signal light recommendations of the CIE (CIE Standard S004/E-2001)

#### RESULTS

The spectral properties and stimulus conditions used for testing applicant pilots who have failed the Ishihara test vary from one lantern to another.

#### CONCLUSIONS

The JAA system of medical certification has established a set of medical requirements for testing colour vision. Three different lantern tests, using lights of different chromaticity and luminance, as well as the Nagel anomaloscope, are approved for assessing applicants who have failed the Ishihara test. Since the three lantern tests use lights with different spectral characteristics (and different testing protocols) and the anomaloscope uses a different testing principle (colour

matching), the same individual taking all tests may produce different results, depending on the test undertaken. A harmonised standard of colour vision testing therefore does not exist across JAA member states.

# PANEL 11. A COMPARISON OF FOUR JAA APPROVED COLOUR VISION TESTS

T.J. SQUIRE<sup>1</sup>, M. RODRIGUEZ-CARMONA<sup>1</sup>, A.D.B. EVANS<sup>2</sup>, AND J.L. BARBUR<sup>1</sup>

<sup>1</sup> Applied Vision Research Centre, City University, London, United Kingdom; <sup>2</sup> Civil Aviation Authority, Gatwick, United Kingdom.

#### INTRODUCTION

City University, London, sponsored by the Civil Aviation Authority, has undertaken a comparison of the Nagel anomaloscope and the Holmes Wright Type A, Spectrolux and Beyne aviation colour vision (CV) lanterns. These are the four CV tests approved by the Joint Aviation Authorities (JAA) for applicants failing the Ishihara screening test.

#### METHOD

The CV of 87 subjects, mostly applicant pilots, was assessed using a battery of tests, including the Nagel anomaloscope and the three lanterns. The testing methods and characteristics of the lanterns and anomaloscope were compared.

#### RESULTS

Of the 62 colour deficient subjects, only deuteranomalous trichromats passed the JAA tests, apart from 3 protanomalous trichromats who passed the Nagel anomaloscope. Of the 25 normal trichromats, only 12 passed the lantern tests. The same individual subjects passed and failed different tests. The lanterns and anomaloscope use different testing principles of colour naming and colour matching respectively. The characteristics and testing criteria of the lanterns differed in several aspects.

#### CONCLUSION

Variability in pass/fail results can be attributed to many factors, apart from loss of chromatic sensitivity, that vary in importance amongst subjects: testing criteria and principles, differences in stimulus properties, variation in visual cues, colour naming problems for stimuli of varying luminosity. There is a potential for normal trichromats failing the initial screening to also fail the lantern test. The outcome of regulatory assessment depends on which CV test is used, and this varies between countries. Consistency in CV testing is therefore lacking and an aspiring professional pilot may be accepted without limitation in one country, and rejected outright in another. Since the flight safety consequences of the current situation cannot be ignored, a better understanding of CV requirements is needed. The study also highlights the need for developing a less variable technique for CV assessment that is accepted internationally.

#### PANEL 12. AN OVERVIEW OF INFORMATION COLOUR CODING IN THE COCKPIT AND ASSOCIATED ANALYSIS OF VISUAL FITNESS FOR THE TASK

C. ROUMES\*, J. PLANTIER\*, C. CORBE°, G. POYOT\*

\*Institut de Médecine Aérospatiale du Service de Santé des Armées, BP 71, 91223 Brétigny-sur-Orge Cedex, France. °Institution Nationale des Invalides,6 boulevard des Invalides, 75007 Paris, France

In the cockpit, colour coding is used to select, gather or quantify information. So, any loss or ambiguity in colour perception may dramatically impair the pilot's performance. First, a review of colour displays over time exhibits the main changes that occurred in the human machine interface. Initially, sparse and localized coloured signals were supported by isolated lights or by secondary light sources, partially reflecting a range of wavelength. Nowadays, in the glass cockpit concept, increasing the number of hues involved in colour coding has led to a much higher amount of information displayed meanwhile keeping the user's workload acceptable. Coloured areas are in spatial contiguity and may overlap in emissive panels. This is a great change regarding the visual properties of colour perception.

Second, colour testing in the course of medical fitness assessment, is considered in relation with the operational use of colour in the cockpit. Most of the tests are derived from the clinical domain to ensure that the observer is free of any colour perception impairment. Tests based on an actual aeronautical use of colour are rather rare. Even in this latter case, they were developed to cover the traditional involvement of colour in the instrument panel (such as the chromoptometric Beyne's lantern).

Third, the main characteristics of an appropriate colour test are discussed. The visual display should reproduce the main luminous and chromatic parameters of the electronic in-flight panels. The size and the spatial arrangement of coloured patterns should replicate the range of the potential applications and discrimination of hues should be achieved for isoluminant stimuli. The entire set of original hues should be tested.

The visual properties involved in the task must be taken into account when selecting a fitness assessment. Colour use in the cockpit changes overtime, colour perception testing must be updated.

#### PANEL 13. COLOUR ASSESSMENT & DIAGNOSIS – THE NEW CAD TEST THAT MEASURES AND QUANTIFIES CONGENITAL AND / OR ACQUIRED LOSS OF CHROMATIC SENSITIVITY

J.L. BARBUR<sup>1</sup>, M. RODRIGUEZ-CARMONA<sup>1</sup>, T.J. SQUIRE<sup>1</sup>, I. MOORHEAD<sup>2</sup> AND A.D.B. EVANS<sup>3</sup>

<sup>1</sup> Applied Vision Research Centre, City University, London, United Kingdom. <sup>2</sup> QinetiQ Ltd, Farnborough, United Kingdom. <sup>3</sup> Civil Aviation Authority, Gatwick, United Kingdom.

#### INTRODUCTION

Rapid, unambiguous processing of luminance and chromatic signals is needed to achieve optimum visual performance. Since both luminance and chromatic sensitivity (CS) vary significantly within the normal population, it is often difficult to establish when someone's vision falls outside the normal range. This is particularly so in colour vision when genetic factors and diseases of the retina and optic nerve can cause varying degrees of chromatic sensitivity loss. It is therefore important to establish limits of expected variability that describe the normal range. The aim of this project was to develop a new *CAD* test that measures small changes in CS and provides accurate classification of even minimal congenital deficiencies.

#### METHODS

The CAD test employs a moving, colour-defined stimulus buried in dynamic luminance contrast (LC) noise. This technique provides effective masking of LC signals without affecting colour thresholds (Proc.R.Soc.Lond B Biol.Sci. 258:327-334, 1994). The moving stimulus is generated on a stable, calibrated visual display. Detection thresholds are measured along 16 directions in colour space and the results are plotted in the CIE (x, y) - 1931, colour reference system.

#### RESULTS

100 normal trichromats and 120 colour deficient observers have been studied using the CAD test and a battery of conventional colour

vision tests. The data obtained from normal trichromats were used to derive the limits of threshold variability. These limits define the "normal" trichromat's performance on the CAD test and provide a template for instant diagnosis of normal or deficient colour vision. Data from the deutan and protan subject groups form distinct patterns that can be used to classify even minimal congenital deficiencies.

#### CONCLUSIONS

The present findings show that the CAD test provides an efficient and rapid method to detect, classify and measure chromatic sensitivity loss using a colour system that is reproducible and recognised internationally.

#### PANEL 14. COLOUR VISION AND COLOUR VISION TESTING RECOMMENDATIONS OF THE NATO-RTO WG24

#### D.J. IVAN MD

Chief, Aerospace Ophthalmology Branch. USAF School of Aerospace Medicine. Brooks City-Base, Texas. USA

The evolution of colour vision standards historically used in the transportation industry and later adopted in aviation were traditionally based primarily on the colours: red, green, yellow, and white. They evolved from navigation aids and signals developed for rail and sea and were biased towards congenital colour vision issues in an almost exclusive all male career field. For the most part, these standards were in sync with the demands and realities of aviation at the time and appear to have remained effective for many years. However, only recently, there has been a significant shift in aviation requirements, both military and commercial, driven by new technologies and new realities. Included among them are: the rapid expansion of the use of multi-spectral colour, both in and out of the cockpit, produced by an ever-expanding variety of generation sources; the adoption of more liberal aero-medical practices with respect to allowable diseases and treatments; the use of selective waveband filters; a gender shift; and new environmental threats. Recognizing these changes, the NATO-RTO (formerly AGARD) organized Working Group 24 to analyze these new developments and to make aero-medical recommendations to NATO regarding colour vision testing and standards that would effectively embrace these new developments in present and future military operational environments. This paper will review the conclusions and recommendations from that process.

### **ERNSTING PANEL (CARDIOLOGY)**

#### PANEL 15. THE NATURAL HISTORY OF ASYMPTOMATIC CORONARY ARTERY DISEASE: LONG-TERM FOLLOW-UP OF 1487 MALE AVIATORS

WB KRUYER, PJ FITZSIMMONS, SL BARNETT, JS PICKARD, WT THOMPSON

United States Air Force School of Aerospace Medicine, Brooks City-Base, Texas, USA

#### INTRODUCTION:

To determine event rates for asymptomatic coronary artery disease (CAD), we examined a database of military aviators who had coronary angiography performed for aeromedical indications.

#### METHODS:

We retrospectively reviewed records of 1487 consecutive coronary angiograms performed on asymptomatic male military aviators between 1971 and 1999. Angiographic subsets were: normal (NL, n

= 929) no stenoses, minimal CAD (MCAD, n = 249) maximum stenosis greater than zero but <50% and significant CAD (SCAD, n = 309) maximum stenosis  $\geq$ 50%. SCAD included two subgroups: SCAD1 (n = 124) maximum stenosis 50-70% and SCAD2 (n = 185) maximum stenosis >70%. We obtained follow-up via questionnaires, telephone interviews, medical records and death certificates. Events considered were cardiac death, first myocardial infarction or first revascularization.

#### RESULTS:

Mean follow-up was 14.2 years and mean age was 43.7 years. Average annual event rates at 2, 5 and 10 years were: NL = 0.0%, 0.0% and 0.1% per year; MCAD = 0.6%, 0.4% and 0.9% per year; SCAD = 4.3%, 2.9% and 2.7% per year; SCAD1 = 1.2%, 2.4% and 2.3% per year; and SCAD2 = 6.3%, 3.3% and 3.0% per year. For MCAD and SCAD1, multivariate analysis identified sum of obstructive lesions and presence of coronary artery calcification as predictive of cardiac events over ten years. Sum of lesions <120% identified a subset of MCAD and SCAD1with an average annual event rate of about 1% per year.

#### CONCLUSIONS:

MCAD event rates were higher than NL, but less than 1% per year, allowing safe return to restricted flying duties. Event rates for asymptomatic SCAD, SCAD1 and SCAD2 were lower than for similar symptomatic populations, but still greater than 1% per year. Select SCAD1 subjects with event rates of about 1% per year may be identified and also considered for return to restricted flying duties.

# PANEL 16. PATENT FORAMEN OVALE: AEROMEDICAL IMPLICATIONS

G.W. GRAY, MD, PHD, FRCPC

Defence Research and Development Canada - Toronto

Abstract: During intrauterine development, the foramen ovale is necessarily patent to allow transfer of oxygenated placental blood from inferior vena cava through right-to-left atrium for systemic perfusion of oxygenated blood. In up to 20% of adults, the foramen ovale remains patent to some degree (PFO), and permits right-to-left shunting of venous blood. PFOs are of aeromedical concern for two main reasons: 1. As substrates for paradoxical systemic embolization of thrombus resulting in stroke, and 2. As conduits for right-to-left shunting of venous gas emboli (VGE) in situations of decompression (altitude, diving, and extra-vehicular space operations). This case-based, interactive presentation (part of the Cardiology panel), will present literature-based data on the risk of stroke and decompression sickness attributable to PFOs, information on various methods detection of PFOs, and the efficacy of various methods of PFO closure. Particularly in young adults (eg military and commercial aviators) with cryptogenic stroke (CS), large PFOs (>10mm) may be a substrate. Investigations of CS should include a trans-esophageal echocardiogram with contrast (TEE-C) which is the gold standard for detection. New techniques allow trans-venous closure of PFOs, and after a suitable observation period (minimum six months), aviators with a full functional recovery from CS may be returned to flying after successful PFO closure. Although a PFO is theoretically a substrate for paradoxical VGE causing type 2 decompression sickness, there is little enthusiasm for widespread screening for PFO amongst divers, aircrew, or astronauts. In cases of unusual or "undeserved" type 2 DCS, TEE-C should be included in the investigations. In those military agencies which screen pilot candidates with trans-thoracic echocardiography, an uncomplicated PFO is not considered disqualifying for selection or retention.

#### PANEL 17. TYPICAL BRUGADA SYNDROME TYPE EKG IN AN AERONAUTICAL POPULATION: EPIDEMIOLOGICAL DATA, CLINICAL AND AEROMEDICAL CONCERNS.

PH. DOIREAU, E. PERRIER, R. CARLIOZ, PA. LEDUC, G. QUIN-IOU, JF. PARIS, J. DEROCHE, V. MARTEL, JP. GOURBAT, JP. BURLATON.

#### HIA Percy 92141 Clamart Cedex France

The Brugada Syndrom (BS) associates electrocardiogram (EKG) abnormalities, family history and a personal risk of sudden death by severe ventricular arrythmia. The aim of this study was to determine the prevalence of the typical BS-type EKG among an aeronautical population, to clarify their clinical characteristics and to assess the aeromedical implications.

**METHODS:** From 10/01/00 to 09/30/01, 16988 EKG were realized in 14140 subjects [male 79%, mean age (ma): 34,7 (17-70)] who undergone periodic examination in the same aeromedical center (CPEMPN). This population includes civilian and military aircrew members (AM), air traffic controllers (ATC) and flight attendants (FA). Medical history and previous EKG were collected. Typical BS-type EKG were defined as right bundle branch block (RBBB) with coved (C) ± saddle-back (S) ST segment elevation (>1 mm) in V1-V2-V3.

**RESULTS:** 12 subjects (0.08%) had atypical BS-type EKG (RBBB  $\pm$  isolated ST segment elevation £1mm). 7 subjects (0.05%) (ma: 37.3  $\pm$  4.2 years) had typical BS-type EKG (1 intermittent) confirmed by NA channel blockage testing (NCBT); none had personal or familial history of syncope or sudden death; none had underlying cardiopathy; typical BS-type EKG were found for 1-27 years; electrophysiological study (EP) was normal in 4 AM and 1 ATC (2 refusal from FA). None of typical BS-type EKG subjects had rythmic event during the follow-up.

**CONCLUSION:** Prevalence of subjects with typical BS-type EKG is very low in our aeronautical population. For BS subjects as defined in the ESC consensus report, an ICD has to be discussed and they cannot return to flying duty. For asymptomatical subjects, as ours, EP with programmed ventricular stimulation (PVS) has to be performed if the EKG is typical (type 1) and if it's positive an ICD has to be discussed. For all the other subjects, some questions remain (NCBT ?, PVS ?...) but they basically have to be watched under medical supervision before they return to flying duty (with or without a waiver).

#### PANEL 18. LONG QT INTERVAL IN AIRCREW

JOY M.

#### **AIR SPORTS MEDICINE PANEL**

#### PANEL 19. INTRODUCTION TO AIR SPORTS MEDICINE

#### P ORTIZ

According to the Federation Aeronautique Internationale (FAI) data, fatal accidents ratios in air sports range from 0/1000 federated in aeromodelling to 53 / 1000 in rotorwing. This is a matter of great concern for airsports pilots and their families, airsports governing bodies and doctors involved in airsports. We believe that safety concerns may even be a limitating factor in the development of these sports.

As in the other air activities, the central role of the human factor in the airsports safety has been widely recognised. The specific data of the different air sports (Aeromodelling, Hang-gliding, Paragliding, Amateur building, Balloon, Parachuting, Private pilots -fixed wing / rotor wing-, Microlights, Soaring and Aerobatics), will be exposed.

The pilot's health status may have a great influence on its performance and behaviour and is recognised as one of the basic elements in the human factors models. Different sports pilots medical examination systems exist nowadays, but it is very doubtful that the may have an influence in preventing fatal accidents or chronic incapacitation.

In the commercial transport world, safety procedures systems are very efficient and one of the corner stones of the entire industry; What can be learned from these systems, acceptable for the Air Sports Community (considering its sociogical, pshychological and economical peculiarities)?

A very active approach is needed, that includes developping the role of the aeroclubs (improved training, safety seminars), an aviation medicine trained doctors "insider" work (teaching and counselling), the establishment of less risky competition systems and the design of safer sports aircrafts. We look also for a greater involvement of the academic world, hence our presence in this forum.

# PANEL 20. THE IMPLEMENTATION OF THE UK NATIONAL PRIVATE PILOT'S LICENCE

#### DR S JANVRIN, UK CIVIL AVIATION AUTHORITY

The UK National Private Pilot's Licence (NPPL) was launched at the end of July 2002. Since then 750 licences have been issued. The licence allows Day/VFR flight in single engine piston aircraft up to 2000kg, microlight aircraft and self-launching motorgliders. The aim of the licence was to devolve this type of flying from the JAA regulatory system to the Air Sports organisations, because it was felt that the former was inappropriate for much recreational private flying. Medically this involved a move away from the ICAO medical examiner system to a Declaration of Health by the pilot, countersigned by the pilot's medical practitioner who has access to the medical history. The Declaration and countersignature state that there is no history of disease which would prevent the pilot holding either a professional or a private driving licence. If the pilot meets the professional driving standards, passengers can be flown. However, if only the private driving standards are met, solo flight or flight with a safety pilot only are allowed. The majority of the applications for the single engine piston NPPL have been from pilots who have previously failed the JAR medical examination. A small number of pilots who have never been able to fly (such as insulin dependent diabetics) have started training. However, the majority of student pilots in the UK still seem to be following the JAR route. Although the numbers of licences are small, there has been no accident involving a holder of a NPPL.

# PANEL 21. EXPERIENCE OF THE BRITISH GLIDING ASSOCIATION

#### DR PETER SAUNDBY

1. Experience of the British Gliding Association: The presentation describes the development of a medical declaration system following a double fatality due to undeclared epilepsy in a instructor. The concept that the pilot and not a certifying doctor should be responsible for fitness, but that this needs education, validation and provision for medical advice to less fit individuals. The use of driving licence standards led to potential problems with diabetes and the management of psychiatric illness. The assessment of disabled pilots by instructors. Validation of medical screening by external analysis of accidents.

2. Development of the UK National PPL. A new analysis of medical fitness requirements for recreational pilots, with a review of incapacity events caused by medical factors. The question of how fitness standards can be assured and the cost effectiveness of these methods. Prevention of incapacity from common diseases. The development of documentation. The value of pilot declarations and the management of difficult illnesses.

# PANEL 22. THE EFFECTS OF NEGATIVE TO POSITIVE GZ IN AEROBATIC FLIGHT

#### GW MCCARTHY MD, DAVMED

#### INTRODUCTION

Aerobatic and fighter pilots observe, and recent centrifuge studies confirm, that  $+G_Z$  tolerance is reduced following  $-G_Z$  exposure. Studies of military aviation accidents have identified this phenomenon, also called the "push-pull" effect, as a cause of GLOC accidents. It is possible that aerobatic pilots are at risk of GLOC because of push-pull effects.

#### METHODS:

The current state of knowledge of the decrement in +  $G_Z$  tolerance that is caused by a preceding exposure to -  $G_Z$  will be reviewed. The time course of decreased +  $G_Z$  tolerance will be compared to typical competition aerobatic G exposure profiles.

#### RESULTS:

A risk curve for G exposures during aerobatic competition will be derived and illustrated. Safe limits of amplitude and duration of negative and positive  $G_{Z'}$  and the probable effects of repeated exposures, will be shown.

#### PANEL 23. HUMAN FACTOR TRENDS IN GLIDER ACCI-DENTS IN JAPAN

K. SHIMADA

Japan Soaring Club, Tokyo, Japan

#### INTRODUCTION:

Most of the glider cross-country flight hours flown in Japan, as well as those in Europe, are logged by composite-construction machines. Gliders are also equipped with FAI-approved GPS flight recorders, which also are able to graphically indicate current position for navigation. Another aspect of change in sport soaring is that modern high performance motorgliders with retractable engine are heavily used in challenging flights such as record attempts. Current Japanese zigzag distance record is 1,038km in 8 hours, cruising at 20,000 ft in mountain lee waves (World Record made in Argentina is 3,008km.) Use of motor and GPS forced revision of FAI rules. You can choose distant start point and use turn points covered with low?clouds.

These changes in flight technology have enhanced sports aspects of soaring. However, engine retraction/extension, GPS/chart navigation to avoid prohibited area, oxygen use, transponder, battery management, and ATC communication with high-altitude centers made the already burdensome cockpit load even higher. We see new types of glider accidents in Japan, in which new technology should be examined as contributing factor. In addition, margin for control error in ultra-high performance open class gliders are slim, as well described in NTSB N807BB accident investigation report. How to construct training system for these machines deserves consideration.

#### CASES:

1) In-flight fatal breakup of JA2402 retractable engine motorglider cruising in mountain wave in VMC attracted attention as unusual. Cause of accident was not clarified. 2) Hull damage, in which carrying over maintenance of automatic engine extension control was pointed out as possibly contributing. 3)4) Hard landings by highwing loading motorgliders; one case was taking-over too late. 5) Partial check list redo case.

#### CONCLUSION:

Because soaring operation employs many new components compare to that in the past, human factor and medical considerations should be stressed at training and accident investigation.

#### HUMAN FACTORS

# (1) THE WORKLOAD-TECHNOLOGY PARADOX: HUMAN FACTORS IN THE MODERN AUTOMATED COCKPIT

CDR DR. A.H. BELLENKES, MSC, US NAVY

Naval Postgraduate School, School of Aviation Safety, Monterey, California USA

#### ABSTRACT:

The use of automated flight control and systems management in modern civil and military aircraft is encouraged as a means of reducing aircrew workloads, and in turn fostering improved resource management, maximum situation awareness, and reduction of human error. However, in some cases, automation has yielded unexpected and paradoxical effects on aircrew flight performance. Cockpit crews of highly automated aircraft have switched their primary role from that of proactive aircraft 'operators' to reactive systems 'monitors'. This has altered the dynamics inherent in the cockpit crew's information processing requirements. It has been observed that increased monitoring by crews may result in more rather than less "head-down" time in cockpits. In certain cases, employing highly automated systems may also induce complacency and dependency. This may, in turn, lead to decreased and/or lost situation awareness, erosion of some flying skills, and may introduce new forms of human error unique to the automated environment. This presentation will first discuss the nature and scope of cockpit automation as it exists in current and planned aircraft. This will be followed by a description of the workload-technology paradox and some of its ramifications on cockpit crew information processing and performance, especially that manifested as changes in the nature of "cockpit crewsystem error". Several automation-related aviation mishaps will be reviewed to illustrate the relationship between automated flightdecks and error. Finally, potential interventions for reducing human factors-related error in highly automated cockpit systems will be reviewed.

#### (2) PERSONALITY INFLUENCES ON WORK PERFORMANCE IN A SPACE ANALOG ENVIRONMENT

G.R. LEON, M.M. ATLIS, AND D. ONES

University of Minnesota, Minneapolis, Minnesota, USA

#### INTRODUCTION:

Crew selection for long-duration space missions requires an optimal combination of individuals based on personality characteristics, group compatibility, and work performance. This investigation assessed the functioning over an 8 month period of a three couple scientific/educational team that was ice locked on a small boat in the High Arctic during a major portion of the expedition.

#### METHODS:

Personality measures were administered prior to departure; rating forms assessing personal, interpersonal, and work performance factors were completed weekly during the expedition; debriefing interviews were conducted on-site at the end of the polar stay.

#### **RESULTS:**

Team members were generally well adjusted, scoring relatively higher on well-being and achievement orientation, and relatively lower on stress reactivity. The personality trait of absorption, particularly manifested in fascination with the environment, was evident in all team members and appears highly adaptive in coping with both arduous and monotonous expedition periods. Correlations between emotional stability and others' ratings of an individual's work performance were as follows: consideration (r=+.80); morale (r=+.73); monitoring performance (r=+.71). Conscientiousness was associated with ratings by other team members: motivation and effort (r=+.49); task orientation (r=+.44). Individual differences on negative emotionality and constraint were related to specific interaction patterns at times of stress; stressors centered primarily on disagreements about task strategies and responsibilities. Reported negative events were most frequent at the beginning of the Arctic stay and toward the end of the darkness interval; in both of these periods, there was an increased number of task demands. A predominant method of coping with stress was seeking emotional support from one's partner.

#### CONCLUSIONS:

Personality traits of absorption, low negative emotionality, emotional stability, and conscientiousness appear highly adaptive in enhancing work performance and positive group interactions during longduration expeditions.

#### (3) AIR TRAFFIC CONTROLLERS – SHIFTWORK, FATIGUE, STRESS AND WELL-BEING

DJ SCHROEDER, T NESTHUS, C CRUZ, B BOQUET, AND D THOMPSON

Civil Aerospace Medical Institute, Federal Aviation Administration

The 24-7 nature of operations in the aviation, aerospace, and transportation industries requires many employees to work rotating shift schedules. A number of questions have been raised regarding the potential impacts of shiftwork on employee health, well-being, and performance. This study investigated the relationship between individual differences, occupational stress, and well-being in U.S. air traffic controllers. Comparisons were made between two groups of controllers and a normative work group.

#### METHOD.

The Standard Shiftwork Index (SSI) was adapted for the air traffic control workforce. A single item with a 5 point Likert rating scale measured work stress: "In general, how stressed do you feel at work?" The 24-page, questionnaire contained 161 items and required around 50 minutes to complete.

#### RESULTS.

Comparisons were made with two groups of controllers, Certified Professional Controllers (CPCs) who were actively involved in the control of air traffic and Flight Service Station specialists (FSSs), whose primary duties involved the provision of weather and other advisory information to pilots. The respondents for both groups (CPC = 3,839) and (FSS = 874) were predominately male (84.7% and 80.7%, respectively). FSSs were slightly older. Overall, responses to the single-item measure of occupational stress were similar to those of the national sample, with 20% CPCs and 16% FSSs reporting that they felt "quite a bit" to "extremely" stressed at work compared with 22% in the 1999 U.S. national sample. Controllers reported lower levels of somatic anxiety and neuroticism and had a higher level of overall job satisfaction than the SSI normative group.

#### DISCUSSION.

Consistent with research in the late 1970s, CPCs and FSSs reported levels of occupational stress that were comparable to that of individuals in other occupations. While the responses of CPCs and FSSs were similar on many of the dimensions, FSSs reported lower levels of job satisfaction and chronic fatigue.

#### (4) AVIATION SAFETY FOR PATIENT SAFETY.

#### GW MCCARTHY, MD, DAVMED.

Wright State University School of Medicine, Dayton, Ohio, USA.

#### INTRODUCTION:

Commercial aviation is described as a highly regulated, ultra-safe industry, in which accidents occur at a rate of  $10^{\circ}$  or  $6\sigma$ . Most areas of medicine are far less safe, with fatal errors at rates of 2-4 $\sigma$ . Health-care agencies have looked to high reliability industries for techniques to increase patient safety.

#### METHODS:

The techniques of enhancing safety in high reliability industries include anonymous reporting systems, regulations and procedures, error resistant design, mechanization of tasks for reliability, use of checklists, direct supervision, and strong leadership emphasis on error detection and correction. Team dynamics are also optimized in aviation via Crew Resource Management (CRM) training. The deployment of these system designs in hospitals is minimal and will be described.

#### **RESULTS:**

Adverse drug events are a principle risk for inpatients. Requiring use of Computer Physician Order Entry (CPOE) can reduce medication errors by at least 50%. Addition of bar-code medication administration (BCMA) further reduces the error rate. Currently, only 5-10% of hospitals in the USA have computerized medication ordering systems or bar-code administration systems. CRM training is known, but rare in hospitals. Use of checklists and supervision is minimal. Government emphasis on patient safety in the US and UK is increasing. Examples of these systems and their effects will be cited.

#### CONCLUSIONS:

Major healthcare organizations have begun deployment of all these methods, but penetration into medical culture is minimal. Improvement in medical outcomes from these techniques has rarely been documented. Patients do not now benefit from aviation safety methods.

### **PSYCHIATRY**

#### (5) FEAR OF FLYING IN SPANISH AIRCREWS. EPIDEMIOLOGICAL ASPECTS AND COMORBIDITY.

J. MEDIALDEA CRUZ AND F. RIOS TEJADA.

C.I.M.A. Arturo Soria 82. 28027 Madrid. Spain

#### INTRODUCTION

Fear of flying may affect aircrews in any step of their flying career. Several symtoms related to cognitive funtions, mood and behavioral response to a flight operation may lead a pilot to seek a medical counselling. It is beyond voluntary control and invariably lead to avoidance of the feared situation.

#### MATERIAL AND METHODS

We have reviewed 150 cases out of our 1101 psychiatric files during the period of 1985-2002. Data collection endosed assessment of fear evoking situations associated to their flight stress history, type of aircraft, class of cockpit job, aircraft accident, past medical history, age range and psychatric comorbidity.

#### RESULTS

Two groups of subjects were compared: pilots (22 airplane pilots and 34 helicopter pilots) and aircrewmembers (19 airplane mechanical engineers, 36 helicopter mechanical engineers, and other aircrewmembers- 32 cabin crew- and 7 paratroopers). Results depicted 143 (95,3%) cases of flight phobia behaviour and 7 cases (4,7%) of anxiety to jump. Flight phobia was more frecuent in cockpit aircrews (62,6%) than in pilots (37,4%). Aircrafts accidents history was

registred in 25,4% of the sample, and it was observed more frecuently in helicopter cabin aircrewmembers than in airplane ones(p<0,05). Psychiatric comorbidity is estimated to occur in 54%. Comorbidity was found in 22% of the cases and related to affective disorders and more common among airplane cabin crewmembres). Comorbidity related to anxiety disorders was found in 19,2% and more common among helicopter cabin aircrewmembers.

#### CONCLUSIONS

Flight phobia is a concept in which a wide spectrum of clinical features might lead a pilot/aircrew to refuse flying. Comorbidity is more frecuent among civil cabin members than military ones. Comorbidity were more common among age range from 30 to 58 years (p<0,01). Finally, close psychiatric evaluation and follow up is neccesary to adequate comorbidity diagnosis and set appropriate medical treatment.

#### (6) ACUTE STRESS DISORDER AND POSTTRAUMATIC STRESS DISORDER IN FLIGHT ATTENDANTS

M.KADOKURA, N.MATSUNAGA, H.OKOSHI, Y.HIJIKATA, Y. OKA-WA, N.MAKI, H.MIYAZAKI, Y.NOGUCHI, M.KAJI, I.ASUKATA

Medical Services Japan Airlines, Tokyo, Japan

#### INTRODUCTION:

In the last few years, the recognition of acute stress disorder (ASD) and posttraumatic stress disorder (PTSD) as a clinical category has gained rapid acceptance in Japan. Unfortunately, flight attendants tend to experience traumatic events such as aircraft accidents, violent turbulence and acts of violence by passengers in their workplaces.

#### METHODS:

We have examined the appearance of ASD and PTSD in 8 flight attendants who experienced traumatic events related to their job. They were diagnosed with DSM-IV criteria of American Psychiatric Association. We also administered the Japanese-Ianguage version of the Impact of Event Scale-Revised (IES-R-J) for evaluating traumatic stress responses. Company psychiatrists did follow up treatments for reinstatement.

#### **RESULTS:**

Two flight attendants met the criteria for PTSD, 4 met them for ASD. Two met no criteria, but they showed some ASD symptoms. All of their score of IES-R-J were improved after our treatment.

#### DISCUSSION:

Flight attendants who experienced traumatic events related to their job are at risk of developing psychiatric symptoms associated with ASD and PTSD. But Japanese people tend to be prejudiced against the field of psychiatry. Even if they suffered from ASD or PTSD, they would be reluctant to see psychiatrists personally. Public and private resources will be necessary for the treatment of ASD and PTSD. But we believe company own resources are essential to provide early and systematic mental health interventions that have the potential for decreasing symptoms. There are two full-time psychiatrists, 6 part-time psychiatrists and 4 full-time psychologists in Medical Services of Japan Airlines. Company mental health professionals are ready to provide clinical interventions immediately. Further studies are needed to evaluate the benefits of clinical interventions.

#### (7) MANAGING AEROMEDICAL RISK IN AVIATORS USING SEROTONIN REUPTAKE INHIBITORS (SRIS)

#### R.R. IRELAND

Usaf School of Aerospace Medicine, Brooks City-Base, Texas, USA

#### INTRODUCTION:

SRIs are widely used to treat a variety of both medical and psychiatric conditions. Maintenance use of SRIs can reduce the significant

recurrence rate of major depression by 75%, enhancing flight safety in recovered aviators. While not sharing the cardiotoxic and marked sedative effects of tricyclic antidepressants, SRIs can produce both acute and chronic effects potentially interfering with flight safety. Authorizing aviators to use SRIs while on flying status enables aeromedical assessment and management of these effects.

#### **METHODS:**

The etiology and clinical course of these SRI adverse effects are reviewed and corresponding suggestions for their aeromedical management presented.

#### **RESULTS**:

SRI adverse drug effects can usually be managed in aviators. As with all aeromedical certification procedures, success of such programs depends upon the careful selection, informed cooperation and integrity of the aircrew members involved.

#### CONCLUSION:

Establishing protocols and studies for SRI use in aviators, as done in Canada and Australia, may result in the knowledge and clinical database necessary to safely recommend such use, especially to reduce the incidence of recurrent depression in previously treated aviators.

#### (8) AEROMEDICAL WAIVER CRITERIA FOR PILOTS TAKING SEROTONIN REUPTAKE INHIBITORS (SRIs): HAS THE TIME COME?

#### D.R. JONES, R.R. IRELAND

Consultant in Aerospace Psychiatry, Montgomery, Alabama, USA, and Usaf School of Aerospace Medicine, Brooks city-Base, Texas, USA

#### BACKGROUND:

Most aeromedical certifying authorities do not allow depressed pilots to fly, with or without medications. Recent psychiatric protocols recommending prolonged use of SRIs for treatment or postdepression prophylaxis have created a cohort of asymptomatic pilots for whom long-term SRI therapy is clinically necessary. Regulations usually bar such pilots from cockpit duties, although Canada and Australia now grant waivers in carefully selected cases.

#### **OBSERVATIONS:**

U.S. data show that such pilots frequently choose to fly without notifying aeromedical authorities of their clinical history or circumstances. Historically, aeromedical authorities have reduced regulatory prohibitions when medical progress validates that such actions are safe (e.g., contact lenses, many cardiac conditions, diabetes). Aeromedically significant data accumulated over the past five years show that carefully selected and followed pilots may return to cockpit duties while on long-term SRI therapy. Granting such waivers, accumulating clinical, aeromedical and administrative information and publishing the results will give the international aeromedical community a broader data base and more refined waiver waivers, as in the past.

#### **RECOMMENDATION:**

Aeromedical certifying authorities around the world should evaluate current treatment of depressive disorders with SRIs in their populations, and consider developing protocols to allow waivers in selected circumstances. The authors will present a model protocol.

### TRAVEL

#### (9) SANTE DES PASSAGERS

R. AUFFRET

Président du Conseil Médical de l'Aéronautique Civile, Paris - France

Cette communication est présentée, au nom de la Conférence Européenne de l'Aviation Civile (CEAC) pour résumer les travaux entrepris par cette organisation européenne intergouvernementale qui réunit aujourd'hui 41 pays européens sous les auspices de l'OACI.

La CEAC a organisé un Symposium à DUBROVNIK (24-25 octobre 2002) consacré au problème concernant la SANTE DES PASSAGERS qui a constaté l'abondance des travaux réalisés et l'absence d'harmonisation des pratiques.

Devant ce constat, les Directeurs Généraux de l'Aviation civile européenne ont décidé la création d'un groupe de travail CEAC sur les questions de Santé du passager aérien avec mandat de:

1) Développer et diffuser la connaissance et la compréhension des incidents médicaux affectant le passager.

2) Harmoniser la fourniture de services au passager.

3) Examiner les aspects juridiques concernant la Santé du passager.

4) Encourager le développement de sources d'information améliorées pour les passagers.

Ce groupe de travail (APHI), lors de sa première réunion à VIENNE le 19 mars 2003 a regroupé 22 pays CEAC et divers observateurs internationaux, l'Union Européenne, l'OACI, la FAA, l'IATA, l'Aerospace Medical Association, l'AECMA, le BRE.

Le programme de travail et le calendrier futur seront développés dans cette communication.

### (10) GUIDELINES FOR INFLIGHT MEDICAL CARE

R.B. RAYMAN\*, M.D., D. ZANICK\*\*, M.D., T. KORSGARD\*\*\*

\* Aerospace Medical Association, Alexandria VA (USA). \*\* Northwest Airlines, Minneapolis MN (USA). \*\*\* United Airlines, Manassa VA (USA)

With the anticipated growth of air travel in the coming years, inflight illness or injury is expected to increase as well. This is particularly compelling because more elderly people and people with preexisting disease are taking to the air. Although an aircraft inflight is not a very good place to treat a passenger, it sometimes becomes necessary. This paper describes those inflight resources available to a physician who is called upon to render medical care.

