

61ST ANNUAL CONFERENCE OF THE INDIAN SOCIETY OF AEROSPACE MEDICINE

AEROSPACE MEDICINE: OPPORTUNITIES & APPLICATIONS



SOUVENIR





AEROMEDICAL SIMULATORS AND FACILITIES AT IAM

**61st Annual Conference
of
the Indian Society of Aerospace Medicine**



**at
Institute of Aerospace Medicine
Bangalore, India**

03 to 05 November 2022

Institute of Aerospace Medicine Indian Air Force



A WARM WELCOME TO ALL THE PARTICIPANTS

Conference logo



Designed and conceptualised by
Staff at the Dept of Space Medicine



Logo Description

1. This logo is to commemorate the rich and illustrious years of the Society, and to celebrate **61st Annual Conference of the Indian Society of Aerospace Medicine**.
2. The logo for the Conference has been designed keeping in view the all-encompassing speciality of Aerospace Medicine. The logo highlights the distinct facets of Aerospace Medicine as a speciality.
3. Description of the individual elements of the logo: -
 - (a) **The Flight Surgeon Badge and ISAM logo**. This forms the epicentre where all aeromedical activities carried out in India connect.
 - (b) **'Fixed wing' & 'Rotary wing'**. The flight envelopes of the fighter aircraft and the helicopter are the two variant aerodynamic operations – 'Fixed wing' & 'Rotary wing' and they depict the different challenges to the aircrew. The Aerospace Medicine Specialists take care of these dynamic aerial platforms which are frequently changing with the advances in the technology.
 - (c) **The three axes**. These in the background depict the pivotal role speciality plays in providing solutions and training to prevent mismatch in the orientation mechanism and the effects of G forces in different axis.
 - (d) **The Orbit and Spacecraft capsule**. It highlights the Society's contribution to India's maiden Human Space Flight Programme – Gaganyaan. Some of the contributions that the society is making to the mission include selection of crew, their periodic aeromedical and physical evaluation, flight surgeon support and consultancy in design and development of various human-use products.
 - (e) The colour combination of the logo highlights the immense contribution of this society to IAF and its sister organisations.



MESSAGES





एयर चीफ मार्शल वी आर चौधरी
पवि से मे अवि से मे वा से मे ए डी सी

Air Chief Marshal VR Chaudhari
PVSM AVSM VM ADC

Tel : (011) Off : 23012517
Res : 23017300
Fax : 23018853



MESSAGE

वायु सेना मुख्यालय
नई दिल्ली - 110011
Air Headquarters
New Delhi - 110011

1. I am happy to know that the Indian Society of Aerospace Medicine (ISAM) is organising its 61st Annual Conference at IAM.

2. Rapid advancement in air and space technology has made the role of aerospace medicine specialists extremely crucial in enhancing operational preparedness and safety. It is heartening that the Society has always been at the vanguard of several path breaking initiatives in aerospace medicine and directly involved in all stages of operations.

3. With India venturing in to human space flight, there are newer challenges for which the ISAM needs to provide tangible solutions. In this regard, the theme of this conference 'Aerospace Medicine: Opportunities and Applications', is very apt. As domain experts, all ISAM members must contribute towards enhancing the role of aerospace medicine in IAF. I am confident that the conference will offer valuable insights and meaningful discussions.

4. On the occasion of the 61st annual conference, I pay tribute to our veterans from the aerospace medical fraternity and acknowledge their outstanding contributions. I extend my greetings to the organisers as well as delegates of ISAM 2022 and wish the conference great success.

Jai Hind!