Resources that will be briefly described include emergency medical kits, automatic external defibrillators, oxygen, ground medical consultants, and telemedicine modalities. The role of the flight attendant will be particularly emphasized.

In addition, the difficulties encountered in examining a passenger will be described including isolation, if necessary, of a passenger with a significant contagious illness. Other topics include do-notresuscitate (DNR) orders, death inflight, and physician liability. The implications of diversion will be discussed.

The material is pragmatic providing the physician with useful information regarding the resources available to render reasonable medical care inflight.

#### (11) SARS: ENSURING PASSENGER AND AIRCREW SAFETY

#### M K LIM

National University of Singapore. Singapore

As of 10 June, the WHO has reported 8,430 probable Severe Acute Respiratory Syndrome (SARS) cases and 789 deaths worldwide. The novel coronavirus (SARS-CoV) responsible for SARS is transmitted primarily through droplet infection but can also be spread by contact with surfaces like armrests and tray tables. Since it surfaced in Southern China in November 2002, the deadly virus has traveled to more than 30 countries on modern jet planes.

A Singapore Airlines flight stewardess on board a March 14 flight between New York and Frankfurt, Germany, on which a Singapore

doctor was incubating the virus, was the first documented case of inflight, occupationally related transmission of the disease. In-flight, passenger-to-passenger transmission was also implicated when a cluster of thirteen passengers became infected during a Hong Kongto-Beijing Air China flight on March 15. A 73-year old passenger was believed to be the source.

Tightened screening measures taken by airlines and airports, including the use of high-tech thermal scanners, have no doubt lessened the risk of catching SARS on board aircraft. But panic-stricken passengers staying home have dashed hopes of early recovery of the ailing airline industry. Meanwhile, anxious aircrew have been on edge. The US Association of Flight Attendants has petitioned the Federal Aviation Administration to issue an emergency order requiring airlines to offer gloves and surgical masks to airline attendants, or at least allow them to bring their own.

SARS is both an occupational and public health concern which the airline industry cannot simply wish away. Educational efforts aimed at communicating the facts and dispelling the myths, backed by sensible and reassuring preventive measures, are needed. The psychosocial dimensions must also be managed. The safety and psychological well being of passengers and aircrew must be ensured.

#### (12) EPIDEMIOLOGICAL STUDY OF FREQUENCIES AND PATTERN OF SICKNESS AMONG AIR TRAVELLERS PASSING THROUGH DELHI AIRPORT

#### DR. B. K. SINGH, MD,

Diplomate of National Board, SMO, IGI Airport, New Delhi, INDIA

Air travel has been responsible rapid emergence of new disease Severe Acute Respiratory Syndrome (SARS) to 26 countries, leading to infecting more than 8000 persons and death of 1500 people. As per rough calculation of health economics, it has resulted in to economic loss of 300 billion dollars so far till 28 May 2003. Mainly it is because of mutually dependant economy, world has become a global village and Asia is now biggest supplier of human resources and air travel is fastest and safest mode of travel. Therefore, there is increase in air traffic in Asia. Therefore, focus on health pattern of air travelers needs attention. For the first time a longitudinal study had been conducted at Delhi airport from India with effect from 01stJuly 2000 to 30thJune 2001 to learn morbidity and mortality pattern of sickness among air travelers passing through Delhi airport. Variables for this study are types of sickness, location of patient during air travel, disposal of cases, deaths at airport, non-scheduled landings due to medical reasons. It has been found that there were 8951869 passengers (9 millions) passed through Delhi Airport. There were 1814 sick passengers on international as well as domestic sectors. There had been one sick passenger per 4900 normal passengers while one passenger per 11,000 normal passengers on board call. General sickness rate is two per ten thousand passengers. There were four out of ten sick travellers from departure while three out of ten were from arrival and on board each. Among the pattern of diseases one forth of cases were from Gastro intestinal diseases formed and one fifth pertained to Cardio-vascular system. Most of traveller's diarrhea cases were from departing passengers colloquively known as Delhi-Belly. Clinically a few cases were suspected to be having infectious disease like Chicken pox, Measles, Mumps and communicable disease like Malaria. Among disposal of cases 62% of reported sick travelers were facilitated for continuation of their flight schedule, 24% cases were referred to hospital while 14% cases were off loaded before boarding flight. There was one death per three million normal air passengers. There were three flight diversions during period of study leading to figure of one flight diversion per 27000 aircraft movement. Maximum numbers of sick air travelers 33% were in 51 to 60 years age group where as 14% cases were more than 65 years of age signifying more number of geriatric travelers. Other areas for further work are to find determinants of travelers diarrhea, identifying infectious passengers particularly in incubation period, scope of telemedicine for air travelers and study of variables of flight diversions in developing countries.

# (13) ULTRA LONG RANGE (ULR) FLIGHTS:- A CONSULTATIVE AND SCIENTIFIC APPROACH.

#### J. SINGH

Chairman, Civil Aviation Medical Board, Civil Aviation Authority of Singapore

#### INTRODUCTION:

Current regulations in Singapore, as in most other countries, allow for flights with augmented flight crew, of up to 18 hours flight duty period (FDP). Singapore Airlines (SIA) made an application to the Civil Aviation Authority of Singapore (CAAS) to mount non stop flights to Los Angeles using the A340-500 aircraft, the FDP of which would exceed the stipulated 18 hours. Methods: The CAAS formed a tripartite ULR task force to look at the issue. Made up of members from the pilots' association, SIA and CAAS, the task force made use of current available scientific methodology to examine the issue. Using the expertise of the European Committee for Aircrew Scheduling and Safety (ECASS), projections for the in- flight alertness levels for the ULR flights were determined based on current long haul flights. These were then validated with data from SIA's operations to the West Coast USA and to London.

#### CONCLUSIONS:

The tripartite task force made recommendations to the CAAS based on these studies and provisional rules have been drawn up to enable SIA to mount the ULR flights between the city pair Singapore and Los Angeles. When the ULR flights commence, these will be monitored to ensure that the projections made are valid.

# (14) CIRCADIAN CARDIAC RHYTHM PATTERN AND MENTAL HEALTH

C M PENG, W L TAN, JOHN WONG

Singapore

#### INTRODUCTION

Research since 1991 by Prof Hans Stampfer of Western Australia has shown that circadian cardiac rate pattern dysregulation has positive correlation with abnormal mental health status. To investigate this claim a study was carried out in a Psychological Medicine Inpatient Centre in Singapore from July to November 2002.

#### METHODS

Patients at the Psychological Medicine Inpatient Centre were evaluated using a proprietary 'Heart Link' Monitor that measures circadian cardiac rhythm over 24 hrs. Serial measurements were made before treatment, on weekly schedules as in-patient until discharge, and continued as outpatients for further changes. These circadian cardiac rhythms data collected in Singapore were then downloaded and transmitted electronically to the evaluation base station in Western Australia for comments and diagnoses. No clinical information of patients was given whatsoever. The diagnosis made based on interpretation of these circadian cardiac rhythm data were then compared with the diagnosis made by a Consultant Psychiatrist by the normal Psychiatric evaluation which was done before initiation of cardiac monitoring. The diagnosis were classified into 3 main subgroups of Psychotic, Anxiety, Mood Disorders, and compared for correlation. Patients with any form of existing cardiac disease were excluded from study.

#### RESULTS

51 patients were evaluated with a 62.7% clinical diagnosis correlation observed. Anxiety related disorders had the highest correlation of 86.4%. Concurrence with 23 main groups of diagnosis that did not fall within the broader classification were also positive. Of significance, clinical recovery was noted for 4 patients following revision of therapy based on feedback obtained from circadian cardiac dysregulation interpretation.

#### CONCLUSION

Hitherto mental health assessment generally lacks an objective measure such as what EKG is to cardiology, or EEG & EMG is to neurology. Aviator mental health assessment in particular remains fraught with much controversy with regards its usefulness in aviator selection, and aviator licensing medical examination. There is only consensus in frank neuropsychiatric manifestations. However if this circadian cardiac monitoring can help define more subtle psychiatric and mood disorders, it may hold promise for application in Aerospace Medicine as an adjunctive tool of mental health status determination.

#### (15) CYCLE VEILLE-SOMMEIL ET VOL DE LONGUE DUREE: GESTION PHYSIOLOGIQUE ET PHARMACOLOGIQUE

M. BEAUMONT, O. COSTE, D. BATEJAT, P. VAN BEERS, G. POYOT, C. PIERARD

Institut de Médecine Aérospatiale du Service de Santé des Armées (IMASSA), BP 73, F-91223 Brétigny-sur-Orge Cedex, France

Le concept opérationnel actuel réside dans la réalisation d'opérations continues qui peuvent durer quatre à six jours tout en ne laissant que de rares et courtes opportunités pour dormir n'importe quand dans le nycthémère. De telles opérations nécessitent un bon niveau de performance et de vigilance la nuit, ainsi qu'un sommeil de bonne qualité pendant les courtes périodes de repos précédant la mission. De plus, certaines opérations peuvent inclure un vol transméridien responsable d'un syndrome de décalage horaire. Il en résulte des troubles du sommeil, une diminution de la performance et une somnolence diurne qui augmentent le risque d'accident ou d'échec de la mission. La gestion du cycle veille-sommeil des équipages prend alors toute son importance, notamment lorsque la rotation des personnels est impossible. On peut proposer des mesures ergonomiques portant sur la charge de travail ou la rotation des personnels, ou des mesures physiologiques comme l'observation de courtes périodes de sommeil dès que possible. Quand ces mesures ne peuvent pas être réalisées pour des raisons opérationnelles, une aide pharmacologique légère caractérisée par une bonne efficacité, une bonne innocuité et une administration facile, est envisageable. On peut induire le sommeil avant le vol par un hypnotique de courte durée d'action (zolpidem ou zaleplon, dosés à 10 mg), maintenir la performance cognitive, la capacité attentionnelle et la vigilance la nuit par la prise d'un psychostimulant (modafinil, dosé à 200 mg ou caféine à libération prolongée dosée à 300 mg), ou encore limiter la durée du syndrome du décalage horaire par la prise de mélatonine, dosée à 5 mg. La combinaison d'un hypnotique pour améliorer la qualité du sommeil récupérateur entre deux missions et d'un psychostimulant la nuit est également envisageable. Cet exposé décrit les différentes modalités physiologiques et pharmacologiques proposables aux équipages militaires Français, impliqués dans des opérations continues.

#### (16) «PNEUMONIE ATYPIQUE ET POURSUITE DE L'ACTIVITE AERIENNE D'AIR FRANCE EN ZONES D'EPIDEMIE: UNE EQUATION DIFFICILE»

M.C. LEBUISSON – M.C. BOUTON – M. CANTEGRIL – G. DES-MARIS – N. KAUFMAN – S. MEFFRE-STEVENS – C. MONCLUS –

#### M. ROYER – B. VARENNE – J.F. VAUCOULEUR – C. MOUSSU

Service Médical du Travail du Personnel Navigant Air France.

La pneumopathie atypique ou SRAS, d'abord apparue dans le sud de la Chine en novembre 2002, affecte dès le début du mois de mars divers pays desservis par la Compagnie Air France.

Des mesures ont été immédiatement instaurées dans un contexte de pression médiatique forte et d'inquiétude légitime:

- Ouverture d'une cellule de crise.
- Création d'un Comité Scientifique composé de médecins hospitaliers référents en matière du SRAS.
- Mise à disposition des personnels d'un « Numéro Vert » pour information médicale.

- Présence d'un médecin du travail au « briefing » des vols vers les zones sensibles.

- Mise en place d'une procédure en cas de suspicion de SRAS à bord.

- Dotation de masques aux équipages et également aux personnels aéroportuaires, du fret et de maintenance.

- Informations actualisées et renouvelées.

Grâce à la participation de tous, à la transparence des informations sur l'évolution de l'épidémie, à la rigueur des procédures, l'exploitation aérienne a pu être maintenue.

#### **AIRCREW HEALTH**

#### (17) A HEALTH, ENVIRONMENT AND SAFETY (HES) SYSTEM FOR MILITARY FLIGHT OPERATIONS – AN OVERVIEW OF THE RNOAF EXPERIENCE.

A.S. WAGSTAFF, MD PHD DAVMED AND V.M. FONNE, MPSYCH,

RNoAF Institute of Aviation Medicine, Oslo, Norway

#### INTRODUCTION:

The RNoAF introduced a new system for management of occupational health and human factors in 1996 – operational health, enviroment and safety (HES). The ideas and initial lessons from this introduction were discussed at the ICASM congresses in 1996, 1997 and 1998. The object of this paper is to summarise and report results of this work 7 years after implementation, and identify key success factors and problems encountered.

#### METHODS:

The starting years were used to inform and develop relations with key personell in the RNoAF. Interdisciplinary team work and frequent visits to air stations, including flight activity, as well as frequent regular reporting have been important aspects of this work. Pilots and other crew member categories have actively participated to ensure operational relevance.

#### **RESULTS:**

Around 90 different projects regarding improvements in the working environment have been run. The projects vary in size and complexity. There was an even distribution among the 4 areas of concern: ergonomics, environmental, survival and organisational issues. Fighter and Search and Rescue operations accounted for around 50% of the workload. Aquisition projects and international operations have produced more activity than expected. Acceptance rates from management on improvement reports was around 80%, actual implementation rates being closer to 50%. Validation on effects on health and flight safety needs to be sharpened. A much improved RNoAF safety record in the last 6 years can not neccessarily be attributed to the implementation of the HES system but these changes may
have common denominators in resent years' focus on quality control.

# CONCLUSIONS:

A 7 year wrap-up of HES activity shows substantial workplace changes and high managament acceptance rates. However, actual implementation of HES matters does not match the high acceptance rate, and validation of success critera needs sharpening. Improved safety records do not neccessarily imply causality although common denominators may be found in an increased quality control culture.

# (18) COCKPIT ENVIRONMENTAL CANCER RISKS IN COMMERCIAL PILOTS – FACT OR FICTION

# R. L. SMITH M.D.

University Hospital/Northwest Hospital, Seattle, Washington, USA Air National Guard – Senior Flight Surgeon (Ret.) USA Federal Aviation Administration – Aviation Medical Examiner (Ret) USA Assistant Clinical Professor University of Washington School of Medicine USA

# INTRODUCTION: OBJECTIVES

To evaluate the risks for the pilots in commercial aviation of developing cancer secondary to the cockpit environment involving ionizing and non ionizing radiation and environmental hydrocarbons from jet fuel

#### METHODS:

Evaluation of the factors known to be oncogenic to man and correlate them to known exposure levels in the cockpit of the commercial aircraft of those factors. Comparison of the cancer rates in the flying and non flying cohorts and consider confounding factors in the cancer rates in the evaluation.

# **RESULTS:**

Non ionizing radiation exposure, i.e. electrical power wave lengths through ultra violet, does not cause electron shell level changes as in ionizing radiation, but may alter cellular response, disrupt nervous system cells, interfere with DNA synthesis, and stimulate neoplastic cell lines. Known cockpit levels of non ionizing radiation are within accepted safety standard levels of 10 mW/ cm2 and even in the long run should not increase cancer incidence of EMF (non ionizing) suspected induced cancers, i.e. brain and leukemia of the myeloid type.

Cosmic ionizing radiation is from neutrons, protons, and gamma rays. The radiation levels in the cockpit a re 9mSv per year in the worst case scenario of 950 work hours considering all parameters. This is well within the safe health industrial limits for radiation workers.

Hydrocarbon exposure, although the levels in the cockpit have not been measured, are undoubtedly increased in the cockpit environment. There has been no evidence that cancers associated with hydrocarbon exposure are increased in the pilot population.

Studies world wide are inconsistent re cancer rates of most types among pilots. The rates are within the general overall population rates. Leukemia may be the only aberration with its increased rate, but it may be on a multifactorial basis.

# CONCLUSIONS:

There is no evidence that cockpit exposure to non ionizing and ionizing radiation and hydrocarbons at the observed levels cause any real increased rates of cancer. The only caveat is that more work needs to be done on EMF exposure and that leukemia of the myeloid type might be increased but on a multifactorial basis. Melanoma rates are increased in some subsets of pilots but most likely is non cockpit UVB related.

# (19) RISK FACTORS FOR MALIGNANT MELANOMA AMONG AIRCREWS AND A RANDOM SAMPLE OF THE POPULATION

# V RAFNSSON<sup>1</sup> J HRAFNKELSSON<sup>2</sup> H TULINIUS<sup>3</sup> B SIGURGEIRS-SON<sup>4</sup> J H OLAFSSON<sup>4</sup>

<sup>9</sup> Department of Preventive Medicine, University of Iceland, Reykjavik, Iceland. <sup>20</sup> Department of Oncology, Landspitali-University Hospital, Reykjavik, Iceland. <sup>30</sup> Icelandic Cancer Registry, Reykjavik, Iceland. <sup>40</sup> Department of Dermatology, Landspitali-University Hospital, Reykjavik, Iceland

# INTRODUCTION:

Malignant melanoma is increased among commercial aircrew in several studies where the cohorts have been compared to the general population. Aircrews' occupational exposure of greatest concern has been cosmic radiation. The aircrews' leisure time exposure to UV radiation, a known risk factor for melanoma, has not yet been documented. The objectives of this study was to evaluate whether difference in the prevalence of risk factors for malignant melanoma in a random sample of the population and among pilots and cabin attendants may explain the increased incidence of malignant melanoma.

# METHODS:

A questionnaire was used to collect information on hair colour, eye colour, freckles, naevi, family history of skin cancer and naevi, skin type, history of sunburn, sunbed and sunscreen use and number of sunny vacations. Predictive values were calculated for evaluating possible confounding.

#### **RESULTS:**

The 239 pilots (males) and the 856 cabin attendants (female) were compared to 454 males and 1464 females of the same age drawn randomly from the general population. The difference in constitutional and behavioural risk factors for malignant melanoma between the aircrews and the population sample was not substantial. The aircrews had more often used sunscreen and had taken more sunny vacations than the other men and women, who on contrary had more often used sunbeds. The predictive values for example for the use of sunscreen were 0.88 for pilots and 0.85 for cabin attendants.

# CONCLUSION:

The prevalence's of risk factors for malignant melanoma were not substantially different between the aircrew and the population. Thus it is unlikely that the increased incidence of malignant melanoma of pilots and cabin attendants can be solely explained by excessive sun exposure. There is an urgent need to evaluate further the role of the exposure of aircrews and frequent flyers to cosmic radiation in relation to melanoma risk.

# (20) CERVICAL MOBILITY AND X-RAY MODIFICATIONS IN SPANISH FIGHTER PILOTS

CARBAYO HERENCIA J.A.\*, VELASCO DÍAZ C.\*\*, SÁNCHEZ NIEVAS L.\*\*\*, ABAD ORTIZ, L. \*\*\*\*

\* Major Flight Surgeon. Albacete AFB. \*\* Major Especialist in Aerospace Medicine. CIMA. Madrid. \*\*\* FEA Rheumatology. Complejo Hospitalario Albacete. \*\*\*\* Head of X-Ray Department. Clinica Recoletas. Albacete

# INTRODUCTION.

Back pain is a frequent symptom in fighter pilots. The main aim of this study is evaluate cervical mobility in fighter pilots and early modifications in the cervical segment of the spine, detected through simple radiology.

# METHODS.

This is a transversal, analytical and non-experimental study. 30 pilots and 16 military non-pilots, control group, assigned in Albacete AFB were studied. All of them were healthy males of similar age and anthropometric charachteristics. Physical exmination included flexion, extension, right and left shift and rotation, as well as posteroanterior and lateral simple X-ray.

Comparison between means was done by *t Student* for independent groups. When crteria of normality were not reached (*Shapiro Wilks test*) *U Mann.Whitney* test was used. *Squared Ji* was used to evaluate qualitative variables (*Pearson* test or *Fisher* test if the value of any expected frequency < 5). The level of maximum alfa error was stated as =/< 5 %.

# RESULTS.

Are shown in Tables to be presented.

# CONCLUSIONS.

Cervical mobility is lower in fighter pilots than in control group and significant radiological modifications were found more often. The highest prevalence ratio were found in a lost of vertebral height.

# (21) MAGNETIC RESONANCE IMAGING SCREENING OF LUMBAR AND CERVICAL SPINE IN 30 PILOTS

L CHAPNIK, E ATAR, N YOFFE, E BARNBOIM, Y SHERER, L GOLDSTEIN\*

Center of Aviation Medicine and Physiology, Israel Air Force, and \* Surgeon General, Israel Air Force

# INTRODUCTION:

The aim of this study was to compare magnetic resonance imaging (MRI) findings of the cervical and lumbar spine between different types of active pilots.

# METHODS:

MRI studies of the cervical and lumbar spine were conducted in 30 pilots including jet pilots, helicopter pilots and cargo pilots (10 subjects at each group). All had at least 10 year experience in flying, had no overt disease related to the spinal cord, and did not have any past medical history that could explain spinal cord injury. Their age ranged from 30 to 50.

# **RESULTS**:

No difference was found between groups in the overall rate of spinal injuries as detected by MRI scans. Eight jet pilots and cargo pilots, and 7 helicopter pilots had some degree of spinal injury. Surprisingly, prevalence of cervical injury was 80% among cargo pilots compared with only 44.4% or 50% in the 2 other groups. Regarding lumbar findings, 60% of all 3 pilot groups had some evidence of injury. The average number of lumbar injuries was 1.7, 2.3 and 3.3 in jet-, helicopter- and cargo-pilots, respectively, while it was 0.9, 1.3 and 1.8 in the cervical spine, respectively. A comparison between the severities of injuries between pilots disclosed no significant difference in distribution between different groups. Several injuries sites were found significantly more prevalent than others: those at levels C6-7, C5-6, and L4-5.

# CONCLUSION:

Spinal injuries as detected by MRI are frequent among aircrew members. Increased number of subjects is needed in order to determine significant differences in injury sites, prevalence and severity between different types of pilots.

# (22) AEROMEDICAL DISPOSITION OF AVIATORS WITH DIZZINESS

### D. SCHRAMM, H. O'NEILL

Civil Aviation Medicine. Transport Canada. Ottawa, Ontario. Canada

### INTRODUCTION

Dizziness is the most frequent otolaryngologic disorder requiring assessment by the Canadian Aviation Medical Review Board. Otologic causes of vertigo/disequilibrium include benign paroxysmal positional vertigo, Meniere's disease, vestibular neuritis (viral labyrinthitis) and acoustic neuroma.

#### METHODS

A search of the Canadian National Aviation Medicine Information System (NAMIS) database was performed to identify those aviators with dizziness who have undergone evaluation since 1991. The disposition of pilots with dizziness due to various otologic disorders was examined.

#### RESULTS

Over the past decade, changes in the management of neurotologic disorders have occurred. This necessitated a re-evaluation of our policy for relicensure of pilots with dizziness. Canalith repositioning maneuvers frequently alleviate dizziness due to benign paroxysmal positional vertigo. Vestibular physiotherapy hastens the resolution of vestibular neuritis. Typically pilots may return to restricted flying 3 months after resolution of these disorders. Unrestricted flying is permitted after 6 months without dizziness. There has been a recent trend to more conservative therapy such as stereotactic radiotherapy or observation for small acoustic neuromas. Three months after radiotherapy aviators may return to restricted flying. Pilots with small stable acoustic neuromas may also fly. Only aviators undergoing complete tumour excision may have an unrestricted license. Generally Meniere's disease is considered disqualifying for flying. Occasionally a pilot with inactive Meniere's disease may resume flying in a restricted capacity.

# CONCLUSION

Improvements in the management of neurotologic disorders have permitted earlier relicensure of aviators with dizziness. A review of Transportation Safety Board aviation occurrence data is supportive of these changes to our guidelines.

# (23) THE AIRCRAFT MANUFACTURERS RESPONSE TO THE CHALLENGES OF IN-FLIGHT MEDICAL CARE

HEMOUS, J.-D., M.D.; AIRBUS, TOULOUSE, FRANCE SCHMITZ, E., DR.-ING.; AIRBUS, HAMBURG, GERMANY

The increasing range and number of long-haul flights and the changing structure of the flying community, might justify the prognosis of an increasing number of medical in-flight incidents. In-flight medical care in terms of diagnosis and treatment becomes more essential than ever before. Medical facilities for e.g. telemedicine or for a medical compartment are equipped with high-end engineered components, which demand provisions on the aircraft side. A lot of aircraft systems are concerned e.g. power supply, data transfer, satellite communication, air conditioning, oxygen, interior, etc.

To response this challenge Airbus has established the Airbus Aeromedicine Projects Structure as the focal and central organization within engineering for Airbus Aeromedical Issues. Two areas of expertise were merged to get an optimum performance. On the one side the aeronautical specialists, the engineers, and on the other side the medical experts. In close cooperation with the operators the medical issues will be identified. To come to a feasible solution the

dedicated transposition of medical requirements into engineering practice is indispensable.

# (24) MEDICAL QUALIFICATION OF 44,000 AIRPORT SECURITY EMPLOYEES

E. B. FERGUSON, MD, MPH

Comprehensive Health Services, Inc. Cape Canaveral, USA

The United States Congress, after the tragic shock of September 11, 2001, created the Transportation Security Administration (TSA). The TSA was directed to establish and deploy a qualified and fully trained federal security workforce in all of the nation's 429 commercial airports by November 19, 2002.

Comprehensive Health Services, Inc., was selected as the sub-contractor to conduct the medical evaluation, drug screening and physical performance testing for baggage handlers, screeners and law enforcement officers for these positions.

Medical and performance standards were established, and guidelines published. A logistics department was set up and supply lists developed. Experience at initial sites was incorporated in standardized protocols and procedures. Rapid expansion in numbers of locations and recruits led to growth issues that were addressed by use of web-based and CD technology to provide consistent training for medical and site management personnel at the 157 examination sites.

Examination Centers were established in all 50 states and US Territories. Licensure of medical professionals had to be verified for the states of operation. More than 2,700 medical personnel were employed in the project. Most Exam Centers were established in hotels near airports. Each location presented unique challenges for the crew planning the examinee flow and setting up the equipment. Individual electronic medical record production, Urine collection for drug testing, digital fingerprinting and performance testing had to be included in planning the multiple stations for the physical examination.

More than 167,000 applicants for TSA employment were evaluated within six months for more than 44,000 positions. Specifics of the examination protocols, comments on the lessons learned from this extremely rapid mobilization, and observations on the process will be offered by the presenter.

# POLICY

# (25) ADMINISTRATION OF THE FAA AVIATION MEDICAL EXAMINER (AME) PROGRAM

# R. F. JONES, M.D.

Manager, Aerospace Medical Education Division, FAA Civil Aerospace Medical Institute; Oklahoma City, Oklahoma, U.S.A.

There are approximately 600,000 civil aviation pilots licensed by the FAA worldwide. These pilots require physical examination for medical certification at a frequency ranging from twice a year to once every three years, depending on the class of the examination and the age of the pilot. Between 450,000 to 470,000 FAA medical examinations are performed annually by a group of 5,000 FAA-designated Aviation Medical Examiners (AMEs) located in the U.S. and in 90 countries around the world. This presentation will outline the mandatory requirements for obtaining and maintaining FAA AME designation. Demographics of the present AME population will be discussed. Special emphasis will be given to the discussion of critical issues involving the management of international AMEs from the perspective of the International Regional Flight Surgeon. This presentation is a necessary prelude to subsequent sessions on AME performance evaluation and reporting.

# (26) FAA AME PERFORMANCE EVALUATION TOOLS

#### R. F. JONES, M.D.

Manager, Aerospace Medical Education Division, FAA Civil Aerospace Medical Institute; Oklahoma City, Oklahoma, U.S.A.

More than 270,000 of the over 450,000 airman medical certificate applications submitted by FAA AMEs in 2002 required manual review due to reports of pathological conditions, AME medical errors, and AME clerical errors contained in these applications. This high volume of manual reviews conducted by personnel in the FAA Aerospace Medical Certification Division contributes to delays in the final processing of medical certificate applications. A system of evaluating AME performance was developed, with the expectation that improved feedback on AME performance would result in a reduction in the number of applications requiring manual review due to AME medical errors and clerical errors. The Aeromedical Certification System (AMCS) database was used to generate reports on AME errors (medical and clerical) contained in all FAA medical certificate applications received during 2002. Error rates were calculated for each AME listed as active in the AME database. There were 4,967 active AMEs. Nearly 37,000 errors (medical and clerical) were initially identified based on AMCS data. Analysis of these errors led to reevaluation of definitions of certain data fields in AMCS. Valuable lessons were learned related to database architecture, query design, and data analysis. Corrections were made to the queries, reports rerun, and data re-analyzed three times before the query results were considered reliable. The final results revealed 12,207 errors (medical and clerical) shared among 2,696 AMEs. It was found that 1,762 AMEs had no errors, and 509 AMEs had performed no examinations during 2002. Airman medical certificate applications containing outof-range vision and blood pressure values accounted for 11,246 (92%) of the total number of errors. In general, AMEs are demonstrating effective performance in medical certification of airmen. Critical AME errors in medical certification decision-making are not common. The use of AMCS data to evaluate AME performance has some limitations; therefore, additional AME performance evaluation tools are needed to provide feedback to AMEs.

# (27) THE FUTURE OF EUROPEAN AVIATION REQUIREMENTS

#### A. RUGE

Central Joint Aviation Authorities, Hoofddorp, Netherlands

The Joint Aviation Authorities, JAA, were created in 1990 when the "Cyprus Agreements" were signed by the Directors General of European National Aviation Authorities. The Member States commited themselves to implement the Joint Aviation Requirements as a sole code with the purpose to create "a level playing field" amongst the Member States.

The main **objective of JAA** is to ensure that its members achieve a common high level of aviation safety resulting in mutual recognition of products, persons and organisations which is recommended by Central JAA after a successful standardisation visit. At the moment 14 States achieved the mutual recognition status regarding JAR-FCL.

The JARs need to be transposed into national legislation to be valid in the Member States. In **the future** direct application of common aviation requirements will be prossible in all EU Member States through **EASA**, the European Aviation Safety Agency.

The **legal basis** of EASA is the Regulation (EC) No 1592/2002 which entered into force in September 2002. The Agency will start work in the field of certification and maintenance in September 2003. The principal **objective** of EASA is a high and uniform level of safety.

The basic rules will be laid down in the **Essential Requirements** which will be included in the Regulation.

**Implementing Rules** will be based on the Essential Requirements and the content regarding Medical requirements will reflect the now existing Section 1 of JAR-FCL 3. The Implementing Rules will be adopted by the Commission. **Guidance Material** will be developed and adopted in the Agency.

# (28) ALCOHOL & DRUG TESTING PROGRAMS FOR FAA PERSONNEL IN SAFETY-RELATED POSITIONS

#### M. J. ANTUÑANO, M.D.

Director, FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, U.S.A.

The FAA Office of Aerospace Medicine is responsible for the administration of Federally-mandated alcohol and drug testing programs for FAA employees occupying safety-related positions. These internal programs target air traffic control specialists, air traffic assistants, electronic technicians, aircraft mechanics, motor vehicle operators, aviation safety inspectors, maintenance mechanics, engineering technicians, computer operators, electronic engineers, air transport systems specialists, and others. The types of drugs covered by the drug-testing program are marijuana, cocaine, amphetamines, opiates, and phencyclidine. Testing for alcohol and drugs is authorized under the following conditions: pre-employment (drugs only), random, reasonable suspicion, post-accident, return-to-duty, and follow up. Alcohol testing targets breath alcohol content (BAC) levels at 0.04 or higher and between 0.02 and 0.039 (Not-Ready-For-Duty). The current random testing rate for alcohol use is 10% and for drug use is 25% of all FAA safety-sensitive employees. Random alcohol testing represented the majority (80.4%) of the 41,624 alcohol tests conducted in 2001. Random testing also represented the majority (87.1%) of the 165,588 drug tests conducted in 2001. However, the highest positive test rates for alcohol (40.9%) and drugs (29.79%) were found under reasonable suspicion testing. This presentation will provide a summary report of the latest results on alcohol and drug testing of FAA employees, including refusals to test

# ALCOHOL & DRUG TESTING PROGRAMS FOR AVIATION INDUSTRY PERSONNEL IN SAFETY-RELATED POSITIONS

M. J. ANTUÑANO, M.D.

Director, FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, U.S.A.

The FAA Office of Aerospace Medicine is responsible for the administration of Federally-mandated alcohol and drug testing programs for employees in the U.S. commercial aviation industry occupying safety-related positions. These external programs target flight crews, flight attendants, flight instructors, aircraft dispatchers, maintenance personnel, aviation screeners, ground security coordinators, and non-FAA air traffic controllers. The FAA requires that these employees be included in an alcohol misuse prevention program. The types of drugs covered by the drug-testing programs are marijuana, cocaine, amphetamines, opiates, and phencyclidine. Testing for alcohol and drugs is authorized under the following conditions: preemployment (not mandatory for alcohol), random, periodic (drugs only), reasonable suspicion, post-accident, return-to-duty, and follow up. The current random testing rate for alcohol use is 10% and for drug use is 25% of safety-sensitive employees in the commercial aviation industry. Alcohol testing targets breath alcohol content levels at 0.04 or higher and between 0.02 and 0.039 (Not-Ready-For-Duty). Random alcohol testing represented the majority (94.7%) of the 58,840 alcohol tests conducted in 2001. The 2001 violation rate for random alcohol testing was 0.11%. Pre-employment and random testing represented the majority (52.7% and 44.8% respectively) of the 259,360 drug tests conducted in 2001. The 2001 pre-employment positive drug testing rate was the second lowest since 1993. This presentation will provide a summary report of the latest results on alcohol and drug testing of aviation industry personnel, including refusals to test.

# (29) POST-MORTEM FINDINGS OF ALCOHOL AND DRUGS IN SPECIMENS FROM PILOTS INVOLVED IN CIVIL AVIATION ACCIDENTS

#### M. J. ANTUÑANO, M.D.

Director, FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, U.S.A.

Pilot consumption of alcohol and drugs (illicit and therapeutic) is considered a causal or a contributing factor in a number of fatal civil aviation accidents every year. The FAA Civil Aerospace Medical Institute (CAMI) is required under Public Law 100-591 [H.R.4686] to help assess the role of potential medical or drug related pilot impairment in civil aviation accidents. Under a cooperative agreement between the FAA and the National Transportation Safety Board (NTSB), CAMI performs toxicological analysis to identify the presence of alcohol and drugs in specimens of body fluids and tissues of pilots who perish in aviation accidents. The purpose of these analyses is to assist in the determination of the cause and contributing factors to such accidents. CAMI's Forensic Toxicology Research Laboratory screens the specimens for drugs, alcohol, carbon monoxide, and cyanide. Specimens are screened for drugs of abuse, over-thecounter medications, and prescription medications. CAMI has identified 239 different types of drugs in specimens tested over the past 12 years. This presentation will provide a summary of the postmortem toxicological testing of specimens from pilots involved in fatal civil aviation accidents in the U.S. (1989 to 2002), including findings on the use of alcohol, over-the-counter medications, prescription medications, and drugs of abuse.

# ASSESSMENT

# (30) FIT-TO-FLY CHECKLIST: A TOOL TO IMPROVE FLIGHT SAFETY

M. SIMONS <sup>1</sup>, P.J.L. VALK <sup>1</sup>, J. HOK GOEI <sup>2</sup>, M. VAN HIJUM<sup>2</sup>

<sup>1</sup> TNO-TM Aerospace Medicine Group, PO Box 23, 3769 ZG Soesterberg, The Netherlands. <sup>2</sup> Civil Aviation Authority, PO Box 575, 2130 AN Hoofddorp, The Netherlands

Research has evidenced that pilot's fitness is affected by circadian disruptions, shift-work, irregular work schedules, fatigue, poor sleep, and lifestyle. Impaired fitness is associated with reduced alertness and error-prone behaviour. To further improve flight safety, pilot's and operator's awareness on these issues should be enhanced, and tools should be made available to evaluate pilot's fitness and to take action.

In the context of the Flight Safety Program of the Netherlands Civil Aviation Authority, the TNO-TM Aerospace Medicine Group has constructed the Fit-to-Fly Checklist (FTF). By using this Checklist pilots are made aware of the principal determinants of pre-flight and in-flight fitness. Items include pre-flight sleep, alertness, health, medication, alcohol, recent workload, operational load, and risk reduction. In analogy with the CFIT Checklist (Flight Safety Foundation), the FTF uses risk factors, risk multiplying factors, and risk reducing factors to enable flight deck crew to evaluate their fitness related risk and to provide them with information how to reduce this risk. Numerical values are assigned to each item of the FTF, enabling pilots to calculate their risk and to make them aware of the effect of the various factors on risk and risk reduction. Risk areas and opportunities to improve fitness are identified. During the pre-flight briefing the crew can also consider information from the FTF when planning their task and rest periods. Moreover, authorities and operators can use the FTF to evaluate effects of (proposed) rules and guidelines. In this way the FTF Checklist enhances fitness-related safety awareness of both pilots and operators.

# (31) CHANGES IN DISQUALIFICATION RATES AMONG NORWEGIAN PROFESSIONAL PILOTS DUE TO JAR-FCL 3 IMPLEMENTATION

#### P. ÅRVA MD, A. WAGSTAFF MD

\*Medical Director, Civil Aviation Authority. \*\*DavMed, PhD, Assistant Director, RoNoAF Institute of Aviation Medicine, Oslo, Norway

#### INTRODUCTION:

The Aeromedical Section of the Norwegian Civil Aviation Authority possesses a complete archive of all aeromedical examinations and decisions made on professional pilots since the 1920s. For the purpose of this paper we have reviewed all cases leading to loss of medical certificate class 1 over a 20 years period, from 1982 including 2001, covering our findings regarding health development among professional pilots over time and changing modalities of aeromedical decision making due to implementation of JAR-FCL 3.

#### METHODS:

The cohort under study consists, in all, of 48 229 pilot years, where 34 221 pilot years (70,9 %) were observed before 1997 and 14041 pilot years (29,1 %) from 1997 to 2001.

#### **RESULTS:**

In the cohort, 275 Class 1 pilots were permanently grounded, 176 cases before 1997 (64 %) and 99 (36 %) after 1997. The average disqualification rate per 1000 pilots/year was 5,7. Before 1997 the disqualification rate was 5,15 per 1000 pilots/year increasing to 7,1 after 1997.

# DISCUSSION:

In our study we have seen that a change has taken place how the pilot population over the years perceive their subjective health. We have the impression that pilots have higher expectations regarding physical, mental and social well-being than before. In the aviation working environment there has been an increasing focus on unfavorable factors in recent years. If the gap between expectations and reality regarding a good working environment becomes too large, a conflict will arise, which the pilot may perceive as a lack of personal health resources. In our study we have seen a changing modality in aeromedical decision making, which has lead to increased disqualification rates in neurologic-, muskuloskeletal- and psychiatric cases. However, this situation seems not to be dependent on more restrictive requirements. A decrease in disqualification rates in cardiological cases is explained by better treatment on one hand and more liberal JAR-FCL 3 regulations on the other.

# (32) PROFESSIONAL, DEMOGRAPHIC AND CLINICAL CHARACTERIZATION OF THE MEMBERS OF THE SPANISH ARMED FORCES WITH RESPONSIBILITY IN FLIGHT THAT PASSED MEDICAL EXAMINATION IN THE DEFENSE AEROMEDICAL CENTER (CIMA) DURING 2002

B PUENTE ESPADA\*, JA LOPEZ LOPEZ\*\*, B ESTEBAN BENA-VIDES\*\*, P VALLEJO DESVIAT\*\*, M PRADAS SEGOVIA\*\*, F RIOS TEJADA\*\*, J AZOFRA GARCIA\*\*, C VELASCO DIAZ\*\*, JB VALLE GARRIDO\*\*, JL GARCÍA ALCON\*\*

\*Military Health Services School (Ministry of Defense), Resident in Aerospace Medicine, Madrid, Spain. \*\*Defense Aeromedical Center (CIMA), Madrid, Spain.

#### INTRODUCTION:

The peculiarities of the aeronautical environment demand a meticulous selection of the personnel with responsibility in flight and a regular surveillance, in order to mantain their medical fitness. In Spain, this activity is carried out mainly by the Defense Aeromedical Center (CIMA). The objective of the present study is to describe the professional, demographic and clinical characteristics, as well as the qualification related to flight obtained by the military who underwent the different types of examinations practiced at CIMA during year 2002. The secondary objective is to analyze the association between these characteristics and the final qualification.

#### METHODS:

A descriptive, transversal study was designed. Medical records were collected from January until December 2002, excluding those whose final qualification could not be obtained. The final sample was constituted by 2214 individuals.

#### RESULTS:

The results are given in groups according to the type of examinaton carried out (541 *initials*, 1537 *periodicals* and 136 *extraordinary* ones). Results include the proffesional and demographic and the most relevant data obtained during the medical examination, subdivided in specialities (aerospace medicine, laboratory, radiology, cardiology, ophtalmology, otolaryngology, psychiatry, psychology giving also their partial qualifications). And finally the most significant results are analyzed, describing the association found between them (clinical data and the partial qualifications given by the different specialists) and the final aptitude.

# CONCLUSIONS:

The three groups of examination differed in several of the variables examined, although the majority obtained a favorable qualification, being fit for flight. In the multivariate analysis, the biggest probability of obtaining a disqualification (temporary or permanent) corresponded to the initials and to those who were unfit in the psychiatric exam. The main causes of permanent disqualification were related to psychiatry and ophtalmology and excluding the initials, the causes were due to psychiatrics and traumatolgy or musculoskeletal conditions.

# (33) CAUSES OF DEFINITIVE INCAPACITY TO FLY IN TAP AIR PORTUGAL CREW A 10-YEAR RETROSPECTIVE STUDY

R POMBAL, H PEIXOTO, M LIMA, A JORGE

UCS Integrated Health Care, TAP Air Portugal Group, Lisbon, Portugal

#### INTRODUCTION

UCS is the main health provider for TAP Air Portugal personnel and their families. Within its multidisciplinary clinical facilities, it

includes an official Fitness to Fly Medical Assessment Board. Pronouncing aircrew as irreversibly unfit to fly impacts significantly on personal, professional, ethical and corporate aspects.

### METHODS

A retrospective study characterising all cases of incapacity between Jan 1993 and Dec 2002 was conducted. The minutes of the Medical Board for that period were systematically reviewed, corresponding to a total of 146 cases of incapacity out of an average universe of 2026 aircrew. Descriptive statistical parameters were applied.

### RESULTS

Over half of all cases (52%) were in the 41-50-year age group (mean age: 46 years), and 62% were female. Eighty-seven percent had been in the company for 16 or more years, and only 2 cases had shorter than 5 years seniority (mean seniority: 24 years). Cabin crew accounted for 93% of cases and pilots 7%. The medical conditions most frequently responsible for incapacity were ENT (34%), followed by musculo-skeletal (20%) and psychiatric (12%). Within ENT reasons for unfitness, sensory-neural hypoacousia and vertigo syndromes predominated. Fourty-four percent of musculo-skeletal cases originated from occupational accidents. Protracted depressive syndrome and flight phobia accounted for three-quarters of psychiatric cases.

# CONCLUSION

An average 7% of the average number of TAP aircrew within the 1993-2002 period were deemed definitively unfit to fly. The average prototypical case would be a 46-year-old female flight attendant, with a seniority of 24 years, with an ENT or musculo-skeletal condition. The total number of incapacities would correspond to 2,542 years of work lost, or 18 years per unfit crew-member. This again highlights the relevance of pre-admission exams, occupational hazard prevention and close occupational medicine follow-up.

# (34) CANADIAN GUIDELINES FOR THE ASSESSMENT OF THE MEDICAL FITNESS OF LICENSED AVIATION PERSONNEL

#### A. WIELGOSZ, J. WALLACE

Consultant Cardiologist Senior Consultant Operations, Policy and Standards Civil Aviation Medicine Branch, Transport Canada, Ottawa, CANADA

# INTRODUCTION

Although ICAO Annex 1 Chapter 6 (medical) and the Canadian Aviation Regulations Part 424 govern the determination of the medical fitness of Canadian licensed aviation personnel, with the exception of the *ICAO Medical Manual*, last published in 1986, these standards do not provide sufficient up-to-date guidance to deal with the variability of individual presentations of applicants with different disease states. We reviewed the recent trends in volume of cases assessed across Canada to examine the possible impact of Guidelines.

#### **METHODS**

In 1985 the Canadian Cardiovascular Guidelines were developed followed by 2 published updates, one in 1995 and in 2003. Other guidelines have also been developed addressing neurology, diabetes, pregnancy, substance abuse and asthma. The Cardiovascular Guidelines have been accessible on the Internet since 1999. Cases reviewed in headquarters or regional offices are registered and entered into a computerized data base. We also examined the recommendations of reviews.

#### RESULTS

Between January 1, 1997 and December 31, 2001, the files of 452 individuals were referred to the Aviation Medical Review Board (AMRB) in Ottawa for a recommendation on medical certification.

There has been a yearly decline in the volume of referrals from a high of 132 in 1998 to a low of 79 in 2001. In recent years, there has been a trend for fewer cardiovascular cases requiring evaluation by the AMRB including the AMRB Cardiologist. Over this same time period there were no fatal or nonfatal aviation accidents or incidents conclusively attributable to a cardiovascular cause and no such accidents or incidents involving a pilot with a cardiac condition who had been assessed fit.

#### CONCLUSIONS

Guidelines for the assessment of medical fitness have been welcomed by the Canadian aviation medical community and have enabled more decision-making to be made locally without compromising aviation safety.

# PHYSIOLOGY

# (35) CORRELATION OF OXYGEN PRESSURE IN AIRCRAFT CABINS WITH RESULTING ARTERIAL OXYGEN SATURATION. POSSIBLE REASONS FOR GENDER DIFFERENCES

F. NEUWIRTH<sup>1</sup>, M. WIESHOLLER<sup>2</sup>, J. DRAEGER<sup>3</sup>, E. RUMBERGER<sup>4</sup>, H. WELSCH<sup>5</sup>.

<sup>1</sup>MD, ATP, German Airline Pilots Association (VC), Germany. <sup>2</sup>AME, ATP, German Airline Pilots Association (VC), Germany. <sup>3</sup>Dept. of Ophthalmology, University Hamburg, Germany. <sup>4</sup>Institute of Physiology, University Hamburg, Germany. <sup>5</sup>Institute of Aviation Medicine, German Airforce Div. II – Flight Physiology, Königsbrück, Germany.

#### INTRODUCTION:

For technical and economical reasons, sea level altitude can not be kept in the cabin during flight and a compromise has to be found. The higher flying altitude is associated with a lower cabin pressure, which has an important physiological effect on oxygen saturation in the blood for both crew members and passengers. Pilots, physicians and engineers often discuss whether re-circulation of cabin air has a negative influence on oxygen proportion.

# METHODS:

To assess the real amount of oxygen in the cabin air, we took measurements on different aircraft types and routes at different flight levels. The cockpit and all other aircraft compartments were examined on an hourly basis and the appropriate cabin altitude was noted.

During further investigation, different cabin altitudes were simulated in a pressure chamber in order to correlate the oxygen pressure with the resulting arterial oxygen saturation at standardized pressure levels.

# **RESULTS**:

In all compartments and all different flight levels, including during longer flight times, no decrease in oxygen proportion could be measured. On one flight the oxygen proportion dropped significantly in the aft galley of a Jumbo-Jet after 5 hours flight time. In addition to this the measured oxygen tissue pressures were discussed in relation to the cabin pressure on long distance flights.

Remarkable was the higher arterial oxygen saturation of some of the female subjects in the pressure chamber. The reasons therefore are possibly not gender differences but thermogenetic causes which needs further investigation.

#### CONCLUSIONS:

The critical state of light to moderate hypoxia is certainly dependent upon the oxygen partial pressure, and to a much lesser degree on recirculation of cabin air. In low ventilated areas of the airplane, the oxygen percentage could drop due to a lack of fresh air. A bigger

effect might be had by the increase of carbon dioxide, especially on smoking flights and in galleys where dry ice is used for cooling purposes.

# (36) INFLUENCE OF SENSOR SITE LOCATION FOR THE ACCURACY OF PULSE OXIMETRY

### J. HINKELBEIN, F. FIEDLER

Institute of Anaesthesiology and Intensive Care Medicine, Faculty of clinical Medicine, University Hospital Mannheim, 68167 Mannheim, Germany

# INTRODUCTION:

Besides its original use in anaesthesia, meanwhile pulse oximetry belongs more and more often to a standard item for the monitoring of oxygen saturation in General Aviation (GA) flights. Measuring oxygen saturation is practicable on many sensor site locations, but different locations revealed different kinetics of measurement [1]. So it is still unclear, where the best accuracy (reliability and variability) does exist [2]. The aim of our study was to evaluate the better location (ear or finger) for the measurement.

#### METHODS:

After approval of the local ethics committee, the arterial oxygen saturation was measured in 50 critically ill patients: Simultaneously a measurement of SaO<sub>2</sub> (arterial blood gas analysis, ABGA) and SpO<sub>2</sub> (pulse oximetry at two different sites:  $EARSpO_2$  and  $FINGERSpO_2$ ) was performed. Bias was defined as  $B=SaO_2-SpO_2$ . T-test for paired values was used for the statistical analysis, p<0.05 was supposed to be significant.

### RESULTS:

50 patients (32m, 18f, 59±14 [20-82] years old) participated. There were no statistically significant differences between the mean SaO<sub>2</sub> (97,8±1,4%) and the paired values for <sup>EAR</sup>SpO<sub>2</sub> (B=-0.5±2.7%, n.s.) and FINGERSpO<sub>2</sub> (B=+0.4±1.6%, n.s.). The variability of the values (SD) was statistically different (p<0.01).

# CONCLUSIONS:

It does not matter whether the oxygen saturation is measured at the ear lobe or at a finger. The measurement of oxygen saturation by pulse oximetry is slightly more accurate at a finger.

#### **REFERENCES:**

[1] Reynolds LM et al. Influence of sensor site location on pulse oximetry kinetics in children. Anesth Analg 1993;76:751-754 [2] Hinkelbein J et al. Dependency of the pulse oximetric saturation from the sensor site location in intensive care patients. Postersession Annual Meeting of the agswn 2003, Germany

# (37) THE EFFECTS OF ACUTE HYPOXIA ON ANAEROBIC WORK CAPACITY

# TE-SHENG WEN, YUH-MIN TSAI

Aviation Physiology Research Laboratory, Armed Force Kang-Shan Hospital

# PURPOSE.

The present study was undertaken to investigate the effects of acute hypoxia on human anaerobic capacity.

# METHODS.

Thirty-two physically healthy males volunteered to participate this study. They were assigned into two groups for testing work power of arms (N = 22) and legs (N = 10) at sea level and at 18,000 feet. Prior to the experimental protocol, individual maximal oxygen uptake and lean body weight were evaluated. A bicycle ergometer (Monark) was used to conduct the Wingate test under the nor-

baric and hypobaric conditions. Every 5 seconds work powers were recorded on the computer, which were computed as max, min, average powers and power drop at the end of test. Blood oxygen saturation and heart rate were measured using oximeter at the 20th sec right after the maximal exercise. Blood sample was collected at the 3rd min of recovery period for analyzing lactate level. Oxygen equipment is available all the time for preventing subjects from hypoxic incidents.

#### RESULTS.

A significant decrease in max and average powers were found in arms during acute hypoxia exposure, which might be caused by insufficient ATP re-synthesis and related to aerobic capacity. Blood oxygen saturation was seen much lower both in arm cranking and leg pedaling in the early phase of post-exercise. To the contrast, heart rate was seen much higher in the same period. This acceleration might be the compensatory mechanism paying for alactic oxygen debt. A lower lactate level was also showed after the exhausted arm exercise in hypoxic condition, which was linked to vasodilation response.

# CONCLUSION.

It is suggested that those who perform heavy work in the moderate altitude should be equipped with oxygen apparatus and aware of the hypoxic syndromes exacerbated by physical activity. Besides, physical fitness will improve the anaerobic capacity to some extent.

# (38) THE RELATIONSHIP BETWEEN FLYING EXPERIENCE AND CARDIOVASCULAR ADAPTATION TO +GZ ACCELERATION

D.G. NEWMAN, MB, BS, DAVMED, PHD; R. CALLISTER, MSC,  $\mathsf{PHD}^{\cdot}$ 

AMST Systemtechnik, Ranshofen, Austria /Aviation Medicine Unit, Monash University, Melbourne, Australia. \*Human Performance Laboratory, University of Newcastle, New South Wales, Australia.

# INTRODUCTION:

Fighter pilots report that their G tolerance increases with regular exposure. Our previous work has shown that the cardiovascular system of +Gz-adapted fighter pilots responds differently to an orthostatic challenge than non-pilots. We have also demonstrated evidence of a +Gz training effect in fighter pilots after a period of repetitive +Gz exposure. Individual pilot factors such as flying experience may have a role in the +Gz adaptation phenomenon. In this study, we investigated the relationship between jet flying hours (as a marker of cumulative +Gz exposure) and the arterial blood pressure response to head-up tilt (as a marker of enhanced cardiovascular performance).

#### **METHODS:**

14 male fighter pilots participated in this study. 9 pilots had more than 1000 hours jet flying experience and 5 pilots had less than 500 hours jet flying experience. Subjects underwent rapid +750 head-up tilt (HUT). Arterial pressure was measured non-invasively on a beat-to-beat basis during 2 minutes of supine rest and for 30 seconds in the upright position. For each subject, the change in MAP from mean resting values was obtained for the first 30 heart beats of the HUT period. The MAP responses across the 30 s of tilt were compared between the experienced and less experienced pilots, and the mean change in MAP with HUT was plotted against flying hours.

#### **RESULTS:**

There was a strong correlation (r=0.87, p<0.01) between the MAP response to HUT and jet flying hours. Compared to less experienced pilots, experienced pilots increased MAP more during the HUT and maintained MAP at a higher level throughout the 30 s HUT.

# CONCLUSIONS:

The results of this study demonstrate that flying experience in the high +Gz environment is strongly correlated with enhanced cardiovascular performance under conditions of accelerative stress such as HUT.

# (39) IS THERE STILL A NEED FOR IMPROVEMENTS IN G-TOLERANCE/ENDURANCE FOR PILOTS IN FUTURE HIGH PERFORMANCE FIGHTER AIRCRAFT?

UI BALLDIN<sup>1</sup>, M.D., PH.D., PM WERCHAN<sup>2</sup>, PH.D., RL STORK<sup>1</sup>, PH.D.

<sup>1</sup>Wyle Laboratories at <sup>2</sup>Air Force Research Laboratory /HEP Brooks City-Base, Texas, USA

# INTRODUCTION.

F-16 and similar advanced fighters have improved ability to sustain high G maneuvers as compared to previous generation aircraft. However, several fatal accidents caused by G-induced loss of consciousness (G-LOC) led to centrifuge training of pilots and improved anti-G suit systems, such as pressure breathing during G and extended coverage anti-G trousers. Such G-protection systems improved Gtolerance, both maximal G and endurance at high G-levels. However, it has been questioned if there is still a need for advanced Gprotecting equipment, since future fighter aircraft are expected to withstand high G for very short periods.

#### HYPOTHESIS.

If future fighter aircraft are developed for high G-maneuvers, these will most probably be used in war situations with pilots who could be both fatigued or heat stressed during multiple sorties. Therefore, the need for G-protective equipment should still be important.

#### METHODS.

Retrospective data from earlier centrifuge studies were analyzed for performance decrements and incidences of G-LOC and Near Loss of Consciousness (N-LOC) and related time courses with modern G-protecting equipment.

# RESULTS.

Most G-LOCs occurred with simulated tactical aerial combat maneuvers with multiple, short, rapid onset G-loads similar to those in operational flying and without modern G-protection. Even if G-LOCs happen in the beginning of such maneuvers, the probability increased at the end of multiple G-loads, when fatigue was more pronounced. Heat stress lowered G-tolerance, but not so much with modern G-protecting equipment. The occurrence of insidious N-LOC with dangerous decrements in performance, mental capacity and sensory information was seen in cases without G-LOC and without modern G-protection.

# CONCLUSION.

Since anti-G protection is most useful for pilots with poor G-tolerance, anti-G protective equipment should still be of value to protect those pilots from G-LOC, insidious N-LOCs and performance decrements, even with sparsely occurring high G. This is particularly true with fatigue or heat stress.

# (40) USE OF INFRARED OCULOGRAPHY AND POSTUROGRAPHY IN SPATIAL DISORIENTATION TRAINING ASSESSMENT

K.P. KOWALCZUK MD DAVMED, W. KLUCH MD, W.G. KOWALS-KI MD PHD, D. KNOCINSKI MSC ENG, M.MALAWSKI MSC ENG. *Polish Air Force Institute of Aviation Medicine Warsaw Poland* 

#### INTRODUCTION:

Most popular method of preventing spatial disorientation (SD) caused mishaps is physiological training of pilots. Main objective of

training is to make pilots aware of potential problems with holding proper spatial orientation during certain elements of flight. Training in PAFIAM consists of theoretical lectures and practical demonstration on GYRO – IPT SD simulator. Proposed method of training efficiency assessment is based on oculographic recording during simulated flight and posturographic assessment of pilots after completion of practical demonstration.

### METHODS:

18 active duty military instructor pilots participated in study. They were subjected to SD demonstration profiles three times in approximately one week intervals. During simulations eye movements recording were taken with IR oculography. Before and after each exposition pilots underwent posturographic examination to assess level of vestibular stimulation during training. Deviations from designated flight path and subjective disorientation rating questionnaire were used to assess level of disorientation during simulated flights.

#### **RESULTS**:

Two oculographic indexes: Isf (saccadic – fixation intensity index) and Dsf (saccade / fixation time derivative) have shown statistically significant (p<0.05) changes in visual information acquisition during disorientation caused by angular accelerations in whole group of subjects. Pilots with greater subjective rating of disorientation presented also higher oculographic indexes changes. Posturography revealed statistically significant changes in response to stimuli experienced during training.

# CONCLUSIONS:

Presented methods are useful tools to confirm both spatial disorientation occurrence and vestibular apparatus excitation during disorientation training. It can be also used during modification of SD flight profiles.

# (41) VISION BINOCULAIRE DANS LES EQUIPEMENTS DE TÊTE EN AERONAUTIQUE

#### C. ROUMES, J. PLANTIER, M. GODFROY, G. POYOT

Institut de Médecine Aérospatiale du Service de Santé des Armées, BP 71, 91223 Brétigny-sur-Orge Cedex, France

# INTRODUCTION

La vision stéréoscopie, basée sur les différences entre les images reçues par les deux yeux, est un élément majeur de perception de l'espace rapproché tandis que le rôle des indices monoculaires du relief augmente progressivement avec la distance. La capacité de perception des distances est évaluée dans un visuel de casque où l'augmentation de la séparation entre les capteurs alimentant les voies optiques des deux yeux maintient des différences interoculaires suffisantes pour les grandes distances considérées en aéronautique.

# MÉTHODE

Des enregistrements vidéo de vol à très basse altitude sont effectués avec un banc stéréoscopique monté dans le nez d'un hélicoptère Puma. Trois écarts entre les caméras (80, 160 et 240 mm) sont testés, les axes optiques des capteurs étant parallèles ou convergents. S'y ajoute une condition sans stéréoscopie où les deux yeux reçoivent les images d'une unique caméra. La perception de distance est évaluée à l'aide d'une procédure d'estimation de demi distance lorsque des pilotes observent les séquences vidéo dans un visuel de casque binoculaire. L'avis des pilotes sur le rendu du relief est aussi recueilli.

# RÉSULTATS

Une sous-estimation des distances, conforme à la littérature est retrouvée. Mais les erreurs perceptives diminuent avec l'augmentation de l'écart entre les capteurs lors de la prise d'images, sans effet

de la convergence des axes optiques. Subjectivement, une vive sensation de profondeur est électivement recueillie avec la grande séparation des capteurs, en position convergente.

### CONCLUSION

Un visuel de casque stéréoscopique peut améliorer la perception des distances en vol hélicoptère, en basse altitude. L'arrangement spatial des capteurs est déterminant pour la perception induite. Ces résultats sont utiles pour la conception d'équipements de tête où les capteurs intensificateurs de luminance, nécessaires au vol de nuit, sont placés de part et d'autre de la tête pour améliorer la tolérance cervicale du dispositif technique.

# (42) NIGHT VISION GOGGLES ADJUSTMENT SURVEY IN THE ISRAELI AIR FORCE

#### L CHAPNIK, E BARNBOIM, Y SHERER, L GOLDSTEIN\*

Center of Aviation Medicine and Physiology, Israel Air Force, and \* Surgeon General, Israel Air Force

# INTRODUCTION:

Proper adjustment of night vision goggles (NVG) can maximize NVG visual acuity. In order to properly evaluate NVG performance, aircrew members should use a resolution chart (e.g. the eye lane or ANV-20/20). Diopter and inter-pupillary diameter (IPD) adjustment should not be performed.

#### METHODS:

A survey was designed to map the status of NVG adjustment in the Israeli Air Force. 111 randomly selected aircrew members completed the relevant questionnaire.

### **RESULTS**:

71% of aircrew members reported using eye lane or ANV-20/20, while 29% reported using different adjustment procedures (e.g. lights, headup display, stars). Surprisingly, 50.5% changed diopter or IPD during flight. Regarding various eye symptoms such as blurred vision, tears, double vision, and eye pain, 63% reported having symptoms, while the rest 37% were free of these symptoms. Among the 70 aircrew members having eye symptoms, 56 (80%) reported changing diopter or IPD during flight, compared with only 9 of the 41 (22%) subjects who were free of symptoms (P<0.001). Fatigue was also associated with diopter or IPD change, as 70% of aviators complaining of fatigue changed IPD or diopter compared with only 44% of those without fatigue (P=0.01). The same trend was noted also in aircrew members who exhibited other symptoms, such as headache and neck pain.

# CONCLUSION:

These results support various symptoms associated with change of diopter or IPD. This association can be incidental, but might reflect a causal relationship between eye symptoms and fatigue leading to diopter and IPD change, or alternatively- unnecessary diopter and IPD change resulting in these symptoms.

# (43 HEAT STRESS ON HELICOPTER PILOTS DURING LOW ALTITUDE FLIGHTS

# LOLIC, ZORAN

Institut of Aviation Medicine, Zagreb, Croatia

Low – Altitude Flights in hot climates often impose significant heat stress on cockpit occupants. Helicopter commonly heat – stroke on the ground before take-off, and operation at low altitudes allows continuing climatic input. Many helicopter have no cocpit environmental control system (ECS) and even when they do there is only limited cooling capacity.

### METHODS:

A group of 34 pilots of Bell 206B helicopter was examined at the Zemunik airfield (Croatia) during the summer period. The microclimatic conditions before, during and after the flight were measured in the cockpit and the runaway: the dry air temperature, humid (natural) air temperature, and globe temperature based on these parameters, the index of humid and globe temperature is determined (WBGT). The heat pressure of the pilots before, during and after of a helicopter was determined by the following values: body and skin temperature, heart rate, blood pressure and body mass.

# **RESULTS:**

WBGT of the cockpit is under direct influence of the surronding WBGT, which causes changes in physiological variables of blood pressure, heart rate and body temperature. The average loss of body mass is 1,16 kg (1,4% of body mass before the flight).

#### CONCLUSION:

In the summer period the fliers and staying on the airfield up to 90 minutes; during taking off and landing of helicopters, the physiological indicators of influence of heatstress are the highest (decrease in value systolic blood pressure, increase in number heart rates and body tempertaure) and along with the increase psycho-physiological requirements in flying/steering a helicopter, we also stress critical safety of these flying stages in this condition.

We propose criteria for estimate of fliers working capability for fulfiling tasks under extreme heat pressure of the following physiological indicators: loss of body mass, imcrease of heart rate per minute under the same flying pressure (exceeding of heart rate of 120/min.), conspicuously slow returning of heart rate to the value before the flight, and critical value of body temeperature is 37,6 oC.

# CLINICAL

# (44) SPONTANEOUS PNEUMOTHORAX: WHEN IS IT SAFE TO FLY AGAIN?

#### CG PREITNER, PD NAVATHE, DB WATSON, C VAN DALEN,

Civil Aviation Authority of New Zealand

Spontaneous pneumothorax remains a problem when it comes to certificating aviators. The presence of blebs or bullae, is a significant risk, and, particularly with big bullae, has been usually believed to be an unacceptable risk. In the past, pilots with spontaneous pneumothorax were required to undergo complete pleurodesis, and were required to be "grounded" for long durations before they were allowed back in the air. New modalities of treatment have now been devised, and it is necessary to review conventional regulatory dictums as a result. The authors have examined the various modalities being practiced at present, and have formulated a policy. This policy is examined against the backdrop of the evidence available, and implications to pilot applicants are discussed.

# (45) CERTIFICATION TO FLY AFTER LYMPHOID MALIGNANCY

#### S A EVANS <sup>1</sup>, D CROWTHER <sup>2</sup>

<sup>1</sup> Head of Aeromedical Section, UK Civil Aviation Authority, Gatwick, UK <sup>2</sup> Emeritus Professor of Medical Oncology, University of Manchester, Manchester, UK

# INTRODUCTION

The lymphoid malignancies are a heterogeneous group of conditions with very different clinical features and widely varying management

regimes, patterns of relapse and survival. Correspondingly the implications for aeromedical certification are diverse.

#### METHODS

The Joint Aviation Authorities' certification protocols for aircrew with a history of malignancy of the immune system were reviewed in conjunction with published data on prognosis, based on eventfree and overall survival rates, and the known characteristics of survival curves. The potential type, site and clinical presentation of relapse was considered for each disease and new protocols were proposed.

#### RESULTS

It was found that malignancies of the immune system can be categorised into broad groups according to their potential cure rate. Certification will depend partly on survival rates which vary widely. Hodgkin's disease now has a high chance of 'cure' but lifelong follow up is necessary because of the risk of treatment related side-effects. Cutaneous lymphomas have a generally good prognosis. Most other lymphoid malignancies are either aggressive (with high initial mortality but a good long-term outlook if treatment is effective) or indolent. The indolent tumours are responsive to treatment but are usually incurable with a continuing relapse pattern.

Affected aircrew are often asymptomatic during periods of remission even though small amounts of disease may be present. Those with indolent lymphomas pose the greatest certificatory problem as active treatment is required intermittently and relapse is almost inevitable.

# CONCLUSIONS

Protocols based on survival rates and future risk of incapacitation can be used to certificate aircrew after treatment for a malignancy of the immune system. Assuming certain prerequisites for certification are met, most licence holders can be safely returned to flying following treatment.

# (46) THE NATURAL HISTORY OF LONE ATRIAL FIBRILLATION IN 279 MALE AVIATORS

WB KRUYER, A PALM-LEIS, TV AREVALO, JS PICKARD

United States Air Force School of Aerospace Medicine, Brooks City-Base, Texas, USA

# INTRODUCTION:

The natural history of lone atrial fibrillation (AF) in a young and otherwise healthy population is not well defined.

# METHODS:

From 1957 to 1993, 279 male military aviators with lone AF (no cardiovascular disease, no hypertension, age <60 years) were evaluated at a central facility approximately 6 months after the initial episode. We reviewed the records of initial and serial evaluations performed on these aviators and obtained further follow-up via questionnaires, telephone interviews and death certificates. Arrhythmic events considered were hemodynamic symptoms, cerebral ischemic events, and progression to chronic AF.

# **RESULTS**:

*Initial evaluation:* Average age was 36.8 years at the time of initial occurrence of AF. An isolated episode of AF occurred in 223/279 (79.9%), 34/279 (12.2%) had paroxysmal AF, and 22/279 (7.9%) had daily or chronic AF. *Follow-up:* A mean follow-up of 18.6 years was obtained on 241/279 (86.4%). At the time of follow-up, 129/241 (53.5%) still had only the original isolated episode of AF without any recurrence, 84/241 (34.9%)

had paroxysmal AF and 28/241 (11.6%) had daily or chronic AF. Of those initially presenting with an isolated episode, 67% had no recurrence, 32% developed paroxysmal AF and 1% developed chronic AF. Of those presenting initially with paroxysmal AF, 48% had no recurrence, 31% had continued paroxysmal AF and 21% developed chronic AF. Eleven had cerebral ischemic events; only one (chronic AF) occurred prior to age 60. Average annual event rate for cerebral ischemic events was <0.5% per year for isolated and paroxysmal AF and 1.1% per year for chronic AF.

# CONCLUSIONS:

Progression to chronic AF from a single episode or from paroxysmal AF was unlikely (1% and 21%, respectively). The event rate for cerebral ischemic episode was low (1.1% per year or less) and the likelihood of a cerebral ischemic event before age 60 was minimal.

# (47) NATURAL HISTORY OF NEW LEFT BUNDLE BRANCH BLOCK IN 135 ASYMPTOMATIC MALE MILITARY AVIATORS

WB KRUYER, A PALM-LEIS, PJ FITZSIMMONS

United States Air Force School of Aerospace Medicine, Brooks City-Base, Texas, USA

# INTRODUCTION:

The natural history of asymptomatic left bundle branch block (LBBB) is not well documented.

# METHODS:

From 1957 to 2000, 205 asymptomatic male military aviators were evaluated at a central facility for new LBBB. Retrospective records review was performed for demographics and results of available noninvasive and invasive cardiac testing. Follow-up surveys were distributed. Clinical endpoints considered were significant coronary artery disease (CAD), idiopathic dilated cardiomyopathy (DCM) and permanent pacemaker implantation.

# RESULTS:

*Initial Evaluation:* Mean age of the 205 was 40.4 years at the time of LBBB diagnosis. Of the 205, 135 (66%) had coronary angiography for occupational indications. Fifteen of 135 (11%) had clinical endpoints. Eleven of 135 (8%) had significant CAD, three (2%) had DCM and one (1%) required a permanent pacemaker. *Follow-up:* Thus, 120/135 (89%) had no clinical endpoint initially. Mean follow-up of 16.2 years was obtained on 97/120 (81%). Twenty-one of the 97 (22%) developed a new clinical endpoint. Nine of 97 (9%) developed significant CAD without cardiac event and 3/97 (3%) had a myocardial infarction. Six of 97 (6%) developed DCM and 2/97 (2%) developed congestive heart failure. One of 97 (1%) required permanent pacemaker. Of the initial 135 patients with coronary angiography, 8 (6%) died prior to age 60 from cardiac causes (mean age 51.8 years).

# CONCLUSIONS:

In this population of asymptomatic, apparently healthy males with new LBBB, prevalence of significant CAD was low (8%). However, it was twice the estimated background prevalence in our military aviator population, suggesting a relationship between LBBB and CAD. DCM was rare (2%) upon initial evaluation. An additional 6% developed DCM within ten years and at relatively young age. LBBB thus may be an early indicator of a myopathic process, suggesting a role for noninvasive follow-up.

# (48) DOES NICOTINE DEPRIVATION AFFECT PILOT PERFORMANCE? PRELIMINARY RESULTS OF AN ONGOING STUDY

M. S. MUMENTHALER<sup>1</sup>, J. L. TAYLOR<sup>1,2</sup>, L. A. WILSON<sup>1</sup>, L. FRIEDMAN<sup>1</sup>, J. A. YESAVAGE<sup>1,2</sup>

<sup>1</sup> Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, Stanford, CA 94305-5550, USA. <sup>2</sup> Department of Veterans Affairs Health Care System, Palo Alto, CA 94304, USA

# INTRODUCTION:

Today, most airlines enforce no-smoking policies for both crew and passengers during flights. Many pilots are currently smokers and are required to cease smoking temporarily while flying. According to previous studies, temporary smoking cessation may cause with-drawal symptoms and impair human performance. However, with-drawal effects in pilots have never before been investigated in their actual work place, the cockpit. The goal of the present, ongoing study is to test the hypothesis that there are nicotine withdrawal effects on aircraft pilot performance within 12 hours of smoking cessation.

# METHODS:

In a randomized, controlled trial, ten licensed pilots who reported smoking a daily average of at least ten cigarettes, were tested on two test days. Each test day lasted 13 hours and included three 75-minute flights (Ohr, 6hr, 12hr) in a Frasca 141 flight simulator. During the first test day, all pilots smoked one cigarette per hour. During the second test day, half of the pilots again smoked one cigarette per hour (smoking group), while the other half smoked one cigarette before the first flight and then were deprived of nicotine during the following 12 hours (deprived group). We calculated the performance changes between the first and the second test day for each pilot and analyzed the group differences.

# **RESULTS:**

At 6 hours, there was a significant difference between the smoking group, and the deprived group in overall flight performance change between the two test days, p < 0.05, effect size = 1.63. Overall flight performance of the pilots in the smoking group improved from the first test day to the second test day (+0.46 z-score units; SD = 0.38) while it declined in pilots in the deprived group (-0.01 z-score units; SD = 0.16). Post-hoc analysis of individual flight tasks showed that nicotine deprivation significantly impaired scores on the landing task, a task that requires a high amount of psychomotor coordination.

# CONCLUSIONS:

The preliminary results of our ongoing study suggest that there are large negative nicotine withdrawal effects on aircraft pilot performance within 12 hours of smoking cessation.

# (49) TUMEURS DU SYSTEME NERVEUX CENTRAL EN MEDECINE AERONAUTIQUE

P-E BERTRAN, S. LABOULBENE, I. MENGOE M. MONTEIL, M. MALAFOSSE, G. SALIOU

Centre d'expertise du personnel navigant de Bordeaux Hôpital d'instruction des armées Robert Picqué

# **RESUME:**

La découverte d'une tumeur du système nerveux central chez un personnel navigant professionnel est, heureusement, une éventualité rare. La pathologie et son traitement peuvent générer des symptômes engageant la sécurité: l'inaptitude aéronautique est donc, a priori, inévitable.

A travers l'analyse d'une série de 14 cas survenus chez des personnels navigants civils et militaires, les auteurs insistent sur la diversité des étiologies, des tableaux et la difficulté du dépistage. Ils décrivent les moyens de diagnostic mis en place, en France, lors des visites d'aptitude. Sur ces 14 dossiers, 10 ont pu reprendre une activité, souvent avec des restrictions. Pour cinq exemples démonstratifs, sont précisés les circonstances de découverte, les symptômes présentés, la thérapeutique instituée, l'évolution et les éléments permettant de discuter une éventuelle dérogation d'aptitude. La décision doit tenir compte des impératifs de sécurité, du risque évolutif mais aussi de la psychologie du patient (la reprise d'une activité, même limitée, est souvent vécue comme un gage de bonne santé retrouvée ...).