Air Chief Marshal
Chief of the Air Staff

19 Oct 22



एयर मार्शल मानवेन्द्र सिंह प वि से मे अ वि से मे वीर चक्र वि से मे ए डी सी
Air Marshal Manavendra Singh PVSM AVSM Vrc VSM ADC
 वायु अफसर कमांडिंग-इन-चीफ
Air Officer Commanding-in-Chief

Telefax : (O) 080-23412821

AFNET : 4111-7202



MESSAGE

प्रशिक्षण कमान मुख्यालय, भा वा से
 जे सी नगर पोस्ट
 बेंगलुरु - 560006

HQ Training Command, IAF
 JC Nagar Post
 Bengaluru - 560 006

1. I extend my warm greetings and felicitations to the members of the Indian Society of Aerospace Medicine which is organising its 61st Annual Conference from 03-05 Nov 22 at the Institute of Aerospace Medicine, Bengaluru.
2. The Indian Society of Aerospace Medicine has taken consistent strides in promoting the speciality of Aerospace Medicine in India ever since its inception in 1952. It has been playing a pivotal role in enhancing Aerospace Safety. It has also encouraged the growth of the speciality by facilitating interaction of specialists from the three services and those from around the world. It has fostered a spirit of research and analysis amongst the members by bringing them together on a common platform annually to discuss aeromedical issues affecting the aerospace community. The conference theme this year, '**Aerospace Medicine: Opportunities and Applications**', is apt as it will allow experts to discuss not only aeromedical issues faced by aircrew in the field, but also dwell on the challenges in launching India's first astronaut into space.
3. On this occasion, I wish the Society a bright future and extend my best wishes to the organizers, members and delegates.

Jai Hind!



सर्जन वाइस एडमिरल रजत दत्ता, ए वी एस एम, एस एम, वी एस एम, पी एच एस
महानिदेशक सशस्त्र सेना चिकित्सा सेवा

Surgeon Vice Admiral Rajat Datta, AVSM, SM, VSM, PHS
Director General Armed Forces Medical Services
Tele : 011-24199801, 24199802
ASCON : 33080



कार्यालय महानिदेशक
सशस्त्र सेना चिकित्सा सेवा
रक्षा मंत्रालय
रक्षा कार्यालय परिसर
'ए' ब्लॉक, (चौथी मंजिल)
अफ्रीका एवेन्यू, नई दिल्ली-110023
Office of Director General
Armed Forces Medical Services
Ministry of Defence
Defence Offices Complex
'A' Block, (4th Floor)
Africa Avenue, New Delhi-110023

MESSAGE

1. At the outset I compliment the Indian Society of Aerospace Medicine (ISAM) for its 61st Annual Conference that is being conducted on a hybrid platform from 03-05 Nov 2022.
2. ISAM has been an integral part of the Armed Forces Medical Services over the decades and I am certain that the knowledge gained by the delegates during these three days will greatly benefit the aerospace fraternity in general and the Indian air force in particular.
3. The theme for this year's conference has been appropriately chosen as 'Aerospace Medicine: Opportunities and Applications', in which a variety of aeromedical issues and their potential solutions will be discussed by the delegates and subject matter experts. The conference would provide an ideal platform for exchange of information, ideas and expertise. The opportunity of interacting with Aerospace Medicine specialists, doctors from allied specialties and scientists will help us to comprehend scientific advances in the field and potential aeromedical issues.
4. I appreciate the efforts put in by the organizing committee to develop a robust scientific programme. I solicit an equally enthusiastic by all members and delegates.
5. I wish you all a rewarding and enriching experience.

'Jai Hind'

Station : New Delhi

Date : 11 Oct 2022

(Rajat Datta)
Surg VAdm
DGAfms



एयर मार्शल के अनंतरामन वी एस एम

प्रशासनिक प्रभारी वायु अफसर

Air Marshal K Anantharaman VSM

Air Officer-in-Charge Administration

Tele (O) : 011-23010231 / 7134

Tele & Fax : 011-23012934

AFNET : 21115100

Mob. : 8884993331

E-mail : aoaweb@iaf.nic.in



वायु सेना मुख्यालय

वायु भवन

नई दिल्ली-110106

Air Headquarters

Vayu Bhawan

New Delhi - 110106

1. I am glad to learn that the Indian Society of Aerospace Medicine (ISAM) is organizing its 61st Annual Conference from 03-05 Nov 2022 at Institute of Aerospace Medicine, Bengaluru.