A partir de la littérature internationale, sont ensuite abordés les facteurs favorisant les tumeurs du système nerveux central. Les nombreux travaux publiés sont divergents: dans l'état actuel des connaissances, le milieu aéronautique et ses contraintes (notamment rayonnements ionisants et champs électromagnétiques) ne semblent pas constituer un facteur de risque des tumeurs du système nerveux. L'intérêt d'élaborer, au niveau français voire européen, un registre prospectif des tumeurs chez le personnel navigant est envisagé.

En fin, la question est posée de savoir si on pourrait faire mieux pour dépister les tumeurs du système nerveux chez les navigants: compte tenu de la faible incidence de ces pathologies, des techniques d'exploration actuelles et de leurs limites (sensibilité, spécificité et faisabilité), le dépistage en visite d'expertise, au moins révisionnelle, nous semble devoir reposer avant tout sur la clinique.

# (50) SILENT ABDOMINAL AORTIC ANEURISM IN PILOTS, PART II

M. CIMA, New York University School of Medicine and Medical Departments of Aerolineas Argentinas, Air France, British Airways, El Al, Iberia, and Varig Airlines; New York, NY, USA

# OBJECTIVE:

Follow up to a presentation on silent AAAs given at the  $41^{st}$  ICASM in 1993.

# METHODS:

Literature search in the past 10 years.

# **RESULTS:**

Silent abdominal aortic aneurysm continues posing diagnostic and therapeutic problems in the population at large and in the pilot community in particular. The serendipity discover of an AAA about to rupture in a 747 captain continues taking place during routine sonographic screenings of asymptomatic individuals and recent concepts and perceptions about the problem include: AAAs have a high degree of correlation with coronary and peripheral artery disease and routine sonograms in these patients should be carried out; AAAs may present as lower back pain and an appropriate high index of clinical suspicion is in order to arrive at the correct diagnosis; women are also at risk for AAAs and the incidence of rupture seems to be higher than in men; Routine screening in large populations has led to a 53 per cent reduction in mortality compared with 42 per cent in controls; The mortality after elective surgery is about 6 per cent at 30 days in screened subjects and 37 per cent after emergency surgery in non routinely screened controls; risk factors for development of AAAs are similar to those of coronary disease and behavior changes and treatment of comorbidities should be pursued.

# CONCLUSIONS:

The detection of silent abdominal aortic aneurisms in pilots may prevent catastrophic accidents if the aneurysm ruptures during criti-

cal phases of the flight (Take off or landing). The routing screening of pilots at risk because of age or existing comorbidities is likely warranted given the low cost of currently available screening techniques.

# (51) COMBAT JET FLYING IS NOT ASSOCIATED WITH DEVELOPMENT OF HYPERTENSION- RESULTS FROM A 22-YEAR FOLLOW-UP

Y SHERER, B AZARIA-SOFER, S MATEZKI, A GROSSMAN, E BARNBOIM, L GOLDSTEIN\*

Center of Aviation Medicine and Physiology, Israel Air Force, and \* Surgeon General, Israel Air Force

# INTRODUCTION:

Combat jet pilots are exposed to excessive gravity forces. In order to maintain cerebral perfusion under excessive +Gz forces- they have to increase their blood pressure temporarily. The aim of this study was to assess whether combat jet pilots develop more hypertension or have higher blood pressure than other pilots.

# METHODS:

Four groups of randomly selected pilots and flight controllers that have been followed-up for 22 years- were compared: 100 combat jet pilots, 70 helicopter pilots, 110 cargo pilots and 96 flight controllers. These subjects were annually followed-up for blood pressure as part of their routine examinations. All blood pressure measurement were done by physicians. Some also underwent echocardiography.

#### **RESULTS:**

Blood pressure measurements were similar between the 4 groups compared at ages 18 and 40. Mean blood pressure in the jet-, helicopter-, cargo-pilots and flight controllers was 123/73, 122/73, 124/71 and 125/75 at age 18, and 117/75, 118/73, 120/77 and 121/79 at age 40, respectively. Combat jet pilots did not have higher blood pressure than other pilots or flight controllers at baseline, and neither developed elevated blood pressure levels in a 22-year follow-up period. Echocardiography was done in some of the pilots. A sub-group of 25 combat jet pilots who underwent echocardiography at a mean age of 25.2 was compared with 38 helicopter pilots who had their echocardiography at a mean age of 25.9. These combat jet pilots had significantly increased estimated left ventricular mass compared with the helicopter pilots (207±38 versus 171±33 grams, respectively; P<0.01). No significant differences were found regarding septum or posterior wall thickness, and in comparison between other groups of pilots, including older jet pilots and cargo pilots.

# CONCLUSIONS:

Combat jet pilots do not develop hypertension or higher blood pressure levels in a 22-year follow-up from age 18 to 40, compared with other pilots or flight controllers.

# (52) LA DIETETIQUE CHEZ LES PERSONNELS NAVIGANTS

M. MONTEIL, P-E. BERTRAN, I. MENGOE, V. SAINSEVIN, M. MALAFOSSE, G. SALIOU

Centre d'expertise du personnel navigant de Bordeaux Hôpital d'instruction des armées Robert Picqué. France

#### **RESUME:**

Au cours du premier semestre 2003, un questionnaire anonyme a été distribué à 1 000 personnels navigants professionnels (civils et militaires de toute spécialité) vus en visite révisionnelle au Centre d'Expertise Médicale du Personnel Navigant de Bordeaux. Cette enquête a permis l'étude des comportements hygiènodiététiques dans cette population.

Le taux de retour est remarquable (92 % de questionnaires interprétables). L'échantillon étudié est majoritairement masculin (près de 91 %) et d'âge moyen voisin de 37 ans (extrêmes de 18 à 70 ans). L'activité aéronautique militaire prédomine (55 %) ainsi que la fonction «pilote» (67 %).

Une personne sur cinq fume actuellement et 92,4 % des PN se déclarent sportifs avec une pratique régulière plus de 6 fois sur 10.

L'activité aéronautique modifie les apports d'eau dans 47,2 % des cas. Il s'agit 9 fois sur 10 d'une hausse. L'eau minérale est la première boisson citée devant l'eau du robinet puis l'eau de source. Les conseils d'hydratation sont mieux suivis lors de la pratique sportive que lors des séjours outre-mer (84 % versus 70 %). Un antécédent de lithiase urinaire est rapporté par 4,8 % des personnes.

Dans la majorité des cas (68,8 %), la prise alimentaire quotidienne est faite de trois repas. Une ou des collations régulières sont ajoutées près d'une fois sur trois. Produits laitiers et protéines puis légumes et sucres complexes sont les aliments les plus régulièrement consommés, au contraire des fruits et des sucres rapides. L'activité aéronautique modifie l'alimentation dans 44,7 % des cas, surtout par *«snacking»* et saut de repas.

Un défaut de connaissances diététiques est noté par plus d'une personne sur deux. Le suivi médico-aéronautique est jugé «inadapté et insuffisant» pour la diététique dans plus d'un tiers des cas.

Moins de un PN sur cinq fait part de l'existence d'un trouble métabolique. 5,8 % suivent un traitement médicamenteux à visée métabolique. Les statines sont la classe la plus prescrite (60,4 % des prises).

Ces principaux résultats sont comparés avec ceux disponibles dans la littérature.

# **AIR EVACUATION**

# (53) THINGS ARE GETTING SMALLER AND BETTER. BIOMEDICAL EQUIPMENT FOR MEDEVAC.

#### A. NYQVIST, MD

Medical Coordinator, Amiri Flight, Abu Dhabi, United Arab Emirates.

The development of biomedical equipment for medevac during the last 10 years will be discussed based on personal experience with intercontinental air transport of critical care patients.

Vital signs monitors allowing continuous observation of all physiological data relevant for critical care management.

Defibrillators becoming smaller and lighter while incorporating biphasic waveforms, automatic ECG interpretation, external pacing and complete physiological monitoring making a separate monitor superfluous.

Ventilators that are light and compact, able to pressurize ambient air while providing the versatility of use and variety of ventilation modes that can be expected from full size intensive care ventilators.

Infusion pumps that are tiny, lightweight, able to deliver three separate infusions simultaneously with high precision and sophisticated programming.

Oxygen concentrators running on aircraft electrical power and making you independent of bulky oxygen cylinders.

Suction units that are durable, lightweight, battery/mains operated and equipped with disposable suction jar lining.

Air ambulance patient modules providing oxygen, power and a bed where the patient is secure in case of turbulence as well as during take-off and landing.

Extra compact equipment for ambulance transport between hospital and aircraft.

Factors of importance when choosing equipment will be discussed as well as service, calibration and maintenance.

# (54) MEDICAL EVACUATION BY A FIXED WING SECONDARY TRANSPORTATION MISSIONS – A FLIGHT TEAM PHYSICIAN OR PARAMEDIC ?

LTC DR YARON BAR DAYAN, MD, MHA, DEPUTY OF THE SUR-GEON GENERAL, IAF, MAJ DR RONEN LEVITE, MD, FORMERLY HEAD OF OPERATIONS SECTION IAF, MAJ DR GAD LEVI, MD, HEAD OF OPERATIONS SECTION IAF, MAJ DR ERIC SITTON MD, HEAD OF THE MEDICAL SECTION OF THE AIROMEDICAL RES-CUE UNIT IAF AND COL (SELECTED) DR LIAV GOLDSTEIN MD, MHA, SURGEON GENERAL IAF

Correspondence: Lt. Colonel Dr. Yaron Bar-Dayan, M.D., MHA, Deputy of the surgeon general IAF and the Department of Emergency Medicine, Faculty of Health Sciences & School of Management, Ben Gurion University of the Negev,Beer Sheva, Israel

# BACKGROUND:

The impact of physician presence on rotor-wing transportation of trauma victims was evaluated by Hamman BL et al in a primary mission set-up. According to their data, experienced nurses and paramedics, operating with well-established protocols, provided aggressive care that yielded equal outcome results compared with those of a flight team that includes a physician. We could find no similar data for fixed-wing aircraft secondary transportation missions over long distances.

The aim of this study was to a adress the advantages and disadvantages of a flight physician compared to a paramedic in secondary transportation missions over long distances by a fixed wing aircraft.

# METHODS:

Evaluation of the requirements of medical abilitis of the medical air crue in a long distance secondary transport by a fixed wing aircraft and a review of the litterature that address this question.

#### **RESLTS AND DISCUSSION:**

7% of the patients who were internationally transferred via fixedwing aircraft, required a major therapeutic intervention during transfer and a major adverse event was registered in 12% of transfers. The composition and training of the crew is an important component that directly affects the success or failure of the mission. More over, the requirements of Consolidated Omnibus Budget Reconciliation Act (COBRA) indicate that patients must be transported by individuals trained to provide whatever treatment is required to maintain the patient's condition and treat any reasonably foreseeable complication.

# CONCLUSIONS:

In light of the above mentioned, we believe that in our secondary missions set up, a physician might make a difference. We recommend that escorting physician should be from an appropriate speciality (e.g. Anaesthetic), has reasonable seniority, and is adequately trained.

# ACCIDENTS

# (55) AIRLINE MEDICAL DEPARTMENT ROLE IN AVIATION EMERGENCIES

P ORTIZ, JM<sup>a</sup> PÉREZ-SASTRE, R DOMINGUEZ-MOMPELL, F MERE-LO, AND J RUANO

Iberia Airlines, Madrid/Barajas, Spain\*

# INTRODUCTION:

The medical department of Iberia Airlines [IBMD] participates in the Company's Emergency Plan, compliant with OneWorld's alliance requirements.

#### METHODS:

The intervention of Iberia's Medical Department in two aviation accidents of associated airlines occurred in Spain in 2001 and 2003 is analysed.

#### **RESULTS:**

The IBMD was activated in the very initial phase of both emergencies. A doctor of the IBMD was on the spot within hours after the accidents, providing valuable information to the Emergency Committee on the victims situation and requirements. In the most severe case, a multi professional team headed by IBMD specialists went to the accident location to support the victims and its families. A follow up of the victims was performed.

#### CONCLUSIONS:

The Airline Medical Service has a central technical role in the Airline's response to an aviation accident. It is essential to maintain a permanent relationship with the standard airline operation by giving an on-line inmediate answer to the minor incidents and in this way creating a permanent communication channel with the main actors of the emergency decision making process. The participation of an assistance company in the post critical process is recommended.

# (56) INJURY TRENDS IN U.S. ARMY HELICOPTER ACCIDENTS 1995-1999.

#### JS CROWLEY AND JL PERSSON

U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama 36362

# INTRODUCTION.

Occupant protection strategies are best designed to counter specific injury patterns resulting from mishaps of the vehicle of interest. Priorities in aircraft design include weight and cost reduction, so safety advocates must be prepared to substantiate recommendations with evidence that the investment is indicated and worthwhile. Accident epidemiology has shown the benefit of the most significant improvement in helicopter occupant safety—crashworthy fuel systems. Evidence suggests that other safety enhancements, such as helmets and occupant restraint, are generally effective in reducing crash mortality. An examination of recent injury trends will help identify injury countermeasures for the next decade.

# METHODS.

Class A-C aviation accidents occurring from 1 January 1995 to 31 December 1999 were extracted from the U.S. Army Aviation Safety Management Information System (ASMIS) at the US Army Safety Center. These accidents were compared to previously published studies of helicopter accident victim injury patterns.

### RESULTS.

During the study period, 525 accidents meeting the study definition occurred, of which 142 involved ground contact. In these accidents, 235 occupants received 367 injuries, and 66 were killed. In descending order of injury frequency, the most commonly injured body regions were the torso, followed by the face, skull/brain, and extremities. Most injuries to the head and brain resulted from striking internal cockpit objects (e.g., instrument panel, cyclic), rather than decelerative non-contact injuries.

#### DISCUSSION.

These results support the assertion made by previous researchers that the proportion of head injuries in helicopter accidents is declining, but head injury remains an important source of accident morbidity and mortality. Research and development programs are underway at the U.S. Army Aeromedical Research Laboratory and other centers to reduce the frequency and severity of torso injuries, which generally result from occupant flail. Possible countermeasures will be discussed, including active and passive restraint devices.

# **FINAL PRESENTATION**

# (57) ADAPTATIONAL RESPONSE OF HUMAN LYMPHOCYTE GENES IN MICROGRAVITY.

#### A.SUNDARESAN<sup>1</sup> AND N.R.PELLIS<sup>2</sup>

<sup>1</sup>Universities Space Research Association, NASA/JSC, Houston, Texas, 2NASA Johnson Space Center, Houston, Texas.

#### INTRODUCTION

Genetic response suites in human lymphocytes in to microgravity are important to identify and further study in order to counter immunesuppression. Immune suppression in microgravity has been documented for many years. With long term space travel and other exploratory ventures planned, the immune system of the astronaut has to be maintained optimally.

#### METHODS

Human peripheral blood from normal donors was used to isolate peripheral blood mononuclear cells. These cells were cultured in 1g (T flask) and modeled microgravity (MMG, rotating wall vessel) for 24 and 72 hours. Cell samples were collected and subjected to gene array analysis using the Affymetrix HG\_U95 array. Data was collected and subjected to a two-way analysis of variance. Different groups of genes related to the immune response were then analyzed.

#### RESULTS

Many molecules related to T cell activation and second messengers located both in the cell membrane and cytoplasm, were significantly altered (positive or negative regulation) in modeled microgravity. Previous findings in our laboratory showed lymphocyte activation and locomotion to be significantly suppressed in microgravity. Further analysis at the protein levels of genes involved in the immune response could lead to development of prophylactic and countermeasure steps to augment the immune system for long-term space travel. Detailed results from the genetic analyses will be presented in this study.

# HUMAN FACTORS

# (1) HUMAN ERROR ANALYSIS OF INDIAN NAVAL AVIATION ACCIDENTS (1990-2001) - THE APPLICATION OF HUMAN FACTOR ANALYSIS AND CLASSIFICATION SYSTEM (HFACS)

#### SURGEON COMMANDER (DR) SS KHANUJA# GROUP CAPTAIN (DR) HARISH MALIK\*

# Classified Specialist, Aerospace Medicine, INS Utkrosh, Port Blair, Andaman & Nicobar Islands, India.

\* DDMS(AM) and Senior Advisor Aerospace Medicine, Air Headquarters, RK Puram, New Delhi, India.

#### INTRODUCTION.

Human Error (HE) has been implicated in 70-85% of aviation accidents in both military and civil aircraft accidents. Investigation agencies concentrate mainly on pilot error (Active Errors) and the role of Latent errors in the causation of aircraft accidents is less clear. The HFACS, developed by Weigmann et al provides a system of identification and classification of HE, both active and latent. This study uses the HFACS to brings out the type of HE committed in Indian Naval Aviation.

#### AIM.

The aim of the study was to detect, analyse and classify, HE in Naval aircraft accidents during the period Jan 1990 to Dec 2001 using the HFACS system.

#### METHODOLOGY.

The Inquiry reports of all Naval aircraft accidents during the period 01 Jan 1990 to 31 Dec 2001 were scrutinized. For each accident, Cause and Factors were identified and tabulated in the HFACS model of classification of Human Factors and then analysed.

#### RESULTS.

203 causes/factors contributed to 66 aircraft accidents, during the period Jan 1990 to Dec 2001. Major accidents contributed to 63.6 % of all accidents. A total of 54.5% of all accidents were attributed to human error (as decided by the investigating agency). Unsafe supervision appeared to be the dominant error committed accounting for 31.5% of all accidents, followed by Unsafe acts (29.06%). Pre-conditions for unsafe acts and organizational influences each contributed 19.7% to all accidents. The study brings out a dichotomy as regards to the high prevalence of Decision Errors over Skill based errors detected in this study as compared to the studies carried out by Weigmann and Shappell.

#### CONCLUSION.

The study brings out the efficacy of the HFACS to identify and classify various factors identified in the causation of aircraft accidents in the Indian Navy. Unsafe Acts (by aircrew) contributed to approximately one third of all factors identified in accident causation. Latent errors contributed to the remaining two thirds. Common errors committed have been described and methods to counter these suggested.

# (2) TYPES OF RELATIONSHIPS FORMED BY A MULTICULTURAL CREW WHILE IN ISOLATION FOR 264 DAYS

#### N. KRAFT M.D.<sup>1</sup>, H. BINDER<sup>1</sup>, T. LYONS M.D. M.P.H<sup>2</sup>, R. KASS PH.D.<sup>3</sup>

<sup>1</sup> NASA-Ames / SJSU Foundation Human Factors Research & Technology Moffett Field, California, USA. <sup>2</sup> Asian Office of Aerospace Research and Development Tokyo, JAPAN. <sup>3</sup> Concordia University, Montreal Department of Applied Human Science Montreal, CANADA

# INTRODUCTION:

For long-duration space flights, sole reliance on strong technical skills, excellent health, and absence of psychiatric illness cannot

ensure effective crew performance as crews become more heterogeneous and multinational. Therefore, this project investigated types of interpersonal relationships formed between multicultural crews in an international isolation study.

#### METHODS:

Sixteen males and two females participated representing cultures of Canada (1), European Union (3), Japan (2), and Russia (12). A pairdiagnostic test was used to analyze participants' types of interpersonal relationships during the 264-day isolation period.

#### RESULTS:

Some participants' self-assessments seemed similar to subjects from Russian and Japanese cultural backgrounds. However, even though participants had similar self-assessments, poor relationships nevertheless formed between and within crews. The three most common intra-group and inter-group relationships were Type 1, an "active and denying harmonic" (32% of measured relationship types), Type 5, a "conflictive complementary" (26% of measured relationship types), and Type 2, a "distrustful-reserved" (16% of measured relationship types). European, Russian, and male participants developed mainly Type 1 relationships, while Japanese and female participants developed mostly Type 2 relationships. Chi-square analyses revealed significantly different relationship types between the Europeans, Japanese and Russians (p<0.01).

#### DISCUSSION:

The focus of this study was to investigate the types of relationships developed between participants of heterogeneous culture and gender. This was based on the observation that similarity in personal profiles does not necessarily lead to "active-harmonic" relationships as demonstrated by the "distrustful-reserved" relationships formed by the Japanese and female participants.

#### CONCLUSION:

In order to maximize crew performance, ensure a high level of crew cohesiveness, and minimize interpersonal conflicts for long-duration missions, entire crews should be selected based on the cohesiveness of their interpersonal relationships.

# (3) ATTRIBUTION THEORY AND INTERCULTURAL CONFLICTS IN AN ISOLATED ENVIRONMENT

- H. BINDER<sup>1</sup>, R. KASS PH.D.<sup>2</sup>, N. KRAFT M.D.<sup>1</sup>
- <sup>1</sup> NASA-Ames / SJSU Foundation Human Factors Research & Technology Moffett Field, California, USA. <sup>2</sup> Concordia University, Montreal Department of Applied Human Science Montreal, CANADA

#### INTRODUCTION:

Our paper focuses on the purpose of The International Space Station simulation study SFINCSS-99: gaining a better understanding of the types of interpersonal conflict arising between crew members of heterogeneous nationality and gender.

#### METHODS:

Four Russian male subjects participated in a 240-day experiment (Crew I). Another four subjects (three males and one female) from, Canada, Japan, European Union and Russia participated in a 110day experiment (Crew II). Participants were instructed to record their thoughts concerning the preceding week through weekly personal logs. Participants' diaries pertaining to an incident where the French-Canadian female was kissed against her will by the commander of Crew I was assessed using attribution theory concepts.

#### RESULTS:

The incident involving the Cosmonaut commander of Crew I and the French-Canadian female of Crew II gave further insight into how humans think about themselves and others by highlighting attribu-

tion biases stemming from the different views held in different cultures. The Japanese crew member accused the commander of Crew I of simply trying to "achieve one's own sexual interest." However, for the commander and his Russian mission control, his behavior was seen as perfectly acceptable and culturally normal. The Japanese crew member's explanation of the incident demonstrated the "fundamental attribution error," the tendency for observers to underestimate situational influences and overestimate dispositional influences upon others' behavior. The "misattribution" (misreading of warmth from the French-Canadian female) made by the commander of Crew 1 led to an event that had disastrous consequences for his future career as a Cosmonaut.

# CONCLUSION:

The knowledge gained from this incident demonstrates how simple, natural human attribution can produce conflict that has the potential to destroy a team. Furthermore, if crews lack strategies for resolving conflict, interpersonal problems can affect the ability of crew members to effectively work together, potentially leading to decrements in team performance.

# **PSYCHIATRY**

# (4) INTRODUCING A NEW APPROACH TO THE OPERATIONAL EVALUATION OF COGNITIVE PERFORMANCE: THE RESULTS OF 2 VALIDATION STUDIES.

N. PATTYN 1,2,4; R. KOLINSKY 2,3; J. MORAIS 2; M. ZIZI 1,5

1:Physiology & Physiopathology -Vrije Universiteit Brussel;2: Unité de Recherche en Neurosciences Cognitives- Université Libre de Bruxelles;3: Fonds National de la Recherche Scientifique, Belgium; 4: Ecole Royale Militaire, Bruxelles;5: ACOS Well Being- Epidemiology and Biostatistics; Belgian Ministry of Defence

# INTRODUCTION

Most of the previous studies assessing human performance during space-flight revealed no significant decrement in higher cognitive functions. Other studies relating performance and circadian rhythms in-flight did not yield univocal results. However, the astronauts' subjective evaluation of their own performance often reports impairment in flight. This apparent discrepancy warrants finding a new standardized approach to evaluate cognitive performance.

We identified several points that seem critical for maximal test validity and sensitivity:

- ⇒ Adaptation of a test to the specificities of the tested population, in terms of both workload and content. This enhances the tests' sensitivity.
- ⇒ Including an emotional dimension. Stress is often invoked to explain unclear results. Designing a test to include a dimension being a sensitive stress indicator might improve both validity and sensitivity of the test.
- ⇒ Using multimodal and multidimensional tasks. In addition of having more ecological validity, careful test design allows to make a distinction between different executive functions as well as between automatic and controlled processes.
- ⇒ Assessing an effect rather than absolute performance provides a built-in control, which allows overcoming the well-known lack of control of experimental conditions during space-flight.

⇒ Adding physiological measurements to correlate to cognitive performance allows a more accurate interpretation concerning resource allocation. This might prove more sensitive than using cognitive parameters alone.

We present the behavioural results of the validation studies of a new protocol according to the previous criteria.

# MATERIAL & METHODS

A classic interference Stroop task; a general emotional Stroop task and a specific emotional Stroop task (using emotional words related to the specific professional experience of the subjects) were presented in a modified dual-task design with a recognition task using the words presented during the Stroop task. This design allowed to apply the *Process Dissociation Procedure* to the data and therefore to make a distinction between automatic and controlled processes.

# RESULTS

Results from two populations were compared: one group of students (N = 30), tested in their native language (French), and one group of jet pilots from the Belgian Air Force (N = 10), tested in English and in their native language (Dutch).

# CONCLUSION

The results suggest that the protocol is a sensitive and valid tool for assessing human performance in varying stress conditions.

# (5) ASSOCIATED VARIABLES TO ANXIETY DISORDERS IN PROFESSIONAL AIRMEN CANDIDATES

JULIO A. CARBAYO HERENCIA<sup>(a)</sup>, LAURA JIMÉNEZ-PRADA DE MIGUEL<sup>(b)</sup>, JOSÉ MORERA PÉREZ<sup>(c)</sup>, RAFAEL ESTRUCH SÁIZ<sup>(b)</sup>, LUIS A. GONZÁLEZ FERNÁNDEZ<sup>(d)</sup>, FRANCISCO JIMÉNEZ QUEREDA<sup>(e)</sup>, ANTONIO GÓMEZ MOLINA<sup>(e)</sup>, JOSÉ V. CAMPOS CALATAYUD<sup>(e)</sup>, JAIME E. SAUMELL BONET<sup>(e)</sup>, SUSANA RODRÍGUEZ GONZÁLEZ<sup>(f)</sup>, JOSÉ R. MARCOS NAVARRO<sup>(g)</sup>, INMACULADA PASTOR SAL-DAÑA<sup>(h)</sup>

<sup>(a)</sup>Comandante Médico, Base Aérea de Albacete. <sup>(a)</sup>Capitán Médico, Base Aérea de Albacete. <sup>(a)</sup>Teniente Coronel Médico, Jefe de Sanidad de la Base Aérea de Albacete. <sup>(a)</sup>Teniente Médico, Base Aérea de Albacete. <sup>(a)</sup>Capitán D.U.E., Base Aérea de Albacete. <sup>(a)</sup>Teniente D.U.E., Base Aérea de Albacete. <sup>(a)</sup>D.U.E. Personal Laboral, Base Aérea de Albacete. <sup>(b)</sup>D.U.E., Personal Laboral, Maestranza Aérea de Albacete.

# INTRODUCTION.

Anxiety problems are of the most frequent in psychiatry, they correspond to young people between 20 and 40 years old, being women twice affected. It is not well known the incidence in military life. Therefore, we pretend, as object with this Project, to study the anxiety in people when they start as Profesional Soldiers and to see the varieties connected with their admision.

# METHODS.

The study took place in Rabasa (Alicante), where candidates to airmen (METP) were to start the instrucction period for two mounths. They were evaluated at the begining, with a test that included the Goldberg inquiry, anxiety subscales and nervous breakdown in Primary Attention. A model of logistic regression was established in which the variable depended on anxiety and the varieties of sex, cultural level, family level, civil status, number of brothers or sisters, place between them, health perception, level of studies of their parents, jobs of their parents, some negative experiences in life, reason to choose the military life and place where they come from, and its relationship whit the environment.

Because in Spain the inicial preparatory periods are similar in the three Armies, the results can be extrapolated to the ME.T.P. destinated to the Air Units.

#### RESULTS.

There were 1433 people (1332 men and 101 women) with an avarage age of 20,54 men and 20,53 women. Anxiety was found in 429 people (29'9 %).

# **CONCLUSIONS**

Negative aspects about health and life are associated 3 and 1,5 times respectively with ansiety. Also the lack of job and money 1,5. Being a woman twice.

# (6) ASSOCIATED VARIABLES RELATED TO CHANGE FROM ANXIETY TO NON-ANXIETY DURING THE BASIC TRAINING PERIOD OF PROFESSIONAL AIRMEN

LAURA JIMÉNEZ-PRADA DE MIGUEL<sup>(a)</sup>, JULIO A. CARBAYO HERENCIA<sup>(b)</sup>, JOSÉ MORERA PÉREZ<sup>(c)</sup>, RAFAEL ESTRUCH SÁIZ<sup>(a)</sup>, LUIS A. GONZÁLEZ FERNÁNDEZ<sup>(d)</sup>, FRANCISCO JIMÉNEZ QUEREDA<sup>(a)</sup>, ANTONIO GÓMEZ MOLINA<sup>(a)</sup>, JOSÉ V. CAMPOS CALATAYUD<sup>(e)</sup>, JAIME E. SAUMELL BONET<sup>(e)</sup>, SUSANA RODRÍ-GUEZ GONZÁLEZ<sup>(f)</sup>, JOSÉ R. MARCOS NAVARRO<sup>(a)</sup>, INMACULA-DA PASTOR SALDAÑA<sup>(h)</sup>

(a)Capitán Médico, Base Aérea de Albacete. (b)Comandante Médico, Base Aérea de Albacete. (c)Teniente Coronel Médico, Jefe de Sanidad de la Base Aérea de Albacete. (d)Teniente Médico, Base Aérea de Albacete. (e)Capitán D.U.E., Base Aérea de Albacete. (f)Teniente D.U.E., Base Aérea de Albacete. (g)D.U.E. Personal Laboral, Base Aérea de Albacete. (h)D.U.E., Personal Laboral, Maestranza Aérea de Albacete.

#### INTRODUCTION.

Anxiety problems are of the most frequent in psychiatry, they correspond to young people between 20 and 40 years old, being women twice affected. In previous studies in our group we have seen changes in anxiety during the period of preparation of soldiers (METP). The aim of this investigation was to find the varieties associated to changes in people who had anxiety problems at the begining and not at the end.

#### METHODS.

The study took place in Rabasa (Alicante), where candidates to METP were to start the instrucction period for two mounths. They were evaluated at the begining and at the end of the period with a test that included the Goldberg inquiry, anxiety subscales and nervous breakdown in Primary Attention. A model of logistic regression was established in which the variable was constituted:

- people who had anxiety problems at the beginging and not at the end; - the reference of those who had no problems from the beginging. We also had in mind sex, cultural level, family level, civil status, number of brothers or sisters, place between them, health perception, level of studies of their parents, jobs of their parents, some negative experiences in life, reason to choose the military life and place where they come from, and its relationship whit the enviroment.

Because in Spain the inicial preparatory periods are similar in the three Armies, the results can be extrapolated to the ME.T.P. destinated to the Air Units.

#### RESULTS.

There were 1433 people. Those who finished the investigation, 170 had anxiety problems at the begining but not later and 612 did not present any anxiety problems. The results will be shown in tables.

#### CONCLUSIONS.

Negative events and cultural level higher than secondary school associates 1.5 times to a possitive change from anxiety to non-anxiety.

Other factors, such as gender, motivation, family are evaluated and measured accordingly.

# TRAVEL

#### (7) CAN SARS BE TRANSFERRED BY AIRCRAFT?

MISSONI E., MLINARI-MISSONI E., GOLUBI J.

Faculty of Transport, University of Zagreb, Croatia Croatian Institute for Public Health

#### SARS – SEVERE ACUTE RESPIRATORY SYNDROME

In simpler words, this disease can be called severe atypical pneumonia. The preliminary reports submitted by WHO and the Centre for Disease Control and Prevention (CDC), which are being collected from the mid-February, indicate that up to now (3 April 2003) SARS has been diagnosed in 16 countries with a total number of the infected 2,270 and 79 deaths.

The epidemiological data indicate that the majority of the diseased are adults of the age between 25 and 70, and there have been only a few cases of children younger than 15. The incubation is usually 2 to 7, and sometimes even up to 10 days. The disease starts with high fever (>38°C), shivering, stiffness, headaches, general feeling of exhaustion, and myalgia.

Naturally, after recognising the symptoms on time (unless these are treated as influenza), then all the available diagnostic procedures are included in order to establish the accurate diagnosis.

The aetiology is still as yet insufficiently known. Therefore, WHO established on the 17 March a global network of laboratories, in order to identify the cause of this illness. The data from the end of March indicate that the cause could be a member of the so-called corona virus group.

For the moment, it may be concluded that the disease spreads by direct contact, and that there are proofs of the transmission of aerosols. The symptoms are treated medically.

For prevention one should wear a protective mask. Crew members working with aspect patients have to have the standard protection: mask, glasses and gloves, and have to wash their hands frequently.

# (8) IN-FLIGHT MEDICAL INCIDENTS: THE NEED FOR PREVENTION

#### M. SIMONS, MD. CONSULTANT AVIATION MEDICINE

TNO-Human Factors Institute, Aerospace Medicine Group, The Netherlands

It is to be anticipated that the incidence of passengers' medical incidents will increase, due to an ever-increasing number of aged and/or diseased passengers, who fly over ever-increasing non-stop distances. In-flight medical incidents may lead to panic reactions, personal distress, and diversions of flights. Passengers as well as their physicians are often unaware of the physiological consequences of the aircraft cabin environmental factors, such as lowered ambient pressure, low relative humidity, contamination, and travel conditions, such as immobilisation and stress. In this context, hypoxic syncope will be discussed as a typical example of an in-flight medical incident in otherwise healthy passengers. In the context of prevention, knowledge on risks and patho-physiological mechanisms is essential. It is recommended that scientists, authorities, passenger organisations, and airlines collaborate in clinical-epidemiological and physiological studies to provide the knowledge needed to develop preventive measures.

# (9) UNDERSTANDING STRESS OF AIR-TRAVELLER; A NEW INSIGHT

#### DR BK. SINGH MD

Diplomate of National Board, Senior Medical Officer, IGI Airport, New Delhi

Travellingis a form of organized movement of human beings with some overt or covert objective. Evolutionally human beings

are instinctively migratory as per Darwinian concept. Types of travelers are tourists, business travelers, pilgrims, technical experts, workers and labourers, refugees, immigrants, military personnels, political representatives, sporting participants, spectators, travel support machinery etc. Over one billion air passengers had traveled in 2002. With increase in speed of travel, security of passengers for safety and surveillance of diseases deserves attention in preventing global spread of emerging trend of disease patterns and bio-terrorism, which may lead to international health risks. With high speed of travel, most of passengers may remain in incubation period or might be in a state of prodrome in a long distance flight. This may go unnoticed by individual or by health care personals. This has gained its importance in present context due to new emerging disease like Severe Acute Respiratory Syndrome. Air travel is responsible for recent spread of Severe Acute Respiratory Syndrome (SARS) to 26 countries. Air travel is safe and fastest mode of travel. Incidence of sickness among air travelers varies from 1-2 per ten thousands air travelers. Some times in-flight medical incidence lead to diversion of flight to nearest airport. Present concept of manifestation of infectious disease among human being is based on interaction of triad of Environment, Host and Agent while there is concept of web of causation for non-communicable diseases. General sickness rate among air passengers is much less than prevalence and incidence of disease in particular region. Why only a few air travelers fall sick during exposure to same triad of environment, agent and host? What are the factors leading to stress and manifestation of disease?

# NOMADIC STRESS COMPLEX-

Term stress has been borrowed from pure science to life sciences. Hens Seyle had shown general adaptation to stress in three stages (i) Alarm Phase (ii) Resistance phase (iii) Exhaustion phase. For air traveler triad of factors are (i) Health dynamics of individual (ii) Airport tumult (iii) Aircraft ambience. These factors interact and in majority of cases, stress is well tolerated depending on inherent Stress Tolerance Limit. Evolutionary psychologists believe that human behavior is out come of archetypal needs, which are neuro -physio- psychic units evolving through natural selection. This is responsible for cognitive and behavioral manifestation of humans. The gap between archetypal needs and environment fulfillment leads to stress. Stress tolerance limit (STL) among individual determines manifestation of symptoms by stress coping mechanism against a particular disease. Once STL is crossed, it leads to manifestation of disease. In atraveller, a Nomadic Stress Complex is in existence because of instinctive nature of migration among Homo sapiens. In case of air passenger, it is called Aero-Nomadic Stress Complex. Sickness among air travelers can be grouped as Aero-Nomadic Stress Syndrome. Thus, different inflight medical incidences, air rage, Terminal syndrome at airport terminals, traveller's thrombosis or economy class syndrome (DVT) etc. may be labeled as part of ANSS. Identification of Stress Tolerance Limit (STL) and determination of its level among travelers will help in identifying "at risk" travelers. Being a new concept, identification of globally applicable STL is matter of multicentric research. Once recognized, this bio-medical printing of passenger like DNA printing will help in keeping a track on health dynamics of each passenger. It may prove to be an additional tool in identifying 'at risk' traveller from aviation as well as public health point of view. It will minimize in-flight medical incidences and flight diversions due to medical reasons. This will be a cost effective tool in view for futuristic travel. Simultaneously identification of STL will be additional tool for monitoring of individual passenger from safety point of view. Hence, it will help in a safe and comfortable travel.

# (10) CREW HEALTHCARE WITH HIGH DEFINITION TV IMAGES

MIYAMOTO A<sup>1, 2</sup>, MATSUZAKI I<sup>1, 3</sup>, YAMADA H<sup>1, 4</sup>

<sup>1</sup>Tsukuba Space Center, National Space Development Agency of Japan, Tsukuba, Japan

<sup>2</sup>Graduate School of Social and Cultural Studies, Nihon University, Tokorozawa, Japan

<sup>3</sup>Institute of Community Medicine, University of Tsukuba, Tsukuba, Japan <sup>4</sup>College of Humanities and Sciences, Nihon University, Tokyo, Japan

# INTRODUCTION:

Both medical and psychological crew supports from the ground are an important factor for the success of mission during a long space flight. NASDA has a plan to install a High Definition TV (HDTV) system in Japanese Experiment Module and it will be applied to the crew healthcare. HDTV system as telemedicine will become a useful tool, and this study was a feasibility study to see how we use the HDTV system in future.

# MATERIAL AND METHOD:

Four cosmonauts in the ISS expedition #3 and #5, who stayed for four and six months, were assigned to two subjects and two cameramen respectively. Experiments: 1) feasibility study on visual inspection procedure in telemedicine, 2) facial pose of emotional expression under microgravity, 3) evaluation of physical and psychological adaptation process by semi-structured interview. A HDTV camera and a tape recorder were loaded on ISS in August 2001. Filming was done every two or three weeks, and all images were recorded on board. Tapes were delivered to the ground after the mission, and physicians, psychologists and psychiatrists examined the images.

# RESULTS:

In the medical evaluation, more than 95% of images seemed applicable to the visual inspection, and furthermore, more than 85% of images seemed usable to make a diagnosis. Facial appearances of crews in expressing emotions seemed different from 1G environment, and the micro-gravity might affect facial muscle movements due to body fluid shift towards head. Adaptation process was evaluated from standpoints of strain and motivation. It showed the highest score at the beginning, then both went down and finally they returned to the position of high motivation- mild strain area.

# CONCLUSION:

The HDTV image would be useful for the medical and psychological supports from the ground, especially in the Private Medical and the Psychological Conference during a long space flight.

# (11) USE OF RECIRCULATED AIR IN A COMMERCIAL AIRCRAFT ON INTERCONTINENTAL FLIGHTS: CABIN AIR POLLUTANTS AND CLIMATE

LINDGREN T, AND NORBÄCK D

CANCELLED

# INTRODUCTION:

Concern has increased about possible health effects resulting from recirculated air in passengers cabin. The increased fuel cost, resulting today in that most airliners use recirculated air. This study was to determine cabin air quality, in-flight exposure of specific pollutants, and the influence of selected flight conditions. The measured concentrations were compared with corresponding values from other indoor air measurements, and given standards for good indoor air quality, and climate.

# STUDY METHODS:

Measurements of air humidity, temperature, carbon dioxide (CO<sub>2</sub>), respirable particles, ozone, nitrogen dioxide (NO<sub>2</sub>), formaldehyde,

and volatile organic compounds of possible microbial origin (MVOC) in cabin, with and without tobacco smoking onboard. The measurements were performed during 26 intercontinental flights with Boeing 767-300.

#### RESULT:

When smoking was allowed, there could be a considerable exposure to respirable particles in the rear part of the cabin, despite spatial separation of smokers, and an efficient ventilation and air filtration system. The number of passengers during smoke flights seemed to have a minor influence on cabin air quality. There can be a pronounced difference in cabin air quality during cruise and non-cruise conditions. The relative air humidity during cruise conditions can be extremely low, irrespectively of latitude. Cabin temperature varied but was within proposed temperature standards. The carbon dioxide was mostly low during cruise, and rarely exceeding the recommended limit during 96 % of measured time. The average concentration of nitrogen dioxide and ozone in the cabin was low. Formaldehyde was below the detection limit in most measurements, irrespectively of smoking, suggesting that this pollutant is not a problem in this type of aircraft. Different MVOC were detected in cabin air. Possible sources of these compounds need to be further investigated

# (12) SUIVI D'UN EQUIPAGE POTENTIELLEMENT EXPOSE AU SARS

DRS S.STEVENS, M C.BOUTON, M.CANTEGRIL, G.DESMARIS, N.KAUFMAN, C.MONCLUS, C.MOUSSU, M.ROYER, B.VARENNE, JF.VAUCOULEUR, MC.LEBUISSON

Service médical du travail du personnel navigant d'Air France, Paris, France

Suite à l'hospitalisation en soins intensifs en France, fin mars 2003, pour une suspicion de SARS, d'un passager de retour d'Hanoi, par un vol d'Air France, le suivi des équipages concernés a été mis en place.

Accueil, information, conseils en cas de symptômes, arrêts de travail, questionnaires journaliers sur l'état de santé ont été réalisés pour la surveillance et pour éviter toute propagation du virus alors inconnu. Cette procédure a été étendue aux passagers ayant voyagé à proximité du malade. Un processus spécifique de désinfection de l'avion a également été mis au point.

Quatre personnes ont été hospitalisées secondairement. Trois d'entre elles ont été, au-delà du malade, étiquettées « cas probables » selon les critères OMS dans l'attente des résultats sériologiques non concluants à ce jour. Il s'agissait de deux passagers et d'un membre du personnel de cabine qui a présenté des symptômes mineurs.

Cette surveillance conforme aux recommandations du ministère français de la santé a été étroite et a permis de conforter les personnels en contact avec le premier « cas probable » français de SARS.

# (13) MEDICAL ASSISTANCE TO AIRLINE CREWS AWAY FROM THE HOME BASE: UNUSUAL SITUATIONS, COMMENTS AND IMPLICATIONS FOR FUTURE INCIDENTS.

M. CIMA, New York University School of Medicine and Medical Departments of AA, AF, BA, EA, IB, and VG Airlines, New York, NY, USA.

# OBJECTIVE:

To bring awareness about unusual incidents experienced during the provision of medical assistance to airline crews during layovers away from the home base.

# MATERIALS:

Medical files from my consulting activities

#### RESULTS:

1. - Addition of a heavy sedative to the drink of a crew member while visiting a bar by a stranger sitting next to her without her knowledge, with the presumptive intention of luring her away and eventual rape.

2. - Accidental bite by a squirrel while visiting a park with the possibility of the animal suffering of or carrying the rabies virus.

3. - Mosquito bite during the summer in the New York area during a mini epidemic of West Nile encephalitis.

4. - Crewmember exposed to breeding the Manhattan air in the weeks following the September 11, 2001 attack.

5. - Crew member arriving to New York with acute illnesses and its appropriate disposition in a high quality and cost effective manner of management. (Fracture hip, chicken pox, kidney stone)

6. - Miscellaneous pertaining crewmembers, passengers and special situations brought about by management.

# CONCLUSIONS:

While providing medical support to commercial airlines away from the home base the designated medical advisor may come across unusual situations which may prompt appropriate responses different from the management of ordinary common occurrences and those atypical happenings deserve comments and reflections to guide future performances.

# (14) ORGANISATIONAL PROCEDURES FOR DEALING WITH SUSPECTED EXPOSURE TO DISEASE ON BOARD – THREE CASE-STUDIES FROM UCS'S EXPERIENCE

#### R POMBAL, H PEIXOTO, A JORGE, M LIMA

UCS Integrated Health Care, TAP Air Portugal Group, Lisbon, Portugal

UCS is the main health provider for TAP Air Portugal personnel and their families. It also provides TAP aircraft with medical and first-aid kits, and is responsible for occupational advisory and medicals, aircrew training in first-aid and human factors, as well as medical clearance for ill or incapacitated passengers. It is often called upon to assist TAP in dealing with organisational and operational emergencies arising from suspected exposure to disease on board its fleet, which flies to a number of destinations in Europe, Africa and the Americas.

The procedures set up for three exemplary alert cases within the last few years are presented. The first case-study involved transportation of a young female passenger with Lassa fever in 1999. The passenger had been carried by TAP from Dakar and was identified initially by the cabin crew as possibly ill with malaria. The alerting, international medical networking and medical safety procedures set in motion are described.

The second case-study, following the sad 9/11 incident, was to do with the measures implemented regarding protection against potential chemical and biological threats on board TAP flights, especially following the anthrax scare. Two false alarm cases with significant operational consequences and psychological impact on aircrew are described.

The third case-study more recently ensued from the SARS epidemics. TAP does not currently fly to either Asia or Canada, but takes up a significant number of passengers therefrom. Dealing with cabin crew apprehension is particularly highlighted.

Financial support for this paper was provided solely by UCS Integrated Health Care.

# **AIRCREW HEALTH**

# (15) MEDICAL ASSESSMENT OF IBERIA PILOTS ACUTE SICK LEAVES

JM<sup>a</sup> PÉREZ-SASTRE, R DOMINGUEZ-MOMPELL, F MERELO, P ORTIZ AND J RUANO

Iberia Airlines, Madrid/Barajas, Spain\*

#### INTRODUCTION:

The aeromedical department of Iberia Airline holds a complete file of all their flight crews. Besides issuing JAR medical certificates, we give pilots a mandatory "fit to flight" clearance before they are allowed to return to fly should they have been on sick leave for more than three days. The research is aimed to update medical causes of acute sick leaves in order to develop health management programs.

#### METHODS:

Between 1th Nov 2002 to 30<sup>th</sup> April 2003, from the pilots who came to our premises for any reason, a 400 pilots sample was assigned randomly to the program collecting data about any medical leave throughout the year 2002. Records were classified and codified by EPI INFO, spanish version of CDC –Atlanta computerized epidemiology program.

#### RESULTS:

213 (53.2%) were at least one day out on medical leave.. Respiratory ailments (24.4%), musculoskeletal (19.7%), ENT (16.9%) and Gastro-Intestinal Upsets (9.3%) were most frequent causes. Total sick time was less than 3 days in 54%, mostly caused by respiratory, ear and digestive problems. 14% were longer than 30 days, especially due to locomotor problems. On a broader sense there was no statistical difference between captains and first officers or by age, but ENT was twice as much in officers. Respiratory and ENT diseases, as well as locomotor, were more frequent in Airbus fleets (A320 and A340) and adults group (30-50).

#### CONCLUSIONS:

The Iberia pilot population is well defined and easily under medical control. The mayority of medical leaves are due to minor ailments and last for very short periods of time. We will keep preventative information about respiratory and ENT (Airbus short haul operations) and musculoskeletal problems (Airbus long haul operations).

# (16) THE ANALYSIS OF FLIGHT PERSONNEL SICK LEAVES OF "LITHUANIAN AIRLINES"

EREMINAS, D<sup>1</sup>., AND VALENTUKEVICIUS, V<sup>2</sup>.

<sup>1</sup>Lecturer of Dept. of Environmental and Occupational Medicine, Kaunas Medical University, Kaunas, Lithuania and A. Gustaitis Aviation Institute of Vilnius Gediminas Technical University, Vilnius, Lithuania;

<sup>2</sup>Head of Aeromedical Section of Lithuanian Civil Aviation Administration, Vilnius, Lithuania.

#### INTRODUCTION:

This retrospective study is related to analyze sick leaves among pilots and flight attendants of "Lithuanian Airlines" (LAL) having the aims to identify major medical problems, to compare with corresponding Lithuanian date and to develop appropriate health management program.

#### METHODS:

The data for this study were collected from flight personnel medical records from the Aeromedical Section of Lithuanian Civil Aviation Administration. The analyzed period is from January 1, 2001 to December 31, 2001. The 95 flight attendants and 129 pilots have worked in the LAL during this period. The records were classified according ICD-10, standardized and statistically analyzed.

# RESULTS:

The total number of sick leaves is 128 cases and the total number of working days lost is 1100. Standardized rate in the LAL is 571,4 cases per 1000 workers (Lithuanian value is 503,9). Standardized sick leaves rate among flight attendants is 1042,1 and among pilots is 224,8. The mean lost working days per case in Lithuanian is 10,4 days, in LAL – 8,6 days, while these numbers between flight attendants and pilots do not differ. The most common medical problems are: respiratory diseases (61 case and 379 days lost, 6,2 days per case), traumas (22 cases/ 287 days, 13,0 days per case) and musculosceletal disorders (9 cases/ 106 days, 11,8 days per case).

#### CONCLUSION:

The standardized number of sick leaves in the LAL is bigger than is Lithuanian value. This index of flight attendants is 4,6 times greater than among pilots. It is related with significant fluctuation of microclimate conditions in the flight attendants working places. The main morbidity causes among LAL flight personnel, as in Lithuania, is respirator diseases and traumas.

# (17) SUDDEN (NONACCIDENTAL) DEATH AMONG CZECH MILITARY AND PROFESSIONAL CIVILIAN PILOTS IN THE PERIOD 1992 - 2002

O. TRUSKA, M.D.; D.AV.MED.; A. DVORAK, M.D.; PHD; J. VANKO, M.D.; M. SOKOL, M.D.

Institute of Aviation Medicine Prague, Czech Republic

When entering the profession, pilots need to be in better health than the general population. During their careers they are under close medical supervision which could influence their life-long mortality.

During the ten-year period from 1992 to 2002 we examined 5 841 commercial and 8216 military pilots. There was no serious aircraft accident in the Czech Airlines and Czech Air Force due to medical reasons during this period. We registered several sudden deaths among the group of airline and military pilots. Nobody of these pilots had control of the aircraft, when they died, but one of them was just travelling to his duty.

There were five sudden cardiovascular deaths, four times we found tumours, two times leukaemia. Acute pancreatitis, liver insufficiency and asthma bronchiole were found one time.

The causes of sudden deaths are possible distinguished into two groups:

- 1. Pilots who try to hide their problems and diagnoses or they are treated by non-aviation doctors and during air-medical examinations do not inform any examiner about their problems (4 times in our group)
- Pilots who die due to possibility of unpredictable sudden deaths (9 times in our group).

The probability of sudden death in our group was 0,16%. It rises a question if the extent of medical examination is sufficient because we could grounded as minimum 4 persons (28,6%) and may be follow up them better. We did not discover the treat of the sudden death in 71,4% !

#### CONCLUSIONS.

1) Since the year 2000 we implemented JAR-FCL rules and our pilots know very well the extension of examinations and do not want (generally) to extend their regular examinations. Our solution is that we offer them cardiovascular and anti-cancer preventive programmes which is for volunteers and it starts running.

2) The JAR-FCL rules should be "live" and national representatives should continue with their amendments.

# (18) BACK MUSCULAR ACTIVITY OF PILOTS, HELICOPTER VIBRATION AND EXPOSURE LIMITS OF ISO 2631

<sup>1,2</sup>C.G. DE OLIVEIRA, <sup>2</sup>J. NADAL

<sup>1</sup>Physical Activity Science Institute of Aeronautics - Av. Marechal Fontenelle 1200, Marechal Hermes – Rio de Janeiro – RJ – Brazil – CEP: 21740-000. email: cgomes@nuicaf.aer.mil.br

<sup>2</sup>Biomedical Engineering Program, COPPE/UFRJ, Rio de Janeiro, RJ, Brazil.

One cause considered for backache in Helicopter Pilots (HP) is Whole-Body Vibration (WBV) increasing activity in the Back Muscle (BM), leading to fatigue. However, BM was not observed to be affected by WBV in HPs during 15 min of flight (J Biomech 43(10):1309-1315). This study investigates the effect of WBV on the electromyogram (EMG) of the BM during flights, and compares the helicopter vibration to limits in the guidelines of ISO 2631-1 (1997) for comfort and health. Flights lasting 2 h in average of 12 HP were monitored in Bell 412 and S-76 helicopters. The fore-and-aft (X), lateral (Y) and vertical (Z) WBV was measured at the pilot's seat through a triaxial accelerometer. The EMG of the right and left BM was obtained by bipolar surface electrodes placed 3 cm from the 3<sup>rd</sup> lumbar vertebra. All signals were registered on a digital recorder and digitized to a computer (sample rate of 1000 Hz). The effect of vibration was investigated in epochs of 1 min length by the coherence function between Smoothed Rectified EMG (SREMG) and the Z vibration, and by the correlation between coherently averaged SREMG and Z in cycles corresponding to the main rotor frequency (1R) and its 1st harmonic (2R). One pilot showed a pattern on SREMG which could be related to vibration at 1R but statistical tests revealed no significant effect (p > 0.05) in the 12 pilots. Compared to ISO 2631-1, the WBV of both helicopters showed to be "a little" and "fairly" uncomfortable and, concerning health, within the "caution zone" for 8 h of daily exposure. While it is proposed that backache in HP could be attributed to muscle fatigue due to vibration, the present study does not support this hypothesis. The WBV measured indicates that attention should be given concerning the daily exposure dose.

#### ACKNOWLEDGEMENT

This study was sponsored by Brazilian Technical Cooperation Program of ICAO and by Brazilian Research Council (CNPq).

# (19) EFFECT OF HELICOPTER PILOT'S POSTURE ON BACK MUSCLE ACTIVITY

<sup>1,2</sup> C.G. DE OLIVEIRA, <sup>2</sup>J. NADAL

<sup>1</sup>Physical Activity Science Institute of Aeronautics - Av. Marechal Fontenelle 1200, Marechal Hermes – Rio de Janeiro – RJ – Brazil – CEP: 21740-000. email: cgomes@nuicaf.aer.mil.br

<sup>2</sup>Biomedical Engineering Program, COPPE/UFRJ, Rio de Janeiro, RJ, Brazil.

One cause proposed for backache in Helicopter Pilots (HP) is the in-flight pilot's posture. While it is suggested by some authors (Aviat Space Environ Med 72(1):38-43) that this posture lead to stress more right than left side of Back Muscle (BM), this was not observed by others (J Biomech 43(10):1309-1315). This study investigates the effect of posture on the electromyogram (EMG) of BM of 12 HP during flights (approximately 2 h) in Bell 412 and S-76 helicopters. The EMG of right and left BM was obtained by bipolar surface electrodes placed 3 cm from the 3<sup>rd</sup> lumbar vertebra bilaterally, registered on a digital recorder and digitized to a

computer. Prior to the flight a Maximal Voluntary Contraction (MVC) test of BM was performed. The Root Mean Square of the EMG of flight was determined for consecutive windows of 0.1 s, and normalized to respective data of MVC (%MVC). The Cumulative Probability Distribution Function (CPDF) of the %MVC was estimated. The mean of %MVC and the probabilities 10%, 50%, 90% of CPDF were determined. Effect of posture on EMG was evaluated by comparing these four parameters of right against left side by t-tests. No significant difference (p > 0.05) between right and left EMG was found for any parameter. Studies comparing right and left EMG of BM in HP show controversial results. Comparison between EMG captured on different sites is a critical concern being the MVC the most powerful method of normalization for such purpose. Thus, the results of the present study allow for a reliable evaluation of the effect of HP's posture on symmetry of BM muscle activity, and this was not observed. Although it has been proposed that increased pain in HP should correlates to difference of right and left BM contraction, this is not corroborated by this study.

#### ACKNOWLEDGEMENT

This study was sponsored by Brazilian Technical Cooperation Program of ICAO and by Brazilian Research Council (CNPq).

# (20) BACK MUSCLE FATIGUE OF HELICOPTER PILOTS DURING FLIGHTS

<sup>1,2</sup> C.G. DE OLIVEIRA, <sup>2</sup>J. NADAL

<sup>1</sup>Physical Activity Science Institute of Aeronautics - Av. Marechal Fontenelle 1200, Marechal Hermes – Rio de Janeiro – RJ – Brazil – CEP: 21740-000. email: cgomes@nuicaf.aer.mil.br

<sup>2</sup>Biomedical Engineering Program, COPPE/UFRJ, Rio de Janeiro, RJ, Brazil.

High prevalence of backache in Helicopter Pilots (HP) has been reported, and attributed to the in-flight pilot's posture and vibration inducing muscle fatigue. In a mockup of UH-1H marginal significant fatigue of back muscle (BM) of HP was found due to posture but not to vibration (AGARD-CP-378:21.1-25.9). Conversely, low activity of BM during short flights of UH50 was reported (J. Biomech 43(10):1309-1315), indicating absence of fatigue. This study investigates fatigue of BM in 12 civil HP during flights (approximately 2 h) in Bell 412 and S-76 helicopters. The electromyogram (EMG) of right and left BM was collected by bipolar surface electrodes placed 3 cm from the 3rd lumbar vertebra bilaterally, registered on a digital recorder and digitized to a computer (sample rate of 1000 Hz). From the spectra of consecutive epochs of 10 s length of the EMG, it was extracted the Median Frequency (MF), forming a time series of MF (TSMF). Evaluation of fatigue was carried out through the study of trends in TSMF performed by Runs Test and by the coefficient of linear regression (C). No trend was detected by Runs Test, and the C values showed that 50% of TSMF increased and 50% decreased, but without statistical significance (p > 0.05). The muscle activities were very low and almost "silent". The literature reports that during fatigue the spectrum of the EMG goes toward low frequencies, reflecting a significant decrease of the MF. This was not observed in the present, indicating the absence of fatigue during the flights investigated. Although it has been proposed that posture or vibration might lead to muscle fatigue producing backache in HP, this was not observed in this study. The mechanical stress suffered by the spine due to vibration in the pilot's posture might be an important causative factor for such disorder.

#### ACKNOWLEDGEMENT

This study was sponsored by Brazilian Technical Cooperation Program of ICAO and by Brazilian Research Council (CNPq).

# (21) RADIOLOGICAL MODIFICATIONS IN THORACIC AND LUMBAR SPINE AND LUMBAR MOBILITY IN SPANISH FIGHTER PILOTS

CARBAYO HERENCIA J.A.\*, VELASCO DÍAZ C.\*\*, SÁNCHEZ NIEVAS G.\*\*\*, ABAD ORTIZ, L. \*\*\*\*

\* Major Flight Surgeon. Albacete AFB

\*\* Major Especialist in Aerospace Medicine. CIMA. Madrid

\*\*\* FEA Rheumatology. Complejo Hospitalario Albacete

\*\*\*\* Head of X-Ray Department. Clinica Recoletas. Albacete

# INTRODUCTION.

Back pain is a frequent symptom in fighter pilots. The main aim of this presentation is evaluate lumbar mobility in fighter pilots and early modifications in the lumbar segment of the spine, detected through normal radiology.

# METHODS.

This is a transversal, analytical and non-experimental study. 30 pilots and 16 military non-pilots (control group), assigned in Albacete AFB were studied. All of them were healthy males of similar age and anthropometric charachteristics. Physical exmination included *tip of the fingers-floor distance*, lumbar extension, right and left lateralization and rotation, as well as simple posteroanterior and lateral lumbar X-ray.

Comparison between means was done by *t Student* for independent groups. When crteria of normality were not reached (*Shapiro Wilks test*) *U Mann.Whitney* test was used. *Squared Ji* was used to evaluate qualitative variables (*Pearson* test or *Fisher* test if the value of any expected frequency < 5). The level of maximum error alfa was stated as =/< 5 %.

# RESULTS.

Are shown in Tables 1 and 2

# CONCLUSIONS.

Lumbar mobility, except for *tip of the fingers-floor distance*, is lower in fighter pilots than in control group. Subcondral irregularities in thoracic spine are found at higher prevalence than in control group

# (22) AIR COMBAT EFFICIENCY FOR FIGHTER PILOTS SUFFERING FROM CERVICAL SPINE SYMPTOMS IN THE ROYAL NORWEGIAN AIR FORCE

K I JAHR<sup>1</sup>, S KLAVENESS<sup>2</sup>, T ALSTAD<sup>3</sup>, A S WAGSTAFF<sup>1</sup>

<sup>1</sup>RNoAF Institute of Aviation Medicine, <sup>2</sup>Rygge Main Air Station, Royal Norwegian Air Force, Norway <sup>3</sup>Bodø Main Air station, Royal Norwegian Air Force, Norway

# INTRODUCTION:

The incidence of Cervical spine symptoms was, for the first time in 2000, studied extensively in the RNoAF. The aim of this study was to identify operational factors related to spinal symptoms and document the correlations between cervical spinal symptoms and other relevant indicators, in order to recommend preventive actions to improve the fighter pilot's working environment. The RNoAF does not use specific procedures for in-cockpit movement techniques.

# METHODS:

An anonymous questionnaire was distributed to fighter pilots in the RNoAF. Totally 147 questionnaires were distributed. The response rate was 71%. The questionnaire includes data on age, flying hours and physical activity. Any experience of spinal symptoms related to flying where included, also detailed questions on the operational factors that were present when acute neck symptoms arose. They estimated to what extent neck symptoms influenced flying perform-

ance. Pilots also described their own in-flight techniques to avoid neck symptoms.

#### RESULTS:

Head movements during high –G load, such as rotation and extension, are associated with neck pain in our study. 51% of the respondents had no limits for head movements during high –G manoeuvres (as previously reported). 25% of the respondents reported to move their head during high-G manoeuvres in only 1 axis at a time, while 21% fixate and keep their head still during such manoeuvres. 18% of the fighter pilots in the study report that consequences of suffering from cervical spine symptoms include limiting their G-tolerance while flying. 19% feel limitations in performing "Check 6" while flying, and 20% feel limitations in flying Basic Fighter Manoeuvres (BFM).

#### CONCLUSION:

The large variation of practises in in-cockpit head movements for the fighter pilots in our study, as well as the reported ratio of limitations during High-G manoeuvres, lends support to the importance of focusing on standardising in-cockpit movement techniques for the fighter pilots in RNoAF.

# (23) OCCUPATIONAL MORPHEA DUE TO EPOXY RESIN EXPOSURE

R.M. Jacubovich, MD, Mocch, M. Zilberberg, Mocch, J. Haviv, MD, Mph, Y. Bar Dayan, MD, Mha, A. Barzilay, MD, N. Yoffe, MD, Mha, L. Goldstein MD Mha.

Lt. Colonel Dr. Yaron Bar-Dayan, MD, MHA, IDF medical corps and Department of Health Systems Management, Faculty of Health Sciences & School of Management, Ben Gurion University of the Negev, Beer Sheva, Israel

#### BACKGROUND:

Scleroderma is a connective tissue disease which has been associated with different occupational exposures.

#### METHODS:

We present a case report of a patient who developed localized scleroderma after occupational exposure to epoxy adhesives.

#### RESULTS:

Physical and histological examinations revealed presence of skin plaques characteristic of morphea, in a disseminated pattern.

#### CONCLUSION:

This case reinforces previous reports that exposure to epoxy resins could provoke localized scleroderma.

# POLICY

# (24) VARIATIONS, EXEMPTIONS AND DEVIATIONS IN THE NETHERLANDS

#### H.J.MEIJER

AEROMEDISCH INSTITUUT, KLM ARBO SERVICES SCHIPHOL AIRPORT THE NETHERLANDS

Experience with variations, exemptions and deviations under the JAR.FCI.3. have been gathered by the Dutch Aeromedical Institute, since the JAR.FCL.3. was introduced in the Netherlands on oct.1<sup>st</sup> 1999.

How the Aeromedical Institute handled and dealt with these issues,0 including the experience with the interpretation of the JAR.FCL.3 by the national authority, is presented in the form of examples.

# (25) USE OF ADULTERANTS AND SPECIMEN SUBSTITUTION TO AVOID DETECTION DURING DRUG TESTING AMONG AVIATION PERSONNEL

#### M. J. ANTUÑANO, M.D.

Director, FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, U.S.A.

FAA and aviation industry personnel who occupy safety-sensitive positions are subject to mandatory screening for drug use. Since the implementation of these drug screening programs in the U.S., the FAA has identified a number of aviation employees who have used a variety of adulterants or who have substituted specimens in an attempt to avoid detection when they were tested for drug use. The U.S. Department of Transportation revised the drug testing regulations to address the use of validity testing designed to deter and detect attempts to adulterate or substitute specimens. Following this DOT revision, a U.S. Congressional Committee expressed their concern that employees subject to drug testing could inadvertently fail the validity testing standards due to medical treatments, medical conditions, working conditions, dietary habits, or individual biological differences such as gender and ethnicity. Therefore, this Committee directed the DOT to conduct a comprehensive study of validity testing to ensure the highest level of accuracy in all DOT drug testing programs for transportation employees. In response to this Congressional mandate, the FAA Civil Aerospace Medical Institute organized and conducted a "Workplace Urine Specimen Validity Testing Colloquium". This presentation will provide a description of the most common adulterants as well as specimen substitution methods used by individuals subject to drug testing, a summary of the current validity testing standards, and listing of the preliminary recommendations from the Workplace Urine Specimen Validity Testing Colloquium regarding future validity testing.

# ASSESSMENT

# (26) OCULAR HEALTH PROFILE OF THE NORWEIGIAN PROFESSIONAL PILOT POPULATION. ONE YEAR EXPERIENCE WITH A NEW CERTIFICATION

DATABASE

J. BECKRÖGE MD\*, P. ARCA MD\*\*

\*Ophthalmologic Section, RNAF Institute of Aviation Medicine, Oslo, Norway. \*\*Medical Director, Civil Aviation Authority, Oslo, Norway

**OBJETIVE**: To obtain a complete description of the ocular health profile among professional pilots in Norway, we used a new software application which allows collecting and storing ocular health data related to the European JAR-FCL 3 (medical) requirements. The stored information can be divided into a wide range of administrative and medical data, being used for both quality assurance and research purposes.

**METHODS:** In Norway all professional pilots have to undergo both and extended medical examination at the RNAF Institute of Aviation Medicine in Oslo. The ophtalmological examinations are performed by certified ophthalmologists. Results and findings according to JAR-FCL requirements are logged into the database. Additional parameters, e.g. refractive surgery, contrast sensitivity, nyctometry and additional color testing methods, can be registered if required.

**RESULTS:** 1198 professional pilots (helicopter/fixed wing/military) were examined. Of these, 1064 (88.9%) were renewal examina-

tions and 134 (11.2%) initial. The total number of examinations in the age group from 20-29 years totalled 192 (16%), in 30-39 years 218 (18.2%), in 40-49 years 471 (39.3%), in 50-59 years 279 (23.3%) and 38 (3.2%) in the group of over 60 years. Based on the ICD10 diagnostic system, 1678 diagnoses were registered. Refractive errors were diagnosed in 1426 (85%) of the cases. Pathological conditions in the periorbital and anterior segment were found in 111 (6.6%) of the cases and 10 (0.6%) in the posterior segment. Other ophthalmologic pathological conditions were found in 131 (7.8%) of the cases. Both medical and administrative findings will be discussed in detail.

**CONCLUSION:** This new software application provides a description of almost all present values and information in the database. A longitudinal as well as cross-sectional review of the population or parts of the population and health development over time in individual cases is easily performed by queries.

# (27) EXPERTISE MÉDICALE AÉRONAUTIQUE: UN CONCEPT ÉVOLUTIF

#### C. ROUMES, S. HOURLIER, S. BUFFAT, G. POYOT

Institut de Médecine Aérospatiale du Service de Santé des Armées, BP 71, 91223 Brétigny-sur-Orge Cedex, France

L'expertise médicale a pour objectif de vérifier l'absence de processus pathologiques ou de dysfonctionnements susceptibles de compromettre la sécurité des vols. L'analyse, éclairée par des exemples, porte sur les multiples facteurs qui limitent dans le temps la validité des méthodes d'investigation pratiquées.

Les bases du processus d'expertise sont présentées. Elles reposent sur trois composantes: l'étude du contexte d'emploi identifie les contraintes subies par l'opérateur; l'analyse des propriétés fonctionnelles de l'opérateur met l'accent sur les tests d'évaluation spécifique à développer et sur leurs différences par rapport aux tests fonctionnels cliniques; la prise en compte des connaissances théoriques les plus récentes, tant dans le domaine des pratiques thérapeutiques que dans celui des sciences fondamentales, permet de sélectionner les critères analysés et les procédures d'évaluation.

La nature dynamique de la démarche est ensuite soulignée. Elle est due aux transformations épidémiologiques et sociologiques de la population concernée, aux changements dans l'activité (cycles d'activité, automatisation, multiplication des sources d'information, ...), aux progrès thérapeutiques. Elle impose qu'un regard critique soit continuellement porté sur la valeur prédictive des investigations pratiquées.

Enfin, les acteurs d'une mise à jour de la démarche d'expertise sont identifiés ainsi que leurs responsabilités respectives. Il revient au médecin œuvrant au contact des opérateurs (médecin de compagnie aérienne, de base aérienne, expert médical, ...) d'isoler les contraintes physiologiques et psychologiques extrêmes de l'activité et de suivre l'effet sur les opérateurs de l'introduction de nouveaux équipements. Il est l'élément déclenchant d'une démarche de mise à jour. Le chercheur analyse les contraintes; il explicite les fonctionnalités humaines mises en jeu et en déduit les dimensions à évaluer. Le spécialiste clinicien identifie les processus pathologiques associés aux conditions d'emploi, cerne les limites des techniques d'évaluation existantes, notamment pour l'évaluation fonctionnelle. L'action concertée des différents acteurs est essentielle car leur contribution est complémentaire.

# PHYSIOLOGY

# (28) EFFECTS OF RAPID DECOMPRESSIN CHANGES IN THE ATMOSPHERIC PRESSURE ON THE INNER EAR OF GUINEA PIG; HISTOPATHOLOGICAL STUDY.

#### ASHRAF SALAH EL-DIN, MD

Consultant Otolaryngology, Air Forces Hospital & Aero-Medical Institute Cairo Egypt

During air travel, many people are exposed to large variations in atmospheric pressure, which may lead to inner ear barotraum resulting in auditory & vestibular disorders.

The objectives of this work is to find out the histo-pathological changes in Guinea Pig inner ear after gradual decrease or increase followed by rapid increase or decrease in ambient pressure & to correlate these changes with possible causes.

#### **METHODS:**

70 Guinea Pigs were used to study the histopathological changes in the inner ear that might occur due to exposure to rapid changes in atmospheric pressure. We used the hypo baric chamber in the Airmedical Institute.

#### **RESULTS:**

Animals were divided into many groups. Many histopthological findings were detected including: hemorrhage in Scala Tympani &/ or vestibulae, rupture of round window membrane, rupture or collapse of Reissner s membrane, damaged stria vascularis & others.

#### CONCLUSION:

Rapid decompression may cause many histo-pathological defects in the inner ear with the subsequent auditory & vestibular problems.

# (29) PRECONDITIONING ATTENUATED HIGH G-INDUCED BEHAVIOR DISTURBANCE IN THE RAT

LI, M.H., S.C. CHEN, C.Y. LEE AND Y.C. WU.

Institute of Aerospace Medicine, National Medical Defense Center, Taipei, Taiwan, R.O.C.

#### INTRODUCTION.

The highly maneuverable property of jet fighter could let physiological tolerance of human to acceleration (+Gz) be easily exceeded, resulting in G-induced loss of consciousness (G-LOC) due to insufficient cerebral blood flow. The impact of G-LOC was severe to the pilot and flight safety. Some studies had showed that experienced pilot had higher tolerance to G-force. However, the mechanism was unclear. In this study sustained acceleration (+Gz) was applied to rats and induced brain injury. The effect of preconditioning on +Gz induced brain injury and behavior disturbance was studied.

#### METHODS.

Male SD rates (G-LOC group) were subjected to 5 min of 15 +Gz exposure and experienced G-LOC. Motor performance and memory retention test were administrated one day before and after G-exposure. The effect of preconditioning (precondition group), 2 times of 30 sec 15+Gz exposure (with interval of 10 min) followed by 10 min rest, on G -induced brain injury and behavioral disturbance was quantified.

#### RESULTS.

Sustained high-G exposure significantly impaired the motor performance measured by screen test, prehensile-traction test and balance bean test with reductions of muscle strength as  $75 \pm 8 \%$ ,  $77 \pm 5 \%$ , and  $87 \pm 5 \%$ , respectively (p<0.001 for all three test). The memory retention measured by the water maze was also disturbed by G-exposure with prolongation of time as  $550 \pm 120 \%$  (p<0.001). Preconditioning significantly decreased the impairment of Ginduced behavior disturbance with the reductions of muscle strength as only  $20\pm 6 \%$ ,  $15\pm 8 \%$ , and  $65\pm 3 \%$ , respectively (p <0.001, <0.001, and <0.05) and with prolongation of memory retention times as only  $97\pm 17 \%$  (p < 0.001).

#### CONCLUSION.

Preconditioning attenuated G LOC-induced behavioral disturbance including motor performance and memory retention.

# (30) BLOOD PRESSURE AND CENTRIFUGE EXAMINATION

ZAWADZKA-BARTCZAK E. MD PHD, KOPKA L.MD PHD

Polish Air Forces Institute of Aviation Medicine, Department of Internal Disease, Warsaw, Poland

#### BACKGROUND:

During the acceleration onset in +Gz axis blood is displaced towards the lower parts of the body and the compensatory reflexes provoke generalised vasoconstriction. The increase in blood pressure provided by the standard centrifuge examination is caused by the both contraction of the muscles of the lover body and by an increased intrathoracic pressure during Valsalva maneuver and the cardiovascular autonomic system also by heart rate changes indirectly.