2. The speciality of Aerospace Medicine has its significant impact on operations. It optimally addresses several issues related to the hostile and unpredictable environments to which aircrew are subjected. It also defines means to tackle the same, be it in peace or war. The Society provides a firm platform on which quality research and practice of the subject is based. All these features make the practice of Aerospace Medicine in India, an important factor that contributes significantly to improve the combat effectiveness of our aircrew, both in the military and civil domain. This year the conference theme is 'Aerospace Medicine: Opportunities and Applications', which would highlight all activities of Aerospace Medicine aimed at improving aerospace safety.

3. I take this opportunity to convey my best wishes to all the organisers and delegates of the 61st Conference of ISAM and wish the event a grand success.

Jai Hind.

(K Anantharaman)

Air Marshal

Air Officer-in-Charge Administration

Date : 17 Oct 22



★ ★ ★

एयर मार्शल प्रशांत भारद्वाज अ वि से मे वि से मे एवं बार पी एच एस

महानिदेशक चिकित्सा सेवा (वायु)

Air Marshal Prashant Bharadwaj AVSM VSM & Bar PHS

Director General Medical Services (Air)

Tele/Fax : 011-26168098 (O)

AFNET : 21125100

Mob : 9650833737

E-Mail : prashantbharadwaj@gmail.com

वायुसेना मुख्यालय

वेस्ट ब्लॉक-VI

आर के पुरम

नई दिल्ली-110066

Air Headquarters

West Block-VI

RK Puram

New Delhi - 110066



MESSAGE

1. It is my privilege and honour to organise the 61st Annual Conference of the Indian Society of Aerospace Medicine at the Institute of Aerospace Medicine, Bengaluru from 03-05 Nov 22.

2. The areas of air operations that need attention at this point of time are the ones related to the application of the knowledge of the subject of Aerospace Medicine in the omnipresent environmental & physiological threat during the times of operations. In order to do so, the aviators need to be informed, trained and guided with ways and means that help them to attain mission success. The theme for this conference thus has been appropriately chosen to be 'Aerospace Medicine: Opportunities and Applications'.

3. I am sure the deliberations of the conference will encompass all facets of the art of practicing Aerospace Medicine. Challenges encountered at the field level will be discussed along with possible remedies that may pave the way to positively utilize opportunities through active interaction by all participants. The conference should witness a high quality of interaction between experts in Aerospace Medicine, both from India and abroad. We would be delighted to have an intense and thought provoking discussion between delegates who will share their rich experience and erudite views on the various aspects of this subject. Such discussions would be of great benefit to our young members who could apply this gained knowledge in the practice of their profession.

4. I convey my good wishes to the Organizing Committee for their untiring efforts and wish the conference great success.

Jai Hind!

10 Oct 2022



एयर वाईस मार्शल साधना एस नायर वी एस एम
प्रधान चिकित्सा अधिकारी

Air Vice Marshal Sadhna S Nair VSM

Principal Medical Officer

Tele : 080-2341 1081

Telefax : 080-2341 4061

AFNET : 4111-7550

Mobile : +91-9148045386

E-mail : kpsadhna55@gmail.com

प्रशिक्षण कमान मुख्यालय
भारतीय वायु सेना
जे सी नगर पोस्ट
बेंगलूरु - 560 006

HQ Training Command
Indian Air Force
JC Nagar Post
Bengaluru - 560 006



MESSAGE

1. I extend a warm welcome to all members, delegates and invitees to the 61st Annual Conference of Indian Society of Aerospace Medicine from 03-05 Nov 22.

2. The conference will provide a comprehensive series of meticulously planned orations, scientific sessions, panel discussions and poster sessions. The conference will be a venue for interaction amongst Aerospace Medicine specialists, doctors from allied specialties, engineers, aerospace scientists and aircrew from India and abroad. I am sanguine that it shall lead to an exchange of information, ideas and expertise. This event will provide a platform for deliberations on recent aeromedical support initiatives and scientific advances directed towards Aerospace Safety.

3. The conference is being attended by delegates from across the globe, in both an offline and online platform. The quality of interaction therefore, will no doubt be of the highest standards, which eventually would lead to an excellent outcome.