The aim of this study was gaining of the answer to question: is there a relation between heart rate and blood pressure changes during interval test in centrifuge.

#### METHODS:

Heart rate (HR) and blood pressure (BP) values of 40 pilots obtained during the tests were assessed. Correlation between means HR and mean BP during each step of procedure: before, during the top and after each interval was estimated.

#### RESULTS:

The average baseline (b), top (t) and end (e) HR and BP systolic (s) and diastolic (d) in relation to +Gz is shown in tables 1 and 2. It was found the lower values systolic and diastolic BP in the top and the end +7Gz interval. Statistical analysis non-showed significant correlation between HR and BP changes.

#### CONCLUSIONS:

We concluded that heart rhythm oscillations haven't determined value blood pressure during +Gz acceleration. The lower values blood pressure during the higher +Gz accelerations may be due to progressive insufficiency of compensatory reflexes.

# (31) THE USEFULNESS OF THE LBNP TEST IN THE DIAGNOSIS OF ISCHEMIC HEART DISEASE IN AIRCREW

#### ZAWADZKA-BARTCZAK E. MD PHD, KOPKA L.MD PHD

Polish Air Forces Institute of Aviation Medicine, Department of Internal Disease, Warsaw, Poland

#### INTRODUCTION:

It is not difficult to recognize coronary heart disease in case of typical symptoms or changes in standard or exercise ECG and associated disturbances of ischemic myocardial contractility. As we know however, there are also some atypical cases of ischemic heart disease with nonspecific changes of ST-T segment in standard and/or exercise ECG test that do not meet the criteria of ischemia. Modern medicine seeks new, sensitive, reproducible and noninvasive methods of coronary artery disease diagnosis at different levels of its pro-

gression. **The aim** of the study was the assessment of the usefulness of Lower Body Negative Pressure /LBNP/ and isotopic exercise tests in the diagnosis of ischemic heart disease, particularly when qualifying patients for coronarography.

# MATERIAL AND METHODS:

In 10 men aircrew members aged 32-57 /average 45/ we examined because of symptoms and/or ST-T changes in exercise ECG test, that suggested coronary heart disease. In all subjects we excluded arterial hypertension, valvular pathology, cardiomyopathy and diabetes mellitus. The examination comprised standard and exercise ECG, echocardiogram - initial - during fast pacing of atrium and during exposure to LBNP of -40 mm Hg / in individual cases of -60, -70 and -80 mm Hg / and exercise heart scintiscan. In cases of myocardial contractility disturbances, noted during the LBNP test, or positive results of scan study, coronarography was carried out.

#### **RESULTS:**

The results are presented in table 1.

Disturbances of myocardial contractility, confirmed by echocardiography, were observed in 5 subjects during the tests with simultaneous application of LBNP and fast atrial pacing. Changes in coronarography were noted in 4 subjects, but only in 2 cases the contractility and perfusion disturbances were explained by the type of vascular lesions. In both cases, contractility disorders occurred during effort / LBNP, stimulation / tests, carried out at different time while the scintiscan results proved perfusion impairment.

#### CONCLUSIONS.

1. LBNP test may be useful in coronary heart disease diagnosis and when classifying pilots for coronarography,

2. Isotope examination with MIBI is of little use in the diagnosis of isolated changes of ST-T segment during exercise ECG and/or atypical chest pain and does not seem to satisfy the demands of aeromedical certification.

# (32) COMPARISON OF CARDIOVASCULAR RESPONSE TO + AND – GZ LOAD CHANGES AT SAFE AND LOW ALTITUDE LEVEL DURING REAL FLIGHT

DOSEL P., HANOUSEK J., PETRICEK J., CMIRAL J., CETTL L.

Institute of Aviation Medicine. Prague. Czech Republic

# INTRODUCTION:

Ability to follow terrain at the low level flight is an attribute of some types of modern aircraft. A new quality of the flying load is represented by + and –Gz changes. The tolerance to this type of the load is not simply derive from the level of relax +Gz tolerance. The evaluation of the heart rate and blood pressure to the above mentioned load during the real flight was selected.

# METHODS:

Group of 6 Czech Air Force pilots was examined during two sinusoidal flights using L-59 aircraft. Each flight was realised at two flight levels: the safe altitude at 7 000 ft and low level at 900 ft. Each pilot accomplished the first flight as a passive pilot and the second as an active (flight) pilot. The amplitude of Gz load reached values from -1,5 to +3,5 Gz. Each pilot was exposed to 15 cycles of repetition. Using anti-G trousers was not allowed. The continual measurement of heart rate (HR) and blood pressure (BP) was realised using Portapres device.

# **RESULTS**:

Most pilots underwent both sinusoidal flights without significant problems. One pilot suffered from nausea. Typical courses of HR and BP changes were obtained during the load. The repetition of the load cycles did not change quality of HR and BP response. We have nei-

ther seen significant HR and BP changes at altitude 7 000 ft nor at 900 feet. The influence of pilot's activity of HR changes was not found but BP values were higher during the active pilotage. We observed typical changes of HR and BP that correspond to push – pull effect during alternation of the acceleration vector. HR sensitively reacts to any deflection of flight trajectory.

### CONCLUSIONS:

The influence of earth surface imminence did not manifest any effects on HR and BP response during sinusoidal flight. Push – pull effect was demonstrated during the mentioned load. Pilot's activity did not influence on HR changes and provoked insignificant increasing of BP. HR is very good marker of acceleration vector changes.

# (33) INCIDENTS OF ANTI-G SUIT FAILURE DURING HUMAN CENTRIFUGE TRAINING

YI-WEN SHEEN, HAW-JANG LIU, SHIOW-JIN FU, TE-SHENG WEN

Aviation Physiology Research Laboratory, Armed Force Kang-Shan Hospital. Kang-Shan P.O. Box 90383, Koa-Hsiung 820, Taiwan, R.O.C.

#### INTRODUCTION.

Currently, ROCAF adopts two different types of anti-G suit including CSU-13B/P and AERAZUR-820 for their high performance fighter pilots. These life support personnel equipment can afford 1.5~2.0 G protection during high–G maneuver. The effectiveness of protection depends upon the uniform body pressurization when G-suit inflates. Any factors affecting the rigidity of texture will attenuate the inflation pressure of bladders.

#### METHODS.

This study was to investigate the potential risk of G-suit malfunction while exposed to high-G stress by reviewing 1,030 files of human centrifuge original phase training conducted from 1996 to 1999.

#### RESULTS.

There were 22 cases of G-suit failure occurred during the high-G tolerance training in that period of time. Among them, 3 episodes of Gloss of consciousness (G-LOC) were brought about by damages to its pneumatic bladders. The causes of damage covered wore texture (N=18), loose zipper fasten (N=2), careless stab (N=1), and leak connector (N=1). The wound site mostly lied at the waist bladder (54.6%). In addition, we noticed that 15 cases of G-suit rupture occurred in those trainees were overweight or obese.

#### CONCLUSION.

It is at stake to wear a broken or unfit G-suit for flying a high-G mission. The personnel equipment technician and aerospace physiologist should inspect its availability regularly. Fighter pilots should watch their body weight and suit themselves for a well-fit G-suit. We consider that human centrifuge can be a proper measure for diagnosing the function of individual G-suit.

# (34) COMPARISON OF PHYSICAL FITNESS FOR CENTRIFUGE RIDER MATCHED WITH SIMILAR CONDITIONS

TE-SHENG WEN, CHIEN-LIANG CHEN, MIN-TE LEE, CHENG-HSUEN HUNG, HAW-JANG LIU

Aviation Physiology Research Laboratory, Armed Force Kang-Shan Hospital. Kang-Shan P.O. Box 90383, Koa-Hsiung 820, Taiwan, R.O.C.

#### INTRODUCTION.

Human centrifuge has provided a practical tool for evaluating +Gz tolerance of fighter pilots. However, some confounded factors

including stature, gender, age, muscle mass, anti-G straining maneuver (AGSM), flight hours, and motivation should be combined into consideration when determining individual G-level tolerance.

# METHODS.

The records of original phase centrifuge training from 180 jet fighter pilots were selected in this study. They were divided into two groups matched with age ( $\pm$ 5 ages), height ( $\pm$ 5 cm), G-load of aircraft (same model), skill of AGSM (good grading), and centrifuge experience (first ride). Gr.1 (N=45) consisted of subjects who completed all mandatory profiles (3 profiles) and all option profiles (2~3 profiles). Gr.2 (N=45) consisted of subjects who only completed all mandatory profiles, but not all option profiles. Their body fat, lean body weight (LBW), body mass index and anaerobic capacity (AC) were measured using body composition analyzer and bicycle ergometer respectively.

# RESULTS.

In general, no significant difference in anaerobic capacity and body composition was found between Gr.1 and Gr.2. But positive correlation between LBW and AC was statistically significant. When focusing on ages 31~40, higher peak power (significant) and average power (insignificant) of low extreme were observed in Gr.1. Both relaxed and straining G tolerances were also significantly greater in Gr.1.

# CONCLUSION.

These results indicate that better conditioning of low extreme and higher lean body weight will be beneficial to individual + Gz tolerance and endurance. It might be due to more muscular tension development and less physical fatigue. However, motivation could not be ignored as a psychological factor for going through the challenge.

# (35) EXPERIENCES WITH A TIME AND MOVEMENT ANTICIPATION TEST IN HYPOBARICS HYPOXIA

A. GRÓSZ\*, J. HORNYIK, E. TÓTH, S. SZABÓ, A. POZSGAI

\*Dept. of Aerospace Medicine, Univ. of Szeged, Hungary Aeromedical Hospital Kecskemét, Hungarian Home Defense Forces

# INTRODUCTION:

In our earlier studies we monitored the evolution of visuomotor performance in military air pilots, using the Schuhfried Two-Hand Coordination Test in hypobaric hypoxia, which situation we considered as a well-controllable physiological stress. We found that pilots aim at maintaining their coordination performance in the course of task resolving. An important factor of the evolution of visuomotor working activity is the perception of time and motion with special regard to how much the subject is able to predict the consequences of his activity on the basis of the sensual impressions obtained. According to our working hypothesis, those subjects will give quick, precise and well-coordinated responses in the two-hand test, whose abilities serving prediction are also significantly better. Our actual goal was to draw conclusions in connection with the time and movement anticipation (ZBA) test, and to determine levels for criteria.

# MATERIALS AND METHODS:

The ZBA test was performed by 22 practically healthy, male helicopter pilots with a mean age of 37 years (r=1.7). We had 11 subjects as control group (0 m) and 11 subjects performed the test in a hypobaric environment at a simulated altitude of 5500 m, during a hypoxia loading of 15 minutes.

#### RESULTS:

The two groups can be separated as according to our expectations. With the current population size, however, the traditional statistical analysis did not show significant differences. In terms of trends, time anticipation declines slightly, and direction anticipation declines to a grater extent. The trend of time anticipation contradicts to our expectations, as – due to the effect of stress on time perception – we expected a more marked deterioration in terms of this variable.

#### CONCLUSIONS:

1. ZBA might be a suitable element of a test battery applied in the circumstances of hypobaric hypoxia, e.g. an auxiliary element to the two-hand coordination test.

2. Further studies are necessary determine standards and criteria levels for ZBA, in order to increase the number of subjects, and for multi-factor data analysis.

# (36) G-LOC: PROMISES FOR A NEW PREDICTION METHOD?

RS MIKULISZYN<sup>1</sup>, M ?EBROWSKI<sup>2</sup>

<sup>1</sup>Polish Air Force Institute of Aviation Medicine, Warsaw, Poland <sup>2</sup>Civil Aviation Authority, Warsaw, Poland

# INTRODUCTION:

G-LOC is an unwanted episode in every military pilot's life. It still happens, however. Every effort is made within the aviation medicine community to protect and counteract it. The best method would be to predict its occurrence which would allow to act before it actually happens.

#### METHODS:

20 young, healthy students volunteered to participate in the study. They were subjected to a set of profiles (GOR profile [0.1 G/s] and SACM profile [3.0 G/s]. Two boards were mounted in the gondola, in front of the subjects. The boards were placed so that they remained within the central visual field. A set of different words was written on both the boards. Throughout the acceleration profiles subjects were to read aloud words from the left and right boards in a predefined sequence. Subjects' eye movements were monitored by the oculographic device, Jaz (Ober Consulting, Poland). All rides were terminated when loss of eye fixation movements had occurred.

#### RESULTS:

Irrespective of the acceleration profile type all subjects had no troubles with reading the words until their individual G-tolerance limit (GTL) had been almost reached. At that particular moment similar pattern was observed in all subjects. As they got closer to GTL time required to fixate their gaze on an appropriate word lengthened. Few seconds before N-LOC (defined as inability to continue the reading task despite preserved vision) or G-LOC were to occur eye fixation movements ceased in all subjects. As the G-load decreased all subjects regained ability to read.

#### CONCLUSIONS:

Eye movements, especially fixation movements could be of value in G-LOC prediction.

# (37) SPATIAL DISORIENTATION AND POSTUROGRAPHY

SÁZEL, M., CETTL, L., INSTITUTE OF AVIATION MEDICINE PRAGUE, CZECH REPUBLIC

Spatial disorientation (SD) continues to be a large problem in military and civilian aviation. SD training remains the main solution of copying with this effect. The most of this training can be done at a special trainer. Some influence of SD during the flight can shortly persist after this training [1, 2]. The aim of a research project is to elaborate the true aeromedical training system with the SD trainer GYRO IPT II. Potential unfavourable effects of SD training will be

also found out. Medical monitoring console will be used to measure pilot's physiological reactions during and after the flight. Changes of reactivity of vestibular system will be evaluated by posturography.

Static posturographic measurement of 163 pilots was prepared for the present. They were evaluated 50 s with eyes opened and closed. Parameters of Way, Area, AnterioPosterior/Lateral Rate (APLR), Romberg Way and Romberg Area (RA) were measured. Statistical evaluation was done for comparison of pilots of different types of aircraft and pilot candidates (PC). Pilot's age was also taken into consideration.

Parameter of APLR shows significantly lower value at PC group than at the other groups. RA was higher above the age of 35 years.

The former difference between groups of pilots was not found [3]. The influence of no rubber foam pad for enhancement of vestibular component is speculated. Because obvious influence of vestibular system could be expected after SD flights, this pad will be used in future.

Implementation of optimal SD training will be the result of the whole project. And some influence of SD on posturography will be also expected.

# (38) RESULTS OF COMPUTERIZED DYNAMIC POSTUROGRAPHY IN CADETS VERSUS EXPERIENCED SPAF PILOTS

# B. ESTEBAN BENAVIDES, P. VALLEJO DESVIAT, J. M. LORENTE, F. RÍOS TEJADA.

Aerospace Medicine Instruction Center (CIMA). Madrid, Spain.

#### BACKGROUND.

Physiological training/demonstration in spatial orientation is gaining bigger relevance day after day. There is a need for a better understanding of the effects caused by these trainers on the equilibrium and coordination of the pilot and the consequences that it would have on his flight activity and on flight safety.

# OBJECTIVE.

The aim of the present work has been to study the response of the visual, somatosensorial and vestibular patterns in cadets versus experienced pilots after exposing them to diverse profiles of spatial disorientation (SD).

# MATERIAL AND METHODS.

The control of balance of 115 subjects (55 cadets and 60 experienced SPAF pilots) was evaluated by Computerized Dynamic Posturography (CDP) after exposing them to the Gyro IPT II trainer. A survey evaluating aviator SD and motion sickness episodes, flight experience, and others personal data were also collected.

#### RESULTS.

The vestibular response after stimulation was the most affected. We obtained a mean for the vestibular pattern lower in pilots than in cadets.

#### CONCLUSIONS.

The results of the CDP have shown the functional state of balance in pilots after SD exercises. It was evidence in pilots a higher dependence on the visual information for maintenance of balance and to overcome SD phenomenons.

# (39) PHYSICAL WORK CAPACITY EVALUATION IN BULGARIAN AIR FORCE PILOTS – A REVIEW

# R.L. NANCHEVA

Military Medical Academy – Department of Aviation Medicine Sofia, Bulgaria

The physical fitness level determines a scientific grounded and an exactly idea from current point of view about the human possibili-

ties to perform work for a long period of time. Therefore the aerobic power /VO<sub>2max</sub>/ of military pilots represents an important goal and a source of information for the aeromedical specialists. The investigation of physical work capacity /PWC/ of Bulgarian military aviators started with a pilot study in 1984, which has worked out a combined method for direct measurement of VO<sub>2max</sub>, consisting of maximum cycleergometry and a synchronous, directly computer registration of VO<sub>2</sub> and its derivates.

During the period 1988-90 the age adjusted group standards of aerobic power were developed. They contain 7 fitness classes. According to them practically all Bulgarian pilots have good and very good physical fitness level.

Due to the labor consuming process and to the big price of the direct measurement as well since 1996 an yearly submaximal testing on veloergometer was introduced for every aviator during his stay at the mountain fitness home of Bulgarian Air Force "Borovetz".

Since 1997 started the process of determining of individual standards of PWC in the Air Force cadets. So the aeromedical evaluation will have a correlation basis for the fitness level of military pilots after years.

The conducted specific aeromedical investigations /hypobaric chamber, breathing under high-pressure, human centrifuge, Barany chair, psychological tests/ showed better results in aerobic trained pilots.

The regular establishment of  $VO_{2max}$  brought to a better motivation and an enhancement in the aerobic power preferably of younger Bulgarian pilots.

# (40) IS NAIL POLISH RISKFUL FOR PILOTS WHEN USING PULSE OXIMETRY TO MEASURE OXYGEN SATURATION?

J. HINKELBEIN, F. FIEDLER

Institute of Anaesthesiology and Intensive Care Medicine, Faculty of clinical Medicine, University Hospital Mannheim, 68167 Mannheim, Germany; hinkelbein@akutmedizin.de

# INTRODUCTION:

Today pulse oximetry is becoming increasingly important in General Aviation for "high-altitude-flights" when using supplemental oxygen. Nail polish, applied on fingernails, can interfere with the measurement [1] and may potentially lead to faulty results [1, 2] with the risk of hypoxia due to under dosed oxygen. The aim of our study was to quantify the influence of nail polish for pulse oximetry.

# METHODS:

50 patients of our intensive care unit participated. In these 9 of 10 fingernails were painted randomised with different colors (black, dark green, purple, dark blue, red, light blue, colorless, light green and yellow). The remaining unpainted 10<sup>th</sup> finger served as reference. Oxygen saturation was measured simultaneously on each finger via pulse oximetry (SpO<sub>2</sub>, Sirecust SC1281, Siemens/Germany) and via an arterial blood gas sample (SaO<sub>2</sub>, Radiometer 625, Copenhagen/Denmark). The potential error of measurement (bias) was defined as ?S=SaO<sub>2</sub>-SpO<sub>2</sub>. The mean bias of each color was compared to mean SaO<sub>2</sub>. Statistical analysis was performed with the t-test for paired values (Statistika<sup>®</sup>), p<0.05 was supposed to be significant.

#### RESULTS:

50 patients (32m, 18f, 59±14 years) participated. Mean  $SaO_2$  (97.8±1.3%) correlated well with the mean  $SpO_2$  of the unpainted finger (?S=+0.3±1.6%). The largest effect had the colors black

(?S=+1.5±3.1%), purple (?S=+1.0±2.5%) and dark blue (?S=+0.9±3.6%). All other colors had less effect (?S<1%, always SpO\_2<SaO\_2).

# CONCLUSION:

The actual oxygen saturation will be underestimated if nail polish is applied on fingernails, which would implicate a beneficial higher oxygen rate per minute. Nail polish needs not to be removed when using pulse oximetry for monitoring the oxygen saturation.

# (41) NAIL POLISH AND AVIATION? EVALUATION OF A METHOD TO ELIMINATE FAULTY RESULTS OF OXYGEN SATURATION DETERMINED BY PULSE OXIMETRY

# J. HINKELBEIN, F. FIEDLER

Institute of Anaesthesiology and Intensive Care Medicine, Faculty of clinical Medicine, University Hospital Mannheim, 68167 Mannheim, Germany; hinkelbein@akutmedizin.de

# INTRODUCTION:

Pulse oximetry is becoming increasingly important to determine the oxygen saturation of pilots in General Aviation. Hereby nail polish may produce faulty results of oxygen saturation determined by pulse oximetry [1]. Both reliability and variability may be impaired significantly. To rotate the probe by 90 degrees might eliminate faulty results [2]. The aim of our study was to evaluate this procedure.

# METHODS:

Nail polish was painted on 9 of 10 fingers in intensive care patients (randomised 9 different colors, one unpainted nail served as reference). Oxygen saturation was measured on each finger in the normal way (SpO<sub>2</sub>) and additionally rotated by 90 degrees ( $^{90^{\circ}}$ SpO<sub>2</sub>). Furthermore an arterial blood gas analysis (SaO<sub>2</sub>) served as "gold-standard". The bias of measurement was defined as B=SpO<sub>2</sub>-SaO<sub>2</sub> and  $^{90^{\circ}}$ B= $^{90^{\circ}}$ SpO<sub>2</sub>-SaO<sub>2</sub>. Values with B>±2% were selected and furthermore investigated. Statistical analysis was performed with the t-test, p<0.05 was defined as significant. The local ethics committee gave approval.

# **RESULTS**:

In 10 patients (5m, 5f, 64±12 [42-76] years old) a mean SaO<sub>2</sub> of 97.7±1.1 [95.6-99.3]% was measured. In 40 out of 100 values the calculated bias was more than ±2%. In these values bias was calculated as B=-2.8±3.7 [-9.5 to +2.8]% (n=40), after a rotation by 90 degrees as  $90^{\circ}$ B=-1.3±2.2 [-4.6 to +1.4]% (n=40, p>0.05). Significance was not achieved.

# CONCLUSION:

Rotation of the sensor probe by 90 degrees does not safely eliminate faulty results produced by nail polish in pulse oximetry. We recommend therefore removing nail polish before flying, if exact oxygen saturation is essential for the pilot in flight.

# (42) RAPID DECOMPRESSION PROFILES FOR POLISH AIRCREW – STANAG'S 3114 IMPLEMENTATION.

# J. LASZCZYNSKA, G. KEMPA

Polish Air Force Institute of Aviation Medicine, Warsaw, Poland

# INTRODUCTION.

Rapid decompression (RD) physiological effects like hypoxia, hypothermia, lungs, ears and sinuses barotrauma in most cases can be overcome by introducion flying personnel training with

rapid decompression exposition. In connection with putting into service a rapid decompression chamber in Aviation Physiology Department of the PAFIAM, study were complited to determine safe and effective RD profiles for aircrew aeromedicla training purposes.

# METHODS.

Study were performed with the group of 15 male, volunteers, mean age 23.4  $\pm$  3.4, qualified as "fit to fly" by the Main Aero-Medical Board. Study protocol was consisted from ear and sinus check, adaptation (20 minutes), and then RD from the 115m o.s.l. to 3000m o.s.l ("low decompression") and from 3000m o.s.l. to 7000m o.s.l.("high decompression") in time 2, 4, 12 and 14s (breathing ambient air in the "low" and 100% oxygen in the "high" decompression). Physiological parameters: blood pressure, heart rate, total periphery resistance and blood oxymetry were continuously measured during entire experiment for medical evaluation. Psychological tests (choice reaction time and tracking test) were performed before RD, during RD and after altitude hypoxia exposure.

# RESULTS.

None of the experimental profiles caused decompression sickness symptoms. In every profile increase of heart rate, systolic and diastolic blood pressure after RD was observed and compared to control level. Slightly less pointed out range of changes during 2 and 14 s profiles was observed. Mean total periphery resistance values increased more effectively in 2 and 4 s "low" and 12 and 14 s "high" decompression profiles. RD casued transcient increase of the choice reaction time and decrease in tracking test performance.

# CONCLUSIONS.

Our study showed that used RD profiles were safe for examined subjects. Based on our study and other NATO countries experience we worked out rapid decompression training for aircrew programme consisted from theoretical lectures and practical exposition.

# (43) THE EFFECT OF ANTICYANOSIDES – MIRTILENE SIFI – ON RETINAL SENSIBILITY AT HEALTHS SUBJECTS.

MAJOR ILIUTA CRISTINA M.D. MAJOR NICODIN AURORA M.D. COL. MACRI MARIAN M.D.PH.D.

# National Institute of Aeronautical and Spatial Medicine. Bucharest ROMANIA

# INTRODUCTION:

To evaluate the effect of anticyanosides on retinal sensibility on visual dark.

# METHODS:

Our study involve 15 normal oftalmologycal subjects, aeronautical personnel, when take 4 doses a day of Mirtilene –SIFI (dry hidroal-coolic extract from vaccinum myrtillus) for 15 days. The assessment of the efficiency of this drug on visual performance was made by comparison of the results (before and after the administration) obtained by testing the retinal sensibility (Treshold Central 30-2, Humphrey visual field analyzer) and the adaptation ability to dark of the retina.

#### **RESULTS**:

The results show the real efficency of the drog on both the parameters.

#### CONCLUSIONS:

This study releved the beneficial effect of Mirtilene on aeronautical personnel.

# (44) COMPUTER SIMULATION TO OPTIMIZE THE PERFORMANCE OF AN ANTI-G SUIT

#### MUNNA KHAN\*, A. SALHAN\*\* AND S.K. GUHA\*\*\*

\* Sr. Lecturer, Department of Electrical Engineering, Faculty of Engineering & Technology, Jamia Millia Islamia (Central University), New Delhi-110 025, India. \*\* Scientist-E, Defence Institute of Physiology and Allied Sciences, Lucknow Road, Timarpur, Delhi-110 007, India. \*\*\* Professor, Centre for Biomedical Engineering, Indian Institute of Technology Delhi (IITD), New Delhi -110 016, and All India Institute of Medical Science, New Delhi-110 049, India

Anti gravity (G) suit and positive pressure breathing during G (PBG) are protective methods to increase the G tolerance of an aircraft pilot. Recent crashes of aircrafts because of G Loss of consciousness (G-LOC) indicate that current straining maneuvers plus above counter measures are inadequate. The profile of pressurization is not according to actual blood pooling of the pilot. Therefore an attempt has been made to investigate the pressurization of anti-G suit using SIMILINK part of MAT lab software. Ramp signal generator was used to simulate blood pooling of the leg segment in the range of 0-500 ml. The blood pooling of leg segment and G forces were combined by logic theory and fed as input signals to electronic controller. The resultant signal was converted to a digital code in the priority encoder and then converted to analog signal by digital to analog converter. This analog signal passed through the pressure selector depending on which suit pressure is generated. The computer simulation made the working of an anti-G suit into close loop operation taking blood pooling as physiologically input signal to the controller. The output of controller selects suit pressure in the range of 100-170 mm Hg for the blood pooling upto 100 ml. Other suit pressure ranges are 175 – 225 mm Hg, 325-400 mm Hg, 450-525 mm Hg, and 500-600 mm Hg for the blood pooling upto 200, 300, 400, and 500 ml respectively. Anti G-suit deflates as soon as blood pooling falls below defined range. The computer simulation has resulted different flexibility of controller design and optimized the performance of an anti-G suit. The findings would be used further to develop a biofeedback controller for anti-G suit.

# (45) HYPOXIA AND THE FRONTAL BRAIN

L. BALÁZS<sup>1</sup>, A. GROSZ<sup>2</sup>, I. CZIGLER<sup>1</sup>, E. TÓTH<sup>3</sup>

<sup>1</sup> Institute for Psychology of the Hungarian Academy of Sciences, Budapest, Hungary

<sup>2</sup> Aeromedical Department, University of Szeged, Hungary

<sup>3</sup> Aeromedical Hospital HDF, Aeromedical Research Unit, Kecskemét, Hungary

Influence of simulated high altitude conditions on mental functioning was studied with two different methods. The first set of experiments took advantage of recording brain electrical activity. The results indicated that frontal brain areas might be particularly sensitive to hypoxia. In a second turn of experiments it was assumed that performances that largely rely on frontal mechanisms should decline in hypoxic state. Performance in a task switching experiment proved that ability to adapt to changing task requirements was indeed impaired in altitude conditions.

All experiments were performed during chamber flights to 5500m. Subjects were military pilots with previous experience in chamber flight.

Two studies of brain electrical activity utilized the method of Event Related Potentials (ERP). In both studies subjects were to respond to one specific visual stimulus (target) and to ignore all other stimuli (distractors). Hypoxia had no effect on reaction time however significant changes over the frontal brain areas were detected in potentials evoked by visual stimuli. Moreover, the amplitude the ERP component evoked by infrequently intervening novel stimuli also decreased. This latter component- the novelty P3 wave - is known to be diminished in frontal lobe patients.

In the task switching experiment subjects were to respond to male and female names pronounced by male and female speakers. In the "voice" task, subjects had to distinguish male and female voices. In the "name" task they had to respond differently to man's and woman's names. The subjects had to switch task after every third trial.

Deterioration of performance in the hypoxic condition was manifested in the increased number of errors as well as in slower reaction times.

The results confirm the singular sensitivity of the frontal brain areas to hypoxia. Impaired frontal functioning may consequently lead to massive disruption in the organization of behaviour.

# (46) THE CONTRIBUTION OF NEUROVEGETATIVE MODULATION TO REHABILITATION FROM AIR SICKNESS.

C DE ANGELIS, V LUGLI, P CARROZZO, R TREZZA, R VITALONE, M LUCERTINI

Italian Air Force: CSV – Aerospace Medicine Dept, Pratica di Mare AFB, Rome (ITALY)

# INTRODUCTION

Rehabilitation programs for air-sickness show high success rates, although different strategies are adopted in different Medical Centres. Autogenic feedback exercises (AFE), according to the Schultz's protocol, are currently adopted in our Centre, together with a physical desensitization of vestibular sensors and with a cognitive-behavioural therapy. The final outcome is a high success rate and a short lasting period of rehabilitation (2 weeks). The study of Heart Rate Variability (HRV) is a reliable method to investigate the relative contribution of the two arms of autonomic nervous system (ANS), sympathetic and vagal, to the body homeostasis. ANS has been shown to be significantly influenced by relaxation techniques as AFE, which induce an increase of vagal tone. Aim of this study was to investigate the role of ANS modulation, induced by AFE, in the rehabilitation from air sickness.

# SUBJECTS AND METHODS

Data from 7 male student pilots referred to our Centre for Air Sickness desensitization were analysed. Due to the duration of our protocol, only 3 out of the 6 Schultz's exercises were administered to each subject. Cardiac activity was monitored by using three channels ECG Holter recording, before starting the rehabilitation program (T0), during AFE (TX) and at the end of the rehabilitation program (T1). During T1 recording, AFE were also performed by each subject, although, due to the concurrent CST stimulation, they could not be taken in account for a correct HRV data analysis. At TO and T1, RR intervals were calculated in supine and orthostatic body position before and after the Coriolis Stress Test (CST) administration, while TX recordings were obtained before and during AFE at the end of rehabilitation. Identification of spectral components was performed by decomposing the signal in a series of sine waves of different amplitudes and sequences, using Fast Fourier Transform mathematical devices. Accordingly with ESC/NASPE recommendation we calculated: absolute and normalized low (0.04-0.15 Hz: LF) and high (0.15-0.40Hz:HF) frequency band power; LF/HF ratio, mean RR.

# RESULTS

All subjects resulted positively rehabilitated during T1 examination (CST negative) as well as during the following flight activity. No sig-

nificant differences were observed between T0 and T1 HRV recordings, while during AFE a significant increase of vagal tone was detected (ratio from 1.94+1.07 to 0.7+0.45: p<0.05).

### CONCLUSIONS

Our data show an absence of significant stable HRV modification during the rehabilitation program (T0 and T1 recordings). HRV was highly sensitive to AFE, as TX findings indicate. Thus, ANS modulation is probably limited to the moments of AFE practice.

# (47) THE INFLUENCE OF ISOTONIC STRENGTH TRAINING ON FITNESS LEVEL OF MILITARY AIRCRAFT PILOTS

ENG. DEREK MIROSLAW \*, DR. ELIASZ JERZY \*, DR. TOCZEK JERZY \*\*

\* - Polish Air Force Institute of Aviation Medicine, Warsaw, Poland

\*\* - Polish Air Force Training - Fitness Centre "Gronik", Zakopane, Poland

In recent years in military aviation much attention is paid to issue of pilots' physical preparation to carry the combat tasks out on high maneuver aircrafts. In a number of studies concerning this topic the influence of muscle strength (static and dynamic) on ability to tolerance the high values of linear acceleration is emphasised. Also in the Polish Air Force Institute of Aviation Medicine researches for preparation of a special physical training for pilots, performed in order to improve an acceleration tolerance, are conducted. In accomplishment of this task the modern training equipment which allows the proper load selection and precise diagnostic of muscle strength level is used.

The aim of the study was to evaluate the effectiveness of isotonic muscle strength training led by pilots during the course in PAFTFC\*\* at Zakopane.

Twelve voluntary pilots volunteered ( $32.2 \pm 4.4$  years of age,  $88.2 \pm 10.1$  kg body mass,  $1.80 \pm 0.08$  m body height) took part in a 20–day training cycle. All the subjects performed squats and bench press daily on "Powertest–M" stand. External load was individually matched, according to assumed strength training program, when taking into consideration the current level of the speed-strength abilities of the subject. At the beginning and at the end of the training the pilots were doing the special diagnostic tests, during which, in both exercises, were registered the maximum and average velocity of movement (isotonic conditions M=20Nm) and moment of force and mechanical power (isokinetic conditions ?=0,2 rad/s). In the analysis, apart descriptive statistics, Student-t test (p<0,05) was used.

There were no statistically significant changes in speed-strength abilities of upper and lower limbs of the pilots. The results suggest that the systematic and long-term training should be used in order to improve the muscle strength level.

# (48) ESTIMATION OF THE PRESS-FORCE VALUES OF LOWER LIMBS ON THE RUDDER BAR DURING G-TOLERANCE INVESTIGATION

DR. ELIASZ JERZY, ENG. DERE? MIROS?AW, DR. SKIBNIEWSKI W. FRANCISZEK

Polish Air Force Institute of Aviation Medicine, Warsaw, Poland

Identification of the pilots activities connected with acceleration tolerance during the real flight is very complicated from the methodological point of view. Partial approximation for such conditions applied in labs are special tests, performed on human centrifuge. One of the most important problems in this field is the estimation of muscle strength developed under gravity overloading. The aim of the study was to evaluate press-force values of lower limbs on the rudder bar during centrifugation.

Five young men - non-aviators (G1; 22.3 $\pm$ 0.8 years of age, 82.7 $\pm$ 7.2 kg body mass, 1.83 $\pm$ 0.06 m body height) and five military pilots (G2; 28.2 $\pm$ 0.5 years of age, 76.4 $\pm$ 10.2 kg body mass, 1.74 $\pm$ 0.02 m body height) took part in the study. The press-force values with right and left legs were registered during the test on human centrifuge (linear program; 0.1 G/s). The measurement system consists of two strain gauges, amplifier, data track and computer was installed inside the cabin of centrifuge. Moreover for each subject the maximal isometric strength level (MVC) was measured in sitting position, using a special stand (locally made). In the analysis of the results descriptive statistics as well as unpaired Student-t test were used (p<0.05).

As the results of performed tests the pilots achieved significantly lower values of press-force than the G1 subjects during the laboratory test  $(53.3\pm7.9 \text{ N/kg v. } 66.4\pm15.5 \text{ N/kg})$  as well as during centrifugation  $(36.3\pm5.4 \text{ N/kg v. } 52.6\pm12.7 \text{ N/kg})$ . In comparison with the maximal values of isometric strength the G2 (pilots) developed lower values then the G1 (68.3% MVC v. 80.7% MVC, respectively), however they reveal the higher G-tolerance  $(8.0\pm0.2G \text{ v. } 6.1\pm1.1G)$ . It may suggests better adaptation for the specific effort and better skills of adjustment to high level of acceleration.

# (49) THE TONUS OF THE CENTRAL NERVOUS SYSTEM, EVALUATION AND PROGNOSIS OF THE FLIGHT APTITUDE

#### V. BALOESCU

The National Institute for Aeronautical and Spatial Medicine, Bucharest, Romania

# BACKGROUND:

The evaluation of the susceptibility of the paroxysmal manifestation of the young candidates for the Aviation Officers Academy is one of the most interesting elements that foresee a pilot's resistance to the flight in different airplane types. On this purpose for the admittance medical examination, the maximal Walsalva test is made along with the reference EEG line (in order to investigate the autonomic nervous system). This data was being correlated with the response of the body to the hypobaric hypoxy test and of the cardiovascular system to the specific flight conditions.

#### METHODS:

On a group of 87 candidates for the Aviation Academy there have been done standard EEG with intermittent lightening stimulation and three minutes long hyperpnoea maximal Walsalva maneuver. The heart frequency both at the beginning and at the end of the hyperpnoea has been recorded. The subjects have been observed during hypobaric hypoxy.

#### **RESULTS:**

The statistic analysis demonstrates significant correlations between the tonus of the central nervous system and the neuro-vegetative equilibrium (p<0.001), between the tonus of the central nervous system and the values of the ventricular beating, as concerns the candidate's hypoxy (p<0.05) and blood pressure tests (p<0.005).

#### CONCLUSIONS:

Based on the above-mentioned data, we are able to evaluate the future pilot's resistance to the specific flight conditions as well as to foresee his flight aptitude.

 From the two groups, the one that presents "irritation" of the autonomic motor system with high energetic support, which corresponds to the sympathetic type, at specific aeronautical investigations presents low risks for paroxysmal manifestations during flight

(loss of consciousness). These subjects are directed to supersonic aircraft.

2. The candidates with cerebral tonus of the "inhibition" type and who respond at the specific aeronautical investigations like the parasympathetic type are directed to crew flight.

# (50) INDIVIDUAL DIFFERENCES IN THE ADAPTABILITY TO IRREGULAR REST-WORK RHYTHMS IN MILITARY PERSONNEL

CASAGRANDE M.<sup>1, 2</sup>, PIRRI F.<sup>2</sup>, GUADALUPI F<sup>2</sup>.

 <sup>1.</sup> Dipartimento di Psicologia - Università degli Studi di Roma "La Sapienza"
<sup>2</sup> Reparto Medicina Aeronautica Spaziale - Centro Sperimentale di Volo -A.M.I.

Military operations are often characterized by prolonged periods of wakefulness; irregular rest-activity patterns; long haul flights. These situations are unnatural. Severe sleep debt can accumulate, leading to dangerous levels of sleepiness and decreases of performance. Although sleep deprivation, time of day and time on task are considered among the most important causal factors of daytime sleepiness, the levels of vigilance may still significantly vary according to individual differences. Poor attention has been paid to such important factors as the individual ones. In fact, there is a surprising lack of studies on individual differences in the adaptability to irregular sleep-wake rhythms. Many factors have contributed to this condition. Studies on individual differences are necessarily long, time consuming and require a large sample size.

To find out which individual characteristics can guarantee the best adaptability to polyphasic rest-activity schedules, we evaluated individual traits of subjects scheduled on a 2-hr activity/4-hr rest (sleep allowed) cycle, repeated 4 times throughout the 24-hr, beginning at 9.00 a.m. This schedule was alternated with 24 hours off duty.

One hundred healthy male volunteers (mean age: 20.37 ± 2.12) participated to the study. Questionnaires have been used for evaluating the following individual traits: Sleepiness (ESS), Circadian Typology, Extroversion, Neuroticism, and Coping Strategies. In addition, immediately after one day of duty, subjects came in the lab and, in three different times (9.30, 10.30, 11.30), they completed VAS for assessing both sleepiness and vigilance and a Letter Cancellation Task for evaluating sustained attention. Step-wise multiple regression showed that extraversion, neuroticism and good coping strategies predict vigilance and attention. Furthermore, a better attentional performance and a higher vigilance were present in alert and evening-subjects. Results show that some individual traits can allow us to predict adequate adaptability to irregular rest-work rhythms in military personnel, suggesting some criteria for the selection of personnel and for identifying subjects who run the greater risk of a fall in vigilance and performance.

# (51) SLEEP DURING ALTERNATING MONOPHASIC AND POLYPHASIC REST-ACTIVITY CYCLES: EFFECTS OF PHOTHERAPY

CASAGRANDE M.<sup>1,2</sup>, GUADALUPI F.<sup>2</sup>, PIRRI F.<sup>2</sup>

 <sup>1</sup> Dipartimento di Psicologia - Università degli Studi di Roma "La Sapienza"
<sup>2</sup> Reparto Medicina Aeronautica Spaziale - Centro Sperimentale di Volo -A.M.I.

Schedules implying night shifts and/or fragmentation of duty periods throughout the 24-hr day require meeting sleep need at different moments of the 24-hr continuum, until uninterrupted 8-hr sleep is possible. In such conditions, polyphasic sleep-wake strategies have

potential practical applications. For the armed defense service on air bases, the Italian Air Force adopts an unusual work schedule, characterized by 24-hrs on duty followed by a day off duty. The day on duty is characterized by 4 rest-activity cycles repeated throughout the day. Each cycle is of 2-hrs of activity and 4-hrs of rest (sleep allowed). In a previous study (1), Italian armed defense personnel were monitored by means of ambulatory polysomnography while attending their 24-hr rest-activity schedule. Results showed that total sleep time was substantially reduced (mean time in sleep= 5 hrs) as compared to the usual 7-8 hour monophasic nocturnal sleep. However no data were recorded in the day off duty, therefore it did not know if a rebound of sleep occurred.

Aims of this study were to evaluate sleep of Italian armed defense personnel for assessing whether a brief photostimulation, intensifying vigilance during working period, can allow to increase total sleep time.

32 healthy male volunteers (mean age:  $21.312 \pm 1.15$ ) participated to the study. The field study included 4 consecutive days (2 days on duty, 2 days off duty recordings). On day on duty, they filled in a brief questionnaire on the sleep-wake cycle after each of the 4 rest periods; on day off duty, they filled in a brief questionnaire on the sleepwake cycle upon morning awakening. A counterbalanced administration of bright light (2000 lux) on both one day on duty and one day off duty, was as follows: 10 min stimulation after each of the 4 rest periods (immediately before working); 30 min stimulation at the end of the working day (i.e. in the morning of the day off duty).

Results showed that on day on duty, the phototherapy produced an increase of both total sleep time and quality of sleep; in addition a significantly decrease of sleepiness was present. During the day off duty, photerapy reduced only daytime sleepiness, while time in sleep not significantly increased. Results suggested that phototherapy, reducing sleep deprivation during day on duty, can be a suitable strategy for the management of polyphasic rest-activity operations.

# (52) BRIGHT LIGHT EXPOSURE AS AN ALERTNESS MANAGEMENT STRATEGY DURING POLYPHASIC REST-ACTIVITY OPERATIONS

CASAGRANDE M.<sup>1,2</sup>, GUADALUPI F.<sup>2</sup>, PIRRI F.<sup>2</sup>

 <sup>1</sup> Dipartimento di Psicologia - Università degli Studi di Roma "La Sapienza"
<sup>2</sup> Reparto Medicina Aeronautica Spaziale - Centro Sperimentale di Volo -A.M.I.

Shiftwork and continuous operations can cause sleep loss and circadian rhythms disruption. Both of these physiological factors can lead to increased sleepiness, decreased performance, and reduced margin of safety. These factors can increase vulnerability to accidents in operational settings.

Alertness management strategies can minimize the adverse effects of sleep loss and circadian rhythm desynchronization and promote optimal vigilance and performance in operational settings. Within these strategies, bright light treatment can be used for management of physiological mechanisms associated with sleepiness. Many experimental and also some field data suggest that the exposure of bright light can be very useful for improving alertness and performance during nighttime work and continuous operations. Aims of this study were to evaluate whether administration of bright light (2000 lux) can increase both vigilance and attentional performance of subjects whose work schedule was characterized by an alternation of 2 hours of activity and 4 hours of rest (sleep allowed), repeated 4 times throughout the 24-hr day. This schedule was alternated with 24 hours off duty.

32 healthy male volunteers (mean age: 21.312  $\pm$  1.15) participated to the study.

On days on duty, subjects completed a Letter Cancellation Task and VAS for evaluating sleepiness, before the beginning and after the end of each working period, at the following times: 8.40, 11.00, 16.50, 17.00, 20.50, 23.00, 2.50, 5.00, 8.50. During the day off duty the tests were completed at: 9.00, 11.00, 16.50, 17.00, 20.50, 23.00, before sleep onset and upon morning awakening. During one of the days on duty, there was an administration of bright light (2000 lux) 10-min after each of the 4 rest periods (immediately before working). During one of the days of duty, phototherapy was scheduled 30 min at the end of the working day (i.e. in the morning of the day off duty).

Results showed that exposure to bright light, on both the days (on duty and off duty), reduced sleepiness. In addition, it increased speed of attentional performance; accuracy was however reduced. Although the negative effect of bright light exposure to accuracy, results seem equally interesting. In fact, for military personnel employed for the armed defense service on the air bases, it more relevant to quickly detect worning stimuli, since, if a real danger occurs, it can suggested that the consequent physiological and cognitive activation could guarantee a good performance.

# CLINICAL

# (53) THE PREVALENCE OF OSTEOPOROSIS IN MILITARY AERONAUTICAL PERSONNEL

ASSOC. PROF. COL. M. MACRI, M.D., PH.D., CAPT. M. ANGHEL, M.D., PH.D., Maj.S.BERBECAR, M.D., Ph.D.

National Institute of Aeronautical and Space Medicine, Bucharest, Romania

# INTRODUCTION:

There is few specialty literature data related to the decrease of bone mineral density (BMD) in military aeronautical personnel (m.a.p.).

# METHODS:

We studied a lot A of 60 subjects using a screening method: the heel *ultrasound densitometry* (BUA), and a lot B of 40 subjects using the lumbar spine and femoral neck *DEXA assay*. All studied subjects are from the m.a.p., periodically examined at the National Institute of Aerospace Medicine. They were evaluated further by clinical exam, laboratory tests and lumbar spine X-rays. The results were statistically analyzed.

# **RESULTS**:

Most of subjects associate more risk factors of osteoporosis. We observed a negative correlation between T score and BMI (r=-0.15) in lot A and a positive correlation between BMD and BMI (r=0.62) in lot B. Serum N-MID osteocalcin, specific marker of osteogenesis, and serum beta cross laps, high specific marker of bone resorption, show low values in certain subjects. In our study, BMD reveals the following results: osteopenia in 35% of lot A subjects and 42.50% in lot B subjects and osteoporosis in 3.33%, respectively 7.50% of studied subjects.

# CONCLUSIONS:

Our results show: the low BMD has a significant prevalence (p < 0.005) and an early onset in the studied m.a.p. Ultrasound densitometry is useful in the osteoporosis screening in m.a.p., but the DEXA assay has a superior accuracy. Both methods identify minimal/moderate low BMD values leading to an early diagnosis of osteoporosis in m.a.p., before fracture development. The presence of the osteopenia/osteoporosis is associated with one or several risk factors which could be counterbalanced. The initiation and the development of a specific program of efficient measures is necessary to prevent/reduce osteoporosis in military aeronautical personnel.

# (54) THE EFFECT OF CPAP TREATMENT ON COGNITIVE PERFORMANCE IN AVIATORS WITH OBSTRUCTIVE SLEEP APNOEA SYNDROME.

C. KOURTIDOU-PAPADELI<sup>1</sup>, E. DASKALOPOULOU<sup>2</sup>, C. PAPADE-LIS<sup>3</sup>, E. VLACHOGIANNIS<sup>2</sup>, A. VIVAS<sup>5\*</sup>, P. BAMIDIS3,<sup>5\*\*</sup>, A. L.LOUIZOS<sup>4</sup>, E. PERANTONI.

1. Evrodiagnosis Medical Center, department of aerospace medicine, Thessaloniki, Greece.

2. "St Paul" General Hospital, Internal Medicine Department, Sleep Laboratory Thessaloniki, Greece.

3. Aristotle University of Thessaloniki, Department of Medical Informatics, Thessaloniki, Greece.

4. Greek Aerospace Medical Association, Thessaloniki, Greece.

5. City Liberal Studies, Dept. of Psychology\* and Computer Science\*\*, Thessaloniki, Greece.

#### INTRODUCTION:

Eighty percent (80%) of aviation-related accidents are caused by human error. Importantly, these accidents could be partly related with undetected and untreated sleep disorders. More specifically, several studies have shown that people suffering from sleep apnoea show deficits in cognitive tasks that involve memory, attention and learning. The purpose of this study was to determine whether diagnosis and treatment of sleep disorders might decrease the rate of aviation accidents by improving performance on motor-cognitive tasks.

#### MATERIAL AND METHODS:

Forty five (45) patients with OSA participated in the study, mean age 44  $\pm$  10.7, RDI 49.22  $\pm$  21, Apnea-Hypopnea Index 31 $\pm$ 15, DI 53.12 $\pm$ 6.64, Average SaO<sub>2</sub> % 89,20  $\pm$  6,64, min. SaO<sub>2</sub> % 71.07  $\pm$  23.08, % of sleep time with SaO<sub>2</sub><90% 25,76  $\pm$  23,08, and EPW scale 12.96  $\pm$  2.72. In order to evaluate their cognitive performance, a flight simulator electronic program, a multiattribute task battery (MATB) was used. Performance was measured by tracking error (RMSE), response time and number of correct, incorrect, and missed responses for dials and lights.

The participants were trained on the task until they achieved an asymptotic level of performance, so any improvement as a results of practice could be ruled out. Then, the patients were treated with continuous airway positive pressure (CPAP), and the performance on the last three trials before the treatment was compared to the performance on the last three trials after CPAP.

#### RESULTS:

Tracking error (RMSE) decreased significantly after CPAP treatment. The mean of tracking error data were submitted to a repeated measures analysis of variance (ANOVA) with treatment and session as within subject factors. The results showed significant main effects of treatment and session, F (1, 40) = 105,23, p<.001 and F (2, 80) = 27.94, p <.001 respectively. That is, performance improved after the treatment (13.68) as compared to pre-treatment sessions (22.34). Also, Post-hoc comparisons showed that performance was worse for session 1 (20.73) as compared to sessions 2 (17.23) and 3 (16.07), p <.001. However, there were no significant differences between sessions 2 and 3, p >.05, where participants achieved their asymptotic level. Finally, the interaction between treatment and session did not reach statistical significance p >.05.

# CONCLUSION:

CPAP treatment seems to improve the performance of pilots with a sleep apnoea disorder in motor-cognitive tasks. These results are very important to understand the factors influencing aviation-related accidents.

# (55) ON THE PHARMACOLOGICAL PREVENTION OF SYMPTOMS EVOKED IN A SPATIAL DISORIENTATION DEMONSTRATOR.

M LUCERTINI, M CASAGRANDE, V LUGLI, F PASQUAZZI, P TRIV-ELLONI

Italian Air Force: CSV – Aerospace Medicine Dept, Pratica di Mare AFB, Rome (ITALY)

# INTRODUCTION

Pensacola Simulator Sickness Questionnaire (SSQ) is a valuable method to analyse symptoms evoked by the exposure to a flight simulator environment that could also be adopted to evaluate the effectiveness of preventive tools aiming at reducing simulator sickness (SS). In this study we analysed SSQ data in subjects undergoing a standard ground based spatial disorientation training inside a flight simulator in order to evaluate the effects of two different pharmacological tools.

# SUBJECTS AND METHODS

12 males volunteers with no sleep, medical, or psychiatric disorders participated to the study. The experimental design was based on a double-blind, balanced administration of 30 mg cinnarizine (CIN), or Cocculus Indicus 6CH (COC), or placebo (PLC) before one trial of one hour spent on a spatial disorientation trainer. All subjects underwent the three different conditions (CIN, COC, PLC) during 3 non consecutive days separated by at least 2 weeks. On each experimental day subjects arrived at the laboratory at 8.00 and, immediately after the assignment to the CIN, COC or PLC sample, were invited to fill in a SSQ before the flight simulation at the following hours: 8.00, 9.30, 11.00 and after it at: 12.30, 13.00, 13.30, 14.00, 15.30, 17.00, 18.30, 20.00. Subjects were also analysed as to possible side effects on the part of each drug.

# RESULTS

SSQ Neurovegetative (N), Oculomotor (O), Disorientation (D) and Total Sickness Scores (TSS) were submitted to ANOVAs *Condition x Time*. Results indicated a strong increase of sickness after flight simulation, that linearly decreased, showing pre-simulator scores after 1.30 hours. In contrast to PLC and COC, CIN showed significant side effects immediately following flight simulation, with an absence of benefit at the simultaneous SSQ scores. ANOVA showed that simulator enhanced sleepiness for 1.30 hour after its use. No differences between COC and PLC were present.

#### CONCLUSIONS

At least as far as the present spatial disorientation trainer is concerned, and our training program is adopted, SS plays a marginal role among subjects under training. None of the pharmacological tools administered in this study reduced SS symptoms as detected by the SSQ. Moreover, CIN significantly increased sleepiness in most subjects.

# (56) TRANSORT OF THE PATIENT AFTER PARS PLANA VITRECTOMY

S.KOVA?EVI?<sup>1</sup>, ?.MOROVI?<sup>2</sup>, Z.PA?TAR<sup>3</sup>

<sup>1</sup>Department of Ophthalmology, General Hospital Zadar <sup>2</sup>Department of Infectology, General Hospital Zadar <sup>3</sup>Institute of Aviaton medicine, Zagreb

Toxoplasma gondii is one of the most frequent parasites in general. It is considered that every second person has positive serology on Toxoplasma gondii. The first case of ocular toxoplasmosis is described in 1923. This case study shows a patient with ocular toxoplasmosis in which the pars plana vitrectomy is done. There is a question of transport of such patient.

# (57) HEART DISEASES AND FITNESS TO FLY - TWO CASE PRESENTATIONS

#### R. MAIRE<sup>1</sup>, J.-O. MEILE<sup>2</sup>

<sup>1</sup>Cardiological Praxis, Maennedorf; <sup>2</sup>Aviation Medicine Praxis, Melide; Switzerland

#### INTRODUCTION:

Applicants or holders of a pilot's licence presenting with cardiac symptoms and heart diseases have to be checked for fitness to fly according to standardized medical requirements (for example to the JAR-FCL 3-Medical-requirements), what sometimes proves to be difficult in practice.

#### METHODS AND RESULTS:

Two cases with cardiac problems are presented: 1) 55-years old experienced commercial pilot with complex, supraventricular tachyarrhythmias which finally could be declared as benign arrhythmias. 2) Asymptomatic 29-years old applicant for a pilot's licence with congenital heart disease: Several operative procedures during childhood (banding of the pulmoary artery, closure of a ventricular septal defect, and reoperation): important residual apical myocardial hypertrophy. - In both cases, the medical history, the specific examinations, the diagnoses, the therapeutic procedures and the implications of the diagnosis for fitness to fly are discussed. Both cases were seen by an AME and a cardiological expert in Aviation Medicine. It is shown that clear decisions for fitness to fly could only be made after a profound analysis of all clinical and technical data in each case.

# CONCLUSIONS:

1) The huge spectrum of diagnostic and therapeutic facilities in modern cardiology allows an individual approach to each patient with heart disease. 2) In order to estimate precisely the risk of sudden incapacitation and to make a correct decision for fitness to fly, individual patient data have to be taken into account in addition to the defined requirements in modern regulatory aviation medicine. 3) The cooperation between the family doctor, the AME and the specialist plays an important role for the precise evaluation of applicants or holders of a pilot's licence with cardiological problems.

# (58) CAN A PILOT FLY WITH A 50% CORONARY LESION? A CASE PRESENTATION

R. MAIRE<sup>1</sup>, J.-O. MEILE<sup>2</sup>

<sup>1</sup>Cardiological Praxis, Maennedorf; <sup>2</sup>Aviation Medicine Praxis, Melide; Switzerland

#### INTRODUCTION:

Although the JAR-FCL 3-Medical-requirements contain clear citeria for applicants or holders of a pilot's licence presenting with coronary artery disease, the decision for fitness to fly may be difficult in the individual case, because the medical situation is often very complex. Such a case and the considerations in the decision making process are presented.

#### METHODS AND RESULTS:

A 54-years old commercial pilot was hospitalized in a local hospital because of weakness. Markers for myocardial infarction were slightly increased. The diagnosis was not clear, neither after some noninvasive cardiological tests had been performed. A

coronarangiography was undertaken, which showed a 50% narrowing of the circumflex coronay artery and a 30-40% lesion of the left anterior descending coronary artery. No therapeutic intervention was performed. Because of the 50% lesion, the pilot would not be considered fit to fly according to the JAR-FCL 3-Medical-regulations. The cath film was reviewed, and the case was discussed with the invasive cardiologists. Finally, the pilot was declared as fit to fly for class 1-licence (commercial pilot) with the restriction of OML ("multi-pilot operation only"). For this decision, the appearance of the circumflex lesion was more weighted than the percentage of narrowing of the lesion. The considerations in this decision making process in this case will be presented in detail.

# CONCLUSIONS:

1) In patients with coronary artery disease the prognostic value of a coronary lesion is not only dependent on the degree of stenosis but also on the kind of structure of the underlying plaque. 2) In complex cardiological cases a clear estimation of the risk of sudden incapacitation and thus a correct decision for fitness to fly is often only possible by a differentiated individual approach.

# (59) INTERET DE L'EXAMEN DE LA THYROIDE AU COURS DES VISITES MEDICALES SYSTEMATIQUES

R. RAK

Centre Médical AIR-FRANCE. FRANCE

La palpation systématique de la thyroïde lors de tout examen clinique permet de déceler des pathologies même débutantes de cette glande.

L'essentiel des anomalies ainsi découvertes est d'ordre anatomique (goitres, nodules, avec ou sans thyroïdite, beaucoup plus rarement néoplasmes). Les troubles hormonaux ne sont pas exceptionnels, associés ou non aux précédents.

Cet exposé détaille l'ensemble des problèmes thyroïdiens trouvés au cours des visites médicales de ces 15 dernières années, pour les personnels navigants et ceux du sol.

Dans ce domaine, l'examen clinique de la thyroïde apparaît comme un élément important de prévention médicale, la surveillance ou la mise en route précoce d'un traitement adapté permettant de préserver au mieux la santé et l'aptitude professionnelle.

# (60) THE HEIDELBERG RETINA TOMOGRAPH AND FLOWMETER IN THE DIAGNOSIS OF GLAUCOMA IN FLYING PERSONNEL

D.BARTOS, M.D., PHD.; H. ?LANCAROVÁ, M.D.; M. JURKOVÁ, M.D.

Institute of Aviation Medicine Prague, Czech Republic

# INTRODUCTION

Two principal theories for the pathogenesis of glaucomatous optic neuropathy have been described – a mechanical and a vascular theory. According to the mechanical theory, increased intraocular pressure causes stretching of the laminar beams and damage to retinal ganglion cell axons. The vascular theory of glaucoma considers glaucomatous optic neuropathy as a consequence of insufficient blood supply due to either increased intraocular pressure or other risk factors reducing ocular blood flow.

# METHOD

The stereometric parameters of the optic nerve head and the capillary blood flow of the optic nerve head and the juxtapapillary areas of the retinae were measured in 16 eyes of 12 glaucoma patients, flying personnel, with moderate visual field defects. The optic nerve head analysis was performed by means of a Heidelberg Retina Tomograph (HRT). The blood flow mearurements were taken by the scanning laser Doppler flowmetry (Heidelberg Retina Flowmeter, HRF) and analyzed using the automatic full field perfusion image analysis (AFFPIA).

# RESULTS

We compared six stereometric parameters HRT (Cup/Disc Area Ratio, Rim Area, High Variation Contour, Cup Shape Measure, Mean RNFL Thickness, RNFL Cross Section Area) and three capillary flow parameters HRF (Nasal Juxtapap. Ret., Temporal Juxtapap. Ret., Neuroret. Rim Nerv. Opt.). The results were statistically evaluated and discussed.

# CONCLUSION

The combination of the confocal laser scanning system (HRT) and the scanning laser Doppler flowmetry system (HRF) present nowadays the best results for early diagnostic of glaucoma.

# (61) DÉPISTAGE DES DYSLIPIDÉMIES CHEZ LE PERSONNEL NAVIGANT TECHNIQUE

PH. PICHEREAU<sup>1</sup>, A. MARTIN SAINT LAURENT<sup>2</sup>, J.-P. CHAMBION<sup>2</sup>

<sup>1</sup>Air France, Laboratoire d'analyses de biologie médicale, aéroport Roissy Charles-de-Gaulle, France

<sup>2</sup>Air France, Centre d'examen médical du personnel navigant, aéroport Roissy Charles-de-Gaulle, France

# INTRODUCTION:

Cette étude vise à améliorer le dépistage des facteurs de risque cardio-vasculaire, et notamment des dyslipidémies, en prévention primaire, chez le personnel navigant technique.

# MÉTHODES:

969 membres du personnel navigant technique, 934 hommes (âgés de 21 à 60 ans), 35 femmes (âgées de 21 à 52 ans), ne prenant pas d'hypolipémiants ou d'antihypertenseurs, ont fait l'objet, au cours de leur visite de renouvellement de licence, des mesures suivantes: poids, taille, pression artérielle, cholestérol total, HDL cholestérol, triglycérides. L'indice de masse corporelle et le taux de LDL cholestérol ont été calculés.

L'étude a eu lieu entre le 15 décembre 2002 et le 1<sup>er</sup> juin 2003.

# **RÉSULTATS:**

Toutes classes d'âge confondues, la cholestérolémie moyenne est de 5,65 mmol/L (2,19 g/L) chez les hommes et de 5,06 mmol/L (1,96 g/L) chez les femmes. Le taux moyen de HDL cholestérol est respectivement de 1,57 mmol/L (0,61 g/L) et de 1,91 mmol/L (0,74 g/L), celui de LDL cholestérol est de 3,53 mmol/L (1,37 g/L) et de 2,73 mmol/L (1,06 g/L), celui des triglycérides de 1,15 mmol/L (1,01 g/L) et de 0,85 mmol/L (0,74 g/L). L'indice de masse corporelle est en moyenne de 25,0 chez les hommes et de 21,2 chez les femmes. La pression artérielle moyenne est respectivement de 12,6-7,4 et de 11,8-7,1 (cm Hg).

# CONCLUSION:

Cette étude montre que certains paramètres lipidiques, cholestérol total et LDL notamment, se trouvent fréquemment au delà des valeurs recommandées par l'ANAES (Agence Nationale d'Accréditation et d'Évaluation en Santé). Ceci incite à déterminer de façon systématique, pour l'appréciation du risque athéromateux, les paramètres lipidiques: cholestérol total, HDL, LDL et triglycérides. Age et fréquence idéaux de dépistage restent à discuter.

# (62) LOWER BACK SYNDROMES: A VEXING PROBLEM IN THE AIRLINE INDUSTRY

M. CIMA, New York University School of Medicine, and Medical Departments of AA, AF, BA, EA, IB and VG Airlines.

# INTRODUCTION:

Lower back pain is a very common problem in Airline industry workers and causes significant disability and enormous financial losses and frequently confrontations between the company and its employees. This presentation addresses current issues about this problem and recently introduced therapeutic modalities.

# METHODS:

Personal industrial, academic and clinical experiences plus contemporary literature contributions.

# **OBSERVATIONS:**

The pathogenesis of low back pain remains incompletely understood.

Some individuals are genetically predisposed to intervertebral disk degeneration at an early age (In some case in the teens). The mobility of different segments of the lumbar spine varies from person to person and some particular patterns of motion may be predisposing factors to develop pathology. Acute pain without radiation or neurological deficit does not require detail diagnostic studies if resolving in 4 to 6 weeks. Chronic persistent pain with or without radiation and inconclusive neurological imaging studies is the most vexing problem leading frequently to adversarial interactions between the treating and the industrial physician. Contrary to previous ideas aggressive treatment of the initial pain episode with heavy narcotic and other analgesic agents may prevent the development of chronic pain. When a job description includes heavy use of the lower back some airlines are using a special testing to predict low back endurance in pre-employment examinations. Recent introduced treatments (Minimal invasive diskechectomies, kyphoplasty, remote lyces of disks by concentrated thermic waves, etc.) have led to reduced long-term disability rates and early return to work.

# (63) HEMOGLOBIN LEVELS AMONG CANDIDATES FOR AIRCREW MEMBERS

B AZARIA-SOFER, Y SHERER, E BARNBOIM, L GOLDSTEIN\*

Center of Aviation Medicine and Physiology, Israel Air Force, and \* Surgeon General, Israel Air Force

# INTRODUCTION:

The aim of this study was to screen for hemoglobin levels in healthy candidates for aircrew members, and to assess whether training for aircrew results in hemoglobin level change and anemia.

# METHODS:

209 male candidates for aircrew members were screened for complete blood count. Among them, 50 were followed-up for 1 year and then screened again for blood count and routine examination.

# RESULTS:

209 candidates for aircrew members at a mean age of 18.1 had hemoglobin level of  $14.8\pm0.9$  g/dl and hematocrit of  $44.6\pm3.7$ . 50 candidates were followed-up for one year, and had no decrease in their body mass index (21.5±2 versus 22.2±1.9, respectively). However, both the hemoglobin level and hematocrit significantly decreased in a one year follow-up during training for aircrew members (14.9±0.8 versus 14.1±1 and 44.6±2.7 g/dl versus 42.2±2.6;  $P{<}0.001$  for both). Among these 50 subjects, 22 had hemoglobin levels below 14.0 g/dl.

# CONCLUSION:

Training for aircrew members is associated with a mild but a significant decrease in hemoglobin and hematocrit levels.

# (64) A 20-YERA FOLLOW-UP OF CHOLESTEROL LEVELS IN 3 GROUPS OF PILOTS

Y Sherer, B Azaria-Sofer, A Grossman, E Barnboim, L Goldstein\*

Center of Aviation Medicine and Physiology, Israel Air Force and \* Surgeon General, Israel Air Force

# INTRODUCTION:

The aim of this study was to determine whether total cholesterol levels differ between 3 different pilot groups (jet pilots, helicopter pilots and cargo pilots), and whether these levels change in a follow-up of 20 years.

# METHODS:

Four groups of randomly selected pilots and flight controllers that have been followed-up for 20 years- were compared: 100 combat jet pilots, 70 helicopter pilots, 110 cargo pilots and 96 flight controllers. These subjects were annually followed-up for body weight and total cholesterol levels as part of their routine examinations.

# RESULTS:

All 4 groups studied had similar body mass indexes at age 18 ( $21.4\pm2.9$ ,  $21.3\pm1.98$ ,  $21.3\pm1.6$ , and  $21.5\pm2.4$ , respectively). Body mass indexes also did not differ between groups at age 42, but were significantly higher than those at age 18 ( $25.2\pm2.5$ ,  $24.5\pm2.8$ ,  $25.3\pm2.6$  and  $25.3\pm2.5$ , respectively; P<0.001 in all cases). Total cholesterol levels were also similar and between the 4 groups at ages 22, 32 and 42. However, gradual increase in total cholesterol levels was found in all groups during follow-up examinations. Among jet pilots, cholesterol levels were significantly higher at age 42 and 32 than at age 22 ( $202\pm45$ ,  $189\pm31$  and  $168\pm32$  mg/dl, respectively; P=0.002 and 0.005). Among cargo pilots, cholesterol levels were significantly higher at age 32 ( $209\pm39$  versus  $191\pm39$  mg/dl, respectively; P=0.01). No other differences were found between groups including those of helicopter pilots.

# CONCLUSIONS:

Body mass index and cholesterol levels progressively increase in pilots during a 20-year follow-up period. This is a general phenomenon in pilots and flight controllers regardless the kind of pilots they are.

# (65) IMPORTANCE OF THE ANTERIOR CHAMBER DEPTH FOR LASIK SURGERY

G. SIMON M.D. PH D

IOGS Madrid, Spain

# INTRODUCTION:

Nowadays Lasik Surgery is very extended and it is an habitual practice all around the World. For practising this technique we need a high precision and we count on several factors to obtain it: pupilar diameter depending on the light conditions, reflexes and haze. Even applicating all this some patients still come to our clinics with sensation of contrast loss and haze after operating. The idea of this study is to find out the reason why some patients have symptoms and others don't.

### METHODS:

We make a study on patients that have had a lasik operation (79 eyes). These patients have the same spherical equivalent (-6.00) and we measure the Optical Zone for the operation taking as reference the pupilar diameter for a clear vision and we measure the anterior chamber depth with an Orbscan.

### **RESULTS:**

We use the same spherical equivalent (refraction) and Optical Zone for all the patients, so that we take them as a constant, and we compare the results of the anterior chamber depth. We try to objectivize the amount of uncomfortableness by making a degree scale so that we can have an idea of the amount of glare vision the patient has.

#### CONCLUSION:

Looking at all the results we discover some amazing numbers. There is an important relation between anterior chamber depth for a lasik surgery. As the depth of the anterior chamber increases, the bigger are the symptoms the patient feels. In conclusion, we add another important factor rely on before surgery. We should measure optical Zone and anterior Chamber's length to have a satisfied patient without haze, reflexes and contrast sensibility loss.

# BASICS

# (66) MG-INDUCED INHIBITION OF APOPTOSIS: MOLECULAR MECHANISMS AND POSSIBLE CONSEQUENCES FOR THE LONG-TERM SPACE MISSIONS.

D. RISIN<sup>1</sup>, S. RISIN<sup>2</sup>, R. J. BICK<sup>2</sup>, N. WARD<sup>3</sup>, A. SUNDARESAN<sup>4</sup>, AND N.R. PELLIS<sup>1</sup>.

Cellular Biotechnology Program, <sup>1</sup>NASA/JSC, <sup>2</sup>Department of Pathology, UT-Houston Medical School, <sup>3</sup>Wyle Life Sciences, Systems and Services, and <sup>4</sup>Universities Space Research Association, Houston, TX 7705, USA.

Apoptosis or programmed cell death (PCD) plays a pivotal role in sustaining tissue homeostasis, especially in such dynamic cell populations as the immune system. Previously we have shown that modeled microgravity (MMG) inhibits apoptosis in human lymphocytes. This phenomenon might have serious biological consequences especially for the long-term space missions. Recent studies strongly suggest that impairments in the mechanisms involved in control of apoptosis could cause many severe pathologic conditions, including lymphoproliferative, autoimmune, neurodegenerative diseases and cancer. Analysis of the mechanisms of the inhibitory effect of MG on apoptosis revealed that it is not associated with changes in expression of Fas, Fas ligand (FasL), bcl-2 and bax. FACS analysis showed that MMG selectively inhibits the expression of PKC isoforms. The decrease was most prominent and substantial in PKC e, less obvious in PKC d and almost marginal and insignificant in PKC a. PKC isoforms d and e were down regulated by more than 50% at transcriptional (RT-PCR) and translational (Western blot) levels in MMG cultured lymphocytes compared to 1g controls. Confocal microscopy using fluorescent antibodies against the PKC isoforms, 3D modeling and rotation of stacked images demonstrated significant difference in distribution of PKC e. It was found to be more uniform in lymphocytes cultured in static conditions in comparison with MG, where it was less uniform and patchy. Further molecular studies are in progress to reveal MG-induced differences in gene expression related to inhibition of apoptosis. Analysis of the mechanisms of inhibition of apoptosis in MG might provide important information for development of specific countermeasures especially for long-term space missions. (Supported by NRA OLMSA-02 and NSCORT NAG5-4072 grants).

# (67) EVALUATION OF AUTONOMOUS DYSTONIA AND ASSESSMENT OF ENDOTHEL DYSFUNCTION IN THE AEROMEDICAL EVALUATION PROCESS: POSSIBILITIES OF DRUG TREATMENT

LTC. S. SZABÓ, LTC. ZS. TÓTKA, COL. A. GRÓSZ (PHD), E. TÓTH., MAJ. J. HORNYIK, LTC. M. DUDÁS, MAJ. ZS. SZAMEK

Hungarian Home Defense Forces, Aeromedical Hospital Kecskemét, Aeromedical Research Dept., Head of Department Col. Dr. habil. A.Grósz

#### INTRODUCTION:

In clinical and applied research the regulatory function of endothelium is extensively investigated. In some area of pharmacotherapy even the possible modifying effects of drugs are in focus. We shortly discuss the importance of assessment of endothelial dysfunction from aeromedical point of view. The warrant for evaluation of possible side effects of any drugs in aviation is also highlighted. We are going to study the combined effect of hypoxia (still remaining a serious flight safety risk) and an ACE (angiotensin convertase enzyme) inhibitor drug (possibly improving endothel function) on cardiovascular parameters. We can characterize the autonomous modulation (the activity level of autonomous nervous system and the modifying effect of drugs) by measuring the HRV (heart rate variability) parameters. On the other hand we can observe the subtle changes in blood supply at the microvascular level.

#### MATERIALS AND METHODS:

Healthy, young subjects were exposed to incremental hypobaric hypoxia in barochamber in two profiles: firstly at rest drug free, then administering single dose of captopril (ACE inhibitor). The retineal vascular reactions were analyzed by Topcon fundoscopy, measuring diameter changes at identical retineal points. The Burdick Vision Holter ECG is capable to provide large scale of parameters concerning heart rate variability: from these data we can draw conclusion on the momentary activity level of autonomous nervous system as efferent modulator.

#### RESULTS:

In the function of barochamber altitude he HRV parameters characterizing sympathicotony by time domain (SDNN, rMSSD) show significant decrease at drug free profile. Certain decrease is observable even after drug administration, but much less extent. In case of retineal perfusion a significant increase in vessel diameters can be observed both on artery and venula side: the dynamic changes at the 1st and 2nd level of branches is really expressed. Captopril (Tensiomin) may cause a limited vasodilatation at an intermediate altitude.

#### CONCLUSIONS:

ACE inhibitor enhanced parasympathetic (vagus) modulation. The altitude dependent vasodilatation is dynamic process influenced by vessels' wall structure and drug effect. Our results confirm that it is a must to treat in time pilots in case of clinical manifestations of atherogenesis to prevent major endothelial dysfunction and cardiovascular diseases, but proper caution is justified to assess possible harmful effect.

# (68) EFFECTS OF SIMULATED WEIGHTLESSNESS ON MAPK/ERK SIGNAL PATHWAY IN OSTEOBLASTIC ROS 17/2.8 CELLS INDUCED BY BMP-2.

Z SHU, W BING, W XING-YU.