4. It is my pleasure, as the Conference's Chief Coordinator, to note that the conference has attracted a wide range of papers from eminent professionals. I wish all the speakers and delegates a most informative conference and wish the conference a tremendous success.

Jai Hind!

Sadhna S Nair



एयर कमोडोर विपिन शर्मा

समादेशक

Air Commodore Vipin Sharma

Commandant

Tele Off. : +91-80-2522 1781

Fax : +91-80-2522 4659

AFNET : 4313 7200

Mob. : 98712 81692

98682 56100

E-mail : vipiniam@gmail.com

वांतरिक्ष औषधि संस्थान

भारतीय वायु सेना

विमानपुरा पोस्ट

बेंगलूरु - ५६००१७

Institute of Aerospace Medicine IAF

Vimanapura Post

Bengaluru-560 017



MESSAGE

1. I would like to take this opportunity to welcome all delegates to the 61st Annual Conference of the Indian Society of Aerospace Medicine, which will be held in the garden city of Bengaluru from 03-05 Nov 22.

2. Being the Executive Coordinator of the conference has been like riding a roller-coaster with its many ups and downs in the run-up to the conference. Notwithstanding, it has been a matter of pride for me and an immense sense of satisfaction to see the arrangements fructifying as conceived. My team has toiled hard to ensure that adequate scientific fare is provided to the delegates as they enjoy the salubrious climate of Bangalore.

3. The theme selected provides a forum to address novel challenges in the field of Aerospace Medicine with applied research. To make the conference interesting for all, papers, consistent with the theme, from a spectrum of topics such as military and civil aviation, flight safety and Human Space Flight Program have been chosen for presentation. The conference will witness a high quality interaction between experts from

various fields in the subject of Aerospace Medicine. I am sure, all of us will leave the Conference a little more wiser, a little more informed and a little bit stimulated to pursue the issues with renewed vigour.

4. I wish you all a pleasant stay in Bengaluru and return back having gained from the scientific deliberations of this event.

Jai Hind!

A handwritten signature in black ink, appearing to read "Lipin Sharma". The signature is fluid and cursive, with a horizontal line underlining the name.

Date: 02 Nov 22



COMMITTEES



**61st Annual Conference of
the Indian Society of Aerospace Medicine
Aerospace Medicine: Opportunities & Applications**

Conference Advisory Committee

Society President

Air Mshl Prashant Bharadwaj AVSM VSM & BAR PHS, DGMS (Air)

Society Secretary

Gp Capt NK Tripathy

Chief Coordinator

AVM Sadhna S Nair VSM

Executive Coordinator

Air Cmde Vipin Sharma

Conference Organising Committee

Organising Secretary

Wg Cdr Stuti Mishra

Asst Organising Secretaries

Wg Cdr Sneha Dinakar
SqN Ldr BN Vasudev

Organising Secretariat

Sqn Ldr YS Thakur
SqN Ldr Saurav Gain
SqN Ldr Anubhav Upadhyay
Maj Jeya Kartik

Scientific Programme Committee

Gp Capt SS Mohapatra
Dr CHN Sowgandhi Sc-F
SqN Ldr Saurav Gain
Dr Suryakiran

Stage Committee

Gp Capt Rahul Pipraiya
Lt Col Srinivasa Bhattachar
Sqn Ldr Polash Sannigrahi
Sqn Ldr Gaurab Ghosh
Sqn Ldr Shruthi B Chandran
Dr Ruchika Rana

MC

Sqn Ldr Gaurab Ghosh
Sqn Ldr Polash Sannigrahi
Wg Cdr Namita Chaudhary
Surg Lt Cdr B Vinod
Dr Neha Arun Rao

Invitation & RSVP Seating and ushering

Gp Capt Piush Renjhen
Lt Col Binu Sekhar M
Wg Cdr Fatima SS
Maj Savina George
Surg Lt Cdr Karthikeyan S
Surg Lt Cdr Shireen Deepthi
Dr Ruchika
Dr Harshini H

Slide Projection & Photography

Gp Capt Urmila Sahu
Gp Capt Bornali Gogoi
SqnLdr Nandishwar Rathore
Sqn Ldr Avishek Sharma