Department of Aerospace Biodynamics, The Fourth Military Medical University, Xi'an, 710032, P.R.China.
# POSTERS

Introduction: It is known that BMP-2, member of transforming growth factor ? (TGF-?) family, has important role in up-regulating the gene expression of osteoblast markers and that is mediated through the activation of mitogen-activated protein kinase/extracellular signal-regulated protein kinase (MAPK/ERK) pathway. But little is known about the effect of simulated weightlessness on the BMP-2 induced MAPK activation in osteoblastic cells. Methods: In our study osteoblastic ROS 17/2.8 cells were cultured in rotating clinostat and 1G condition for 24, 48 and 72 h. BMP-2 was added to the culture medium to the final concentration of 500 ng/ml. Cells were fractured at different time point and the protein composition was separated by SDS-PAGE, then Western-blotting was used to exam the expression of total ERK and p-ERK. Immuno-precipitation was made to invest the kinase activity of p-ERK in cells. The total RNA in cells was isolated at the same time and reverse transcription PCR analysis was made. Results: It showed the protein expression of total ERK was unchanged while that of p-ERK and its kinase activity was reduced when osteoblastic ROS 17/2.8 cells were exposed to rotating clinostat. The gene expression of c-fos and c-jun induced by BMP-2 was reduced under simulated weightlessness. Conclusion: Our results suggest that the up-regulation of MAPK/ERK signal pathway in osteoblastic ROS 17/2.8 cells by BMP-2 is impaired under rotating clinostat simulated weightlessness and this might have negative effects on its downstream transcription activity.

### (69) EXPRESSION OF NITRIC SYSTEM AND PROTEIN NITRATION IN ADULT RAT BRAINS SUBBMITTED TO HYPOBARIC HYPOXIA.

S. CASTRO-BLANCO<sup>1</sup>, J. SERRANO<sup>1</sup>, AP. FERNÁNDEZ<sup>1</sup>, P. FER-NÁNDEZ-VIZARRA<sup>1</sup>, D. ALONSO<sup>1</sup>, R, MARTÍNEZ-MURILLO<sup>1</sup>, J. SÁNCHEZ<sup>2</sup>, F. RÍOS-TEJADA<sup>2</sup> AND J. RODRIGO<sup>1</sup>.

<sup>1</sup>Department of Neuroanatomy and Cell Biology, Instituto de neurobiologia "Santiago Ramón y Cajal", CSIC, E-28002 Madrid, Spain.

<sup>2</sup>Centre of Aerospatial medicine, Ministery of Defense, E-28027 Madrid, Spain.

Changes in the nitric oxide (NO) system of the rat cerebral cortex, hippocampus and cerebellum were investigated by immunohistochemistry, immunoblotting, and NO synthase (NOS) activity assays in adult rats submitted to simulated altitudes of 38,000 ft (11000m) and 27,000 ft (8325 m) for 30 minutes and 7 days to hypoxia respectively, in a hypobaric chamber. The rats were sacrified after 0h, 7h, 1, 3, 5, 8, 10, 15, 20 and 30 days of reoxygenation. The cerebral cortex showed morfological alterations in the large type I interneurons, as well as immunoreactive changes in the appearance and number of the small neurons (Type II), both containing neuronal NOS (nNOS). Ultrastructurally, these small neurons exhibited changes in nuclear structures as in the shape of the nuclear membrane, in the distribution of heterochromatin, and nucleolar morphology. The reaction product for nitrotyrosine, as marker of protein nitration, showed modifications in distribution of the immunoreactive product. No expression was found for inducible NOS (iNOS). The hippocampus showed increased the number of nNOS neurons and their dendritic plexus from 0h to 3 days of reoxygenation. The endothelial NOS (eNOS) immunoreactivity peaked after 7 hours of hypobaric hypoxia. Nitrotyrosine immunoreactivity showed an increased in the pyramidal cells of CA2-CA3, and glial cells surrounding the blood vessels, after 0h,1 and 3 days of reoxygenation. Immunoreactivity to iNOS was found only in some blood vessels after 0h, 1 and 3 days of reoxigenation. In the cerebellum the nNOS showed a slightly increased in the basked of the Purkinje cells layer and in the granule cells after Oh of reoxygenation and being coincident with a peak of eNOS expression. Nitrotyrosine formation showed significant

increments after 0h and 1 day of reoxygenation, showing an intracellular location change in the neurons of cerebellar nuclei and in addition, an appearance of nitration in the soma of the Purkinje cells was detected. All these immunocytochemical modifications to nNOS were accompained by modifications by Western blotting and calcium-dependent activity, but no changes in iNOS immunoblotting and calcium-independent activity was detected. We conclude that at least part of the nitric oxide system is involved temporarily in cortical, hippocampal and cerebellar responses to hypobaric hypoxia.

### (70) ACTIVATION AND RESPONSE OF NEURONS IN THE HIPPOCAMPUS FOLLOWING EXPOSURE TO HYPOBARIC HYPOXIA

C.KAUR<sup>1</sup>, G. SINGH<sup>2</sup>, J. SINGH<sup>3\*</sup>, E.A. LING<sup>1</sup>.

<sup>1</sup> Department of Anatomy, Faculty of Medicine, Blk MD10, 4 Medical Drive, National University of Singapore, Singapore 117597.

<sup>2</sup> Undergraduate Medicine (final year) student, Faculty of Medicine, National University of Singapore, Singapore 117597

<sup>3</sup> Singapore Technologies Medical Services Pte. Ltd., Aeromedical Centre, 492 Airport Road, Singapore 539945.

\* Presenting Author (Dr J. Singh, Member of IAASM)

#### INTRODUCTION.

Transient loss of memory is known to occur in high altitude climbers (Cavaletti et al, 1990). Hypocapnic cerebral vasoconstriction that in turn could cause local hypoxia or ischemia in particular regions of the brain at high altitude is thought to result in impairment of memory (Litch and Bishop, 2000). The present study aimed to examine the hippocampus, the brain region responsible for memory function, following a high altitude exposure for any possible damage or structural alteration in the neurons which may lead to memory impairment.

#### METHODS.

Adult Wistar rats weighing 250 gm were exposed to an altitude of 8000m for 2 hours in an altitude chamber and were sacrificed at 1-24h and 2, 4 and 7days after the exposure. Normal rats of similar weight kept at ground level were used as controls. The hippocampus was removed and processed for electron microscopy and immuno-histochemistry to detect c-fos and neuronal nitric oxide synthase (nNOS) expression.

#### RESULTS.

Fos (a marker of neuronal activation) and nNOS expression was induced in the neurons of hippocampus 1-4h after altiude exposure but was not observed in the neurons of control and longer surviving rats. At the ultrastructural level, some of the dendrites appeared swollen and vacuolated at 1-4h but the neurons in the hippocampus appeared normal at all time intervals.

#### CONCLUSIONS.

It is suggested that hypobaric hypoxia is responsible for the initial nNOS expression and activation of the neurons in the hippocampus as well as the dendritic changes and these may be linked to the transient memory loss experienced at high altitude.

This study was supported by a Research Grant (R181-000-020-112) from the National University of Singapore

#### REFERENCES

1.Cavaletti G, Garavaglia P, Arrigoni G, Tredici G. Persistent memory impairment after high altitude climbing. Int J Sports Med. 1990 Jun; 11(3):176-178.

2. Litch JA, Bishop RA. High-altitude global amnesia. Wilderness Environ Med. 2000; 11(1):25-28.

# POSTERS

### **SPACE**

### (71) ULTRASOUND IMAGE PROCESSING: APPLICATION TO DIAGNOSE DIFFUSE HEPATOPATIES IN SPACE

A.PÉREZ-POCH, C. BRU, C.NICOLAU

Imaging Diagnostic Centre, Hospital Clínic i Provincial, University of Barcelona, Spain.

Chronic hepatitis and hepatic cirrhosis are pathologies with high prevalence in the world population. Ultrasound (US) allows for a quick and precise examination of focal liver lesions but it is not mainly used at present to diagnose and classify the degree and type of diffuse liver lesions. Interventional procedures such as biopsies are the current way to determine such affectations, although the risk of complications they present.

A software computer system is being developed to evaluate the degree of diffuse affectation of the liver and diagnose its pathology, Such system should minimize the number of biopses undertaken. A software application will enable the clinician to perform a statistical and texture analysis of the ultrasound image of the liver and determines the degree of diffuse affectation of the liver parenchyma. Parameters are being validated through a clinical study being performed at the Ultrasound Unit, Dept. Radiology, Imaging Diagnostic Center (CDI), Hospital Clinic, Barcelona, Spain. Results from more than 50 patients under our study give quantitative good correlation with pathologist's report and allow us to discriminate affected from non-affected patients giving objective clues to the clinician.

A further study is proposed to evaluate the possibility of such evaluations in a microgravity environment. The parameters validated to evaluate the diffuse affectation of the liver parenchyma may change as a result of the presence of microgravity and hence, a new calibration should be performed to undertake.

Statistical and texture analysis of Ultrasound imaging of the liver give more objective and precise ways to diagnose for clinicians, both on earth and space. In the latter environment, risk-free and inexpensive Ultrasound processed imaging should be of an enormous value, specially for long-term Spaceflight where such diseases may develop and should be monitorized. The method may also further apply to ultrasound diagnosis of other diffuse pathologies such as nephritis.

### MISCELLANEA

# (72) BLOOD TRACE ELEMENTS BEFORE AND AFTER FLIGHT

NATA?A DOJ?INOVSKI, MARJAN BILBAN, FRANJO VELIKANJE

The purpose of this study was to determine how trace metal levels change during stressful flight tests.

Blood Zn and Cu levels were determined in 20 pilots before and after flight.

Applicants had significantly decreased Zn concentrations following flight, but Cu concentration remained almost unchanged.

#### MATERIAL AND METHODS:

The subject of investigation were 15 male applicants and 5 male instructor pilots. All subjects were fully briefed on the scope of the experiment and served voluntarilly. Each flight lasted cca 60 min and was held in winter months. Samples of blood were collected 15 min before and 15 min after flight.

#### **RESULTS:**

Average concentration of blood Zn before flight was 16,7 n mol/l and 12 n mol/l after flight. Whereas average concentration of Cu was

21,7 before and 20,7 after flight.(Reference for Zn are 10-19,7, for Cu 11-26,7 n mol/l)

### DISCUSSION:

Some 40% of Zn in plasma is firmly bound to alpha 2 macroglobulin. The remaining Zn is losely bound either to albumine or to aminoacids. This losely bound fraction provides the transport and delivery of Zn to tissue. In the liver synthesis of Zn containing proteins, e.g metallothioneines is induced buy stressors such as infaction and inflammation. Induction of such protein synthesis enhances redistribution of Zn from plasma to liver.

Psychological stress may affect immune function via changes in cytokines, the key signaling proteins involved in cellular intereactions.

#### CONCLUSION:

Prolonged phisical and psychological stress induces the decrease in blood Zn levels and mostly a very little decrease in Cu level.

### (73) INSTITUTE OF AVIATION MEDICINE IN PRAGUE: 50TH ANNIVERSARY OF THE ESTABLISHMENT OF THE INSTITUTE OF AVIATION MEDICINE IN PRAGUE AND 80TH ANNIVERSARY OF THE BEGINNING OF AVIATION MEDICINE IN CZECH (CZECHOSLOVAK) REPUBLIC

D.BARTOS, M.D., PHD.; O. TRUSKA, M.D., D. AV. MED.; J. MRÁZEK, ING.; P. DO?EL, M.D.

Institute of Aviation Medicine, Prague, Czech Republic

The Institute of Aviation Medicine (IAM) is part of military medical facilities which are subject to the directives and command of the Military Medical Service Section of the General Staff of the Armed Forces of the Czech Republic. As a specialized medical institution of with a nationwide scope of competence, it is autorized by the Ministry of Health, Ministry of Defense, Ministry of Transport to perform medical examinations and issue health fitness reports to aviation personnel and members of air traffic control, both military and civilian.

The IAM presents the base of aviation medicine in the country and the standards for the examination processes for the resorts of defense, transport, industry and trade and health, as well as other departments having their own aviation agenda.

The commendable state of technology and the qualifications of its personnel allow the IAM to perform highly sophisticated medical procedures, such as may be of use not only to members of the air forces, but also to civilian patients

The medical and preventive activities of the IAM focus primarily on prompt diagnosis and follow up, determining the ability to perform flying duty and proposals for preventive health measures. This specialized activity is performed by trained personnel, largely in ambulatory facilities, but also in the form of short-term hospitalization, where x - ray, ultrasound and laser imaging systems, ophthalmological and vestibulografic computer complexes, or spiroergometric monitoring units are used.

The training activities of the IAM concentrate on various kinds of professional training of students of the Military Academy in Brno, aviators of the Army of the Czech Republic, civilian aviation personnel, parachutists and divers utilizing special equipment such as low and high pressure chambers, negative pressure on the lower part of body (LBNP) and pilot simulators.

The pedagogical activities of the IAM are in the preparation of undergraduate students of the Medical Faculty of the Charles University and the Military Medical Academy J. E. Purkyn? in Hradec Králové, pilot and air traffic control cadets of the Aviation Faculty in the cam-

# POSTERS

pus of the Military Academy in Brno and students specializing in aviation ergonomics at the Czech Technical University in Prague. Pedagogical activities in post-graduate study for physicians focus on the additional certification in Aviation Medicine and in follow-up courses for aviation medical examiners (AME).

Highly specialized activities of the IAM involve primarily investigation work and clarification of the causes of air crashes, probability studies, assessment of the toxic risks of the micro-climate of the aircraft cocpicts and analytical studies to set the limits for medication, alcohol and drug content in the blood.

### (74) ANALYSIS OF OCCUPATIONAL HEALTH REFERRAL PATIENTS, IN THE IAF OCCUPATIONAL HEALTH CONSULT SERVICE CLINIC.

RUBEN M. JACUBOVICH, MD MOCCH, OCCUPATIONAL HEALTH SPECIALIST PHYSICIAN, OCCUPATIONAL HEALTH SECTION CONSULT SERVICE CLINIC, IAF, MAJ. MICHAL ZIL-BERBERG, MOCCH, HEAD OF THE OCCUPATIONAL HEALTH SECTION IAF, COL. (SEL.) LIAV GOLDSTEIN MD MHA, SUR-GEON GENERAL IAF, LTC. JACOB HAVIV, MD, MPH, HEAD OF THE OCCUPATIONAL HEALTH BRANCH IDF MC,COL. NEHEMIA YOFFE, MD MHA, FORMERLY SURGEON GENERAL IAF,LTC. YARON BAR-DAYAN, MD MHA, DEPUTY SURGEON GENERAL IAF Correspondence: Lt. Colonel Dr. Yaron Bar-Dayan, Deputy Surgeon general IAF, MD, MHA. Surgeon general headquarters IAF

An enormous amount of literature has been published on aviation physiology, most of it dealing exclusively with aircrew. Only rarely are the occupational problems of ground personnel addressed. An occupational health cosult service refferal clinic was established in the Israeli Air Force since 1993.

We present a retrospective analysis of periodic and fitness-for-work examinations of 1472 medical encounters of ground personnel between the years 2000-2002 who were examined in this clinic.

An upward trend is seen concerning the total number of visits in the clinic in the last decade.

The three most common causes of fitness-for-work examinations were: musculoskeletal (29%), respiratory (17%), neuropsychologic (13.9%) and skin (12%) problems.

The four most common causes of periodical examinations visits were: crane operators (38.7%), noise surveillance (34.4%), solvent exposure follow up (13%) and hydrazine exposure follow up (6.4%).

In 15% of all the examinations, health impairment was found leading to complete disability to the required job, and 26% of examinations resulted in partial work restriction recommendations.

The activity described in the occupational health consult service clinic reflects the special occupational hazards in military aviation ground personnel occupations.

# CREDITS FOR CONTINUOUS MEDICAL EDUCATION:

Arrangements are made to provide 10 credit of continuous medical education to the participants, specially to the authorized medical examiners. (A.M.E.)

# CRÉDIT DE FORMATION MÉDICALE CONTINUE:

Les participants pourront bénéficier de 10 crédits de formation continué, notamment les médecins examinateurs agréés.

# INDEX OF AUTHORS/INDEX DES AUTEURS

ANTUÑANO M.J. (USA) (28, 29, P. 25) ARVA P. (NORWAY) (31) ASHRAF-SALA (EGYPT) (P. 28) AUFFRET R. (FRANCE) (9) AZARIA-SOFER B. (ISRAEL) (P. 63) BALAZS L. (HUNGARY) (P. 45) BALLDIN U.I. (USA) (39) BALOESCU V. (ROMANIA) (P. 49) BARBUR J. L. (UK) (Panel 7, Panel 13) BARDAYAN Y. (ISRAEL) (54) BARTOS D. (CZECH REP) (P. 60, P. 73) BEAUMONT M. (FRANCE) (15) BECKRÖGE (NORWAY) (P. 26) BELLENKES A.H. (USA) (1) BERTRAN P-E (FRANCE) (P. 55) BINDER H. (USA/JAPAN/CANADA) (P. 3) CARBAYO J.A. (SPAIN) (20, P. 5, P. 21) CASAGRANDE M. (ITALY) (P. 50, P. 51, P. 52) CASTRO-BLANCO S. (SPAIN) (P. 69) CHAPNIK L. (ISRAEL) (21, 42) CHISHOLM C. M. (UK) (Panel 8) CIMA M. (USA) (50, P.13, P. 62) COMTOIS J M. (CANADA) (Panel 2) CROWLEY J.S. (USA) (56) CURDT-CHRISTIANSEN C. (DE) (Panel 9) DAMANN V. (GERMANY) (Panel 3) DE ANGELIS C. (IT) (P. 46) DERK M. (POLAND) (P. 47) DOIREAU P. (FRANCE) (Panel 17) DOJLINOVSKI N. (SLOVENIA) (P. 72) DOSEL P. (CZECH REP) (P. 32) ELIASZ J. (POLAND) (P. 48) EREMINAS D. (LITHUANIA) (P. 16) ESTEBAN B. (SPAIN) (P. 38) EVANS A. (UK) (Panel 10) EVANS S. (UK) (45) FERGUSON E.B.(USA) (24) FISHER C. L. (USA) (Panel 1) GRAY, G. (CANADA) (Panel 16) GROSZ A. (HUNGARY) (P. 35) HEMOUS J. (FRANCE) (23) HINKELBEIN J. (GERMANY) (36, P. 40, P.41) ILIUTA C. (ROMANIA) (P. 43) IRELAND R.R. (USA) (7) IVAN D. J. (USA) (Panel 5, Panel 14) JACUBOVICH R.M. (ISRAEL) (P. 23, P. 74) JAHR K.I. (NORWAY) (P. 22) JANVRIN S. (UK) (Panel 20) JIMENEZ-PRADA L. (SPAIN) (P. 6) JONES D.R. (USA) (8) JONES R.F. (USA) (25, 26) JOY M (USA) (Panel 18) KADOKURA M. (JAPAN) (6) KAUR C. (SINGAPORE) (P. 70) KHANN M. (INDIA) (P. 44) KHANUJA S.S. (INDIA) (P. 1) KOUTIDOU-PAPADELI C. (GREECE) (P. 54) KOVAEVI S. (CROATIA) (P. 56) KOWALCZUK K.P. (POLAND) (40) KRAFT N. (USA/JAPAN/CANADA) (P. 2) KRUYER W.B. (USA) (Panel 15, 46, 47) LASZYNSKA J. (POLAND) (P. 42)

LEBUISSON M.C. (FR) (16) LEON G.R. (USA) (2) LI M. H. (TAIWAN) (P. 29) LIM M.K. (SINGAPORE) (11) LINDGREN T. (SWEDEN) CANCELLED LOLIC Z. (CROATIA) (43) LUCERTINI M. (ITALY) (49) McCARTHY G.W. (USA) (Panel 22, 4) MACRI M. (ROMANIA) (P. 53) MAIRE R. (SWITZERLAND) (P. 57, P. 58) MEDIALDEA J. (SPAIN) (5) MEIJER H.J. (THE NETHERLANDS) (P. 24) MIKULISZYN R.S. (POLAND) (P. 36) MISSONI E. (CROATIA) (P. 7) MIYAMOTO A. (JAPAN) (P. 10) MONTEIL M (FRANCE) (52) MUMENTHALER M.S. (USA) (48) NANCHEVA R.L. BULGARIA) (P. 39) NEUWIRTH F. (GERMANY) (35) NEWMAN D.G. (AUSTRALIA) (38) NYQVIST A. (UNITED ARAB EMIRATES) (53) OLIVEIRA C. (BRASIL) (P. 18, P. 19, P. 20) ORTIZ P. (SPAIN) (Panel 19, 55) PATTYN N. (BELGIUM) (P. 4) PENG C.M. (SINGAPORE) (14) PÉREZ-POCH A. (SPAIN) (P. 71) PEREZ SASTRE JM (SPAIN) (P. 15) PICHEREAU P. (FRANCE) (P. 61) POMBAL R. (PORTUGAL) (33, P. 14) PREITNER C.G. (NEW ZEALAND) (44) PUENTE B. (SPAIN) (32) RAFNSSON V. (ICELAND) (19) **RAK R.** (FRANCE) (P. 59) RAYMAN R (USA) (10) **RISIN D.** (USA) (P. 66) **ROUMES C.** (FRANCE) (Panel 12, 41, P. 27) **RUGE A.** (THE NETHERLANDS) (27) SAUNDBY P. (UK) (Panel 21) SAZEL M. (CZECH REP) (P. 37) SCHMITZ E. (GERMANY) SCHRAMM D. (CANADA) (22) SCHROEDER D.J. (USA) (P. 3) SHERER Y. (ISRAEL) (51, P. 64) SHIMADA K. (JAPAN) (Panel 4, Panel 23) SHU Z. (CHINA) (P. 68) SIMON G. (SPAIN) (P. 65) SIMONS R. (THE NETHERLANDS) (30, P. 8) SINGH B.K. (INDIA) (12, P. 9) **SINGH J.** (SINGAPORE) (13) **SMITH R.L.** (USA) (18) SQUIRE T. J. (UK) (Panel 11) STERN C. (GERMANY) (Panel 6) STEVENS S. (FRANCE) (P. 12) SUNDERASAN A. (USA) (57) SZABO S. (HUNGARY) (P. 67) TE-SHENG WEN (TAIWAN) (37, P. 34) TRUSKA O. (CZECH REP) (P. 17) WAGSTAFF A. (NORWAY) (17) WIELGOSZ A. (CANADA) (34) YI-WEN SHEEN (TAIWAN) (P. 33) ZAWADZK-BARTZAK E. (POLAND) (P. 30, P. 31)

# **EXHIBITORS PROFILE/PRESENTATIONS DES EXPOSANTS**

### ADDCOM INNOVATION AS

Terje Halvorsen Nydalen Park Gjerdrumsvei 10A 0484 Oslo. NORWAY Tel: + 47-23008630 FAX: + 47-23008631 E-mail: <u>th@addcom.no</u>

Addcom Innovation is a software company with main focus on developing and selling software for the medical sector. In co-operation with the Institute of Aviation Medicine in Norway, the company has developed a Medical Certification Software (Medces). The system is used to collect and store health data related to the European JAR-FCL 3 (medical) requirements and to obtain a complete description of the health profile among professional pilots. The stored information can be divided into a wide range of administrative and medical data, being used for both quality assurance and research purposes.

### AIRSEP Corp.

Helen Ying 401 Creekside Drive Buffalo, NY 14228-2085 Tel: 1-716-6910222 FAX: 1- 716- 6914141 E-mail: <u>hying@airsep.com</u>

Airsep Corporation offers its LifeStyle Portable Oxygen Concentrator for complete patient mobility and air travel. The company's specialty in oxygen concentrators and other respiratory devices extends to broader options for the highly mobile or traveling patient – no cylinders or refills needed. Call (716) 691-0202 for complete product line.

### AMST

Dipl.Ing. Richard Schlüsselberger (Managing Director) AMST Systemtechnik GmbH PO BOX 3 A-5282 RANSHOFFEN. AUSTRIA Phone: +43 7722 892400 FAX: +43 7722 892498 E-mail: office@amst.co.at

The company specializes in design, development, manufacturing and installation of complete (up to turn-key) aeromedical training facilities, as well as simulation and training systems for civil and military aviation. AMST products are not only unique in respect of their design and state of the art technology, but our more than 20 years experience, and our continuous investment in R&D are the guarantee that our customers receive the expected solution with simulators on the cutting edge of technology, and the appropriate support services like training, aero-medical consulting and after sales service. AMST products are designed for high reliability, simple maintainability and to be simple to upgrade in the future.

### ENVIRONMENTAL TECTONICS CORP.

Richard Leland 125 James way SOUTHHAMPTON PA 18966, USA Phone: 1 215 3559100 FAX: 1 215 3574000 E-mail: <u>dletc@aol.com</u> <u>daverell@surfbest.net</u>

Environmental Tectonics Corporation is the world leader in the design, manufacture, installation, operation and maintenance of human aviation training and research equipment. Since 1969, they have been serving the international aviation community with the most cutting edge technology available anywhere. Our products include the GFET-II ™TM human research and training centrifuge featuring 25G maximum ; Gyrolab®GL 1500 Spatial Disorientation Trainer providing 4 DoF with sustained motion in any vector and high performance craft cockpit ; Gyrolab®Model TFS 300 Tactical Flight Simulator with 6 DoF full fidelity, sustained G motion cuing for true fighter aircraft simulation; Gyro IPT II Integrated Physiology Trainer with 4 DoF, PC controlled motion base; Gyroflight Professional Senes Flight Trainer for fixed and rotary wing crafts. We also provide Night Vision Training/Night Vision Goggle Training, Pilot Selection and custom pilot simulation training curriculums. Let ETC's team of experts assist you in the development of your specification for the most complete trainer's available anywhere in the world today.

### GLAXO SMITH KLINE ESPAÑA

Luis Gil Ariza Línea Vacunas Plaza Carlos Trías Beltrán 4, 2ª 28020 Madrid. SPAIN Tel: 34 91 5562064 FAX: 34 91 558458 E-mail: Luis.Gil-Ariza@gsk.com

GlaxoSmithKline was formed by the merger of Glaxo Wellcome and SmithKline Beecham, a "merger of equals" that brought together two premier pharmaceutical companies, both of which had extensive pedigrees in healthcare and were pioneers in many areas of science and medicine.

# **EXHIBITORS PROFILE/PRESENTATIONS DES EXPOSANTS**

GlaxoSmithKline is a world leading research-based pharmaceutical company with a powerful combination of skills and resources that will help meet the healthcare needs of people around the world, enabling them to do more, feel better, and live longer.

GlaxoSmithKline is a leader in four major therapeutic areas: anti-infectives, Central Nervous System (CNS), respiratory and gastro-intestinal/metabolic. In addition, it is a leader in the increasingly important area of vaccines.

The company also has a Consumer Healthcare portfolio comprising over-the-counter (OTC) medicines, oral care products and nutritional healthcare drinks, all of which are among the market leaders.

### **MICROGENICS ESPAÑA**

Passatge Celler, s/n 08190 Sant Cugat del Vallès Barcelona. Spain Phone: 0034 935898338 Fax: 0034 936756521

Microgenics Corporation develops, manufactures and markets next-generation in-vitro immunodiagnostic products, offering innovative solutions to help customers meet their distinct drug testing challenges. Our CEDIA<sup>®</sup> product line offers the most comprehensive range of Drugs of Abuse tests, including several unique assays as well as a broad menu of TDM assays. In addition, our proprietary DRI<sup>®</sup> line product complements the CEDIA® Drugs of Abuse menu with an extensive line of homogeneous enzyme immunoassays and specimen validity tests. All our products are optimised for a wide range of analysers and backed by exceptionally responsive technical support. During the next 12 months Microgenics will introduce a number of new parameters including further unique CEDIA<sup>®</sup> Drugs of Abuse tests, new immunosuppressive drug tests and additions to our CEDIA<sup>®</sup> TDM menu.

Microgenics worldwide central headquarters and manufacturing facilities are located in Fremont, California, USA. The European operations are headquartered in Passau, Germany, and there are fully operational subsidiaries for marketing, sales and technical support in Spain, United Kingdom, France, Norway and Sweden. Exclusive distributors make available the Microgenics products in other European countries like Italy, Portugal, Austria, Greece and Turkey.

Micogenics España main offices are based in Sant Cugat, Barcelona. An extensively experienced, technically knowledgeable team of professionals will help you with all your drugs of abuse testing needs in the country.

Microgenics - Drug Testing for professionals

### **URIACH GRUPO**

Francisco J. González Valdés-Hevia Boix y Morer 5 28003 Madrid Tel: 34- 91-5542106 FAX: 34-91-5542108 E-mail: <u>madrid@uriach.com</u>

Uriach Group is a Spanish pharmaceutical company founded in 1838. Present in all the major continents, Uriach Group is currently made up of five companies whose activities cover each of the main areas in the pharmaceutical industry: research, rawmaterial production, drug production, marketing and exports. Through its Pharmaceutical Divisions, Uriach Group has an extensive portfolio of pharmaceutical products, especially in the cardiovascular, neurology, dermatology and inflammation areas. Besides the products it has generated as a result of its own research as Disgren (triflusal), Rupafin (rupatadina) and Micetal (flutrimazol), Uriach Group markets pharmaceutical products licensed by major pharmaceutical multinationals as Sonata (zaleplon).

### WYLE LABORATORIES

Dan Reeder and Richard E. Rupert 128 Maryland Street El Segundo, CA 90245. USA Phone: 1 310 563 6728 FAX: 1 310 322 0781 E-mail: <u>dreeder@els.wylelabs.com</u> <u>dickrupert@aol.com</u> <u>Service@wylelabs.com</u>

Wyle Laboratories ' Dynamic Flight Simulator is a key component of any modern state-of-the-art aerospace medical training centre. For training pilots to fly modern high performance aircraf the Dynamic Flight Simulator will be used in G-tolerance training of the aircrew, acceleration physiology research and development and medical evaluations of flight personnel. Performance characteristics include: Maximum G (design)-15g; Onset-Offset-0 to 5 g/sec; Gimbals-(2) (roll and pitch); Control-Selectable open & close loop; and Payload-1000 lb. For the past 35 years, Wyle has been providing highly skilled personnel and laboratory facilities to NASA, the Department of Defense, the National Institutes of health, and numerous international space partners. WYLE is the recognised leader in life sciences, biomedical research and spaceflight hardware development. Wyle GmbH, a subsidiary of WYLE provides life sciences systems and services to European governement space agencies and companies.

# SPONSORS PROFILE/PRESENTATION DES SPONSORS

# ASOCIACION ESPAÑOLA DE ESCUELAS DE FOR-MACION AERONAUTICA (AEFA)

### AEROMADRID

Aeropuerto de Cuatro Vientos s/n. 28044 Madrid, SPAIN Tel. 34-91-5089620 FAX. 34-91-5087661 E-mail: <u>aeromadrid@aeromadrid.com</u>

# AEROTEC

Aeropuerto de Cuatro Vientos Chalet del RACE s/n. 28044 Madrid, SPAIN Tel. 34-91-5080359 FAX. 34-91-5080359 E-mail: <u>madrid@aerotec.es</u>

### AIRMAN

Velazquez 119, 2°A, 28006 Madrid. SPAIN Tel. 34-91-5640493 FAX. 34-91-5640494 E-mail: <u>airman@airman.es</u>

### AIRMED

Bloque Técnico, Aeropuerto de Valencia 46940 Manises-Valencia. SPAIN Tel. 34-96-1523195 FAX. 34-96-1521898 E-**mail:** <u>airmed@airmed.es</u>

AMERICAN FLYERS Alaro 5 (Barajas). 28042 Madrid, SPAIN Tel. 34-91-3292938 FAX. 34-91-3292963 E-mail: <u>info@americanflyers.es</u>

### **MUTUA BALEAR**

Mutua de Accidentes de Trabajo y Enfermedades Profesionales de la Seg.Social, nº 183 Dora Simonet Borrás Dpto. Compañías Aéreas C/ Bisbe Campins, 4 07012 Palma de Mallorca Tel: 34-971.213413 Fax: 34-971.213191 Email: <u>dsimonet@mutuabalear.es</u>

### SPANAIR (OFICIAL CARRIER)

Spanair S.A., a Spanish airline, was founded in December of 1986. Flights began at the end of March 1988, and since then up to 56.5 million passengers have flown with Spanair.

It started operations with its international charter flights, carrying tourists to Spain from more than 100 European airports. At present, 78% of the company's flights are scheduled, while the remaining 22% are charter operations. Spanair's strategy is to develop a true alternative in domestic and international transport of passengers and cargo, from, to and within Spain, thus strengthening the business, leisure, tourism and export industries of its home country.

With its 340 daily flights, a fleet of 53 aircraft, comprising Airbus 320 (11), Airbus 321 (5), MD-82/83/87 (33), and Boeing 717 (4) and with more than 3,000 employees, Spanair carried near than 8 million passengers in 2002.

In addition to having a modern, state-of-the-art fleet, the company's priorities are to offer the best levels of safety, punctuality, comfort and excellence of service. April 1st, 2003 marks the date of Spanair joining the Star Alliance network

CONTACTS Address: Ed. Spanair-Aeropuerto PO BOX 50086 07010 Palma de Mallorca Balearic Islands Spain Phone: +34 971 74 50 20 Fax: +34 971 49 25 53 e-mail: <u>spanair@spanair.es</u> Web site: www.spanair.com

# ACKNOWLEDGEMENTS/RECONNAISSANCES

The Organising Committee of the International Congress of Aviation and Space Medicine would like to thanks the following people and organizations for their contribution to this event:

To the Spanish Society of Aerospace Medicine (SEMA), who made possible this event under the auspices of the International Academy of Aviation and Space Medicine (IAASM).

Dr. Yehezkel Caine, President of the Scientific Committee of IAASM and members of his committee and session chairs for their invaluable help in reviewing, commenting and participating in the Scientific Programme.

Dr. Alain Martin Saint Laurent, for his most generous assistance with the french translation.

Prof. Jean Pierre Crance, for his support in providing key information for the scientific programme.

Madrid Medical Association and Expacontra who provided the venue and specially Mrs. Purificación Moyano, always ready available and open to handle our sugestions. Also technicians for their professional support.

The Town Hall Tourist Board & Convention Bureau who provide us advise and support during the opening ceremony and free offered all type of touristic information to our participants.

Special thanks to the Director and Music Band of the Town Hall of Madrid who delighted us with typical traditional music from Madrid.

Our appreciation to General Gonzalez Gallarza, Chief of the Staff of the Spanish Air Force who supported this event since the begining and host personally the Official Reception at the Spanish Air Force Headquarters.

The JEMA Cabinet/Public Relationships Office of the Air Force, for their sponsorhip behond any formalism and be able to handle the reception at the Air Force Headquarters.

Our thanks to the Defense Aeromedical Center (C.I.M.A.), who sponsored their staff participation and technically supported the Congress.

To the General Director of Civil Aviation, Mr. Estaún y Diaz de Villegas for their technical and economical support.

VIE Viajes-Congresos and Mrs. Marisa de Toribio and team (Natalia, Laura and Pablo) for her dedication and interest. EADS-CASA, and the department of Public Relations for their support and arrangements in providing a superb visit to EADS-CASA Getafe Factory.

General, Chief Commander of Torrejón AFB who provides the resources for a technical tour to the main Air Force Facility in Spain.

Iberia Medical Service for their support and arrangements in providing us an intersting visit to the Maintenance Facilities of the Company at La Muñoza.

Airport and Air Navegation Agency who kindly provides us economical resources to support printing and logistical requirements of the Congress.

Spanair, our official carrier who very gently catched the sponsorship since the begining.

We are grateful to Lufthansa Airlines for their cooperation as a partner of Spanair.

To Mrs Chelo Estévez from Servicio de Promoción Turística de la Dirección General de Turismo (Comunity of Madrid), for her attention and help in providing tourist information.

And of course, all our sponsors:

SPANAIR AIRLINES.

LUFTHANSA AIRLINES.

AIRPORTS & AIR NAVEGATION AGENCY (AENA). SPANISH AIR FORCE.

CIVIL AVIATION AUTHORITY (MINISTRY OF TRANSPORTATION).

C.I.M.A.

MUTUA BALEAR INSURANCE COMPANY.

MICROGENICS

GSK (Vaccine Division).

etc

AMST

ADDCOM Innovation.

AIRSEP Corp.

WYLE Laboratories.

URIACH Laboratories.

SPANISH ASSOCIATION FOR AERONAUTICAL TRAINING (AEFA):

- AEROMADRID
- AEROTEC
- AIRMAN
- AIRMED
- AMERICAN FLYERS









# Ábrete a un mundo de posibilidades.

Ahora con tu Tarjeta Spanair Plus es más rápido acumular puntos, más fácil disfrutar de las ventajas exclusivas del mejor programa de viajeros frecuentes del mercado. Porque volar a 129 países, con 700 destinos, con más de 10.000 vuelos diarios.

Para poder llevarte más lejos que nunca.

miembro de la red STARAL ANCE

Información y Reservas: en tu Agencia de Viajes de confianza, en el 902 13 14 15 o en www.spanair.com www.staralliance.com

bmi

€ ANA∎

uda-