Poster Presentation

Col VK Malhotra
Maj Savina George
Dr Harshini H

E-Souvenir

Lt Col Binu Sekhar M
Wg Cdr Sushree S Khatua
Maj M Hemanth K A
Sqn Ldr Shaleen P Singh

Folders, Banners &Printing

Lt Col Binu Sekhar M
Wg Cdr Sushree S Khatua
Sqn Ldr Shaleen P Singh

Accommodation & Catering

Surg Capt Ranjan Sarkar
Wg Cdr Y Dinker
Wg Cdr KK Singh
Wg Cdr Biplab Bhowmick
Sqn Ldr Devdeep Ghosh
Sqn Ldr BK Singh
Sqn Ldr Deepan Rai
Sqn Ldr B Bhowmick
Dr Akshay C Shirur

PRO

Dr Biswajit Sinha Sc F

Treasurer

Dr SR Santosh Sc F
Sqn Ldr Shambhavee Singh

Ladies Day Out

Wg Cdr Sushree S Khatua
Sqn Ldr T Anitha
Surg Lt Cdr Shireen Deepthi

Reception & Registration

Wg Cdr TD Khaling
Wg Cdr Vinita Binni

Delegate Kits

Sqn Ldr Sara Praveen
Maj Jeya Kartik
Dr Preethi R

Transport

Gp Capt Urmila Sahu
Gp Capt Bornali Gogoi
Maj Hemanth K A

**Business meetings & SMO's
Conference**

Sqn Ldr S Praveen Kumar
Sqn Ldr Shambhavee

TMS Co-ordination

Gp Capt Rahul Pipraiya
Surg Capt Ranjan Sarkar
Wg Cdr Biplab Bhowmick

Technical Support

Gp Capt Urmila Sahu
Gp Capt Bornali Gogoi
Sqn Ldr Nandishwar Rathore
Sqn Ldr Avishek Sharma

Administrative Support

Wg Cdr Vikram Singh
Sqn Ldr Sara Praveen
Sqn Ldr Devedeep Ghosh

Medical Cover

Lt Col Shravan TS
Sqn Ldr U Solanki

Facilitation of BAIL

SMO Yelhanka

Officers Mess Support

PMC, Offrs Mess

Beverages

OIC Canteen

Orations

Org Secretariat

Trophies & Awards

Lt Col Srinivasa B

CME Credits

Sqn Ldr BN Vasudev

ISAM Video

Wg Cdr Sneha Dinakar
Sqn Ldr Gaurab Ghosh
Sqn Ldr Avishek Sharma



SCIENTIFIC PROGRAMME



61ST ANNUAL CONFERENCE OF
THE INDIAN SOCIETY OF AEROSPACE MEDICINE

SCIENTIFIC PROGRAMME

03 NOV 22

**0830h–
0930h** **Session I – Field Talk**
Chairpersons: **AVM MS Sridhar**
 Gp Capt YS Dahiya

A case of incidentally detected Spina Bifida at DV1 level in a Fighter Pilot: Aeromedical Deliberations *Dr Neha Rao*

Analysis of ST-Elevation Myocardial Infarction occurring in soldiers during strenuous military training *Brig Navreet Singh (Online)*

Surge Fighter Flying at an Operational Base: Aeromedical aspects *Wg Cdr Ashu Chandra*

A disabling dive: A physician's nightmare *Dr Ajith Kumar*

**0930h–
1030h** **Session II - Aeromedical Stress – ‘Height’ Matters!**
Chairpersons: **AVM Shankar Subramanian**
 Gp Capt Prathu Rastogi

Randomized Trial - Does Tadalafil and/or Acetazolamide help prevent HAPE *Maj Savina Oommen*

Anthropometric changes in male subjects on exposure to 24 h of simulated microgravity *Lt Col Manu N*

Comparison of Intermittent Hypoxia Exposure at High Altitude and routine Acclimatisation - A pilot study *Lt Col Srinivasa AB*

Effect of Acute Normobaric Hypoxia on passively simulated illusions *Lt Col Srihari Iyer (Online)*

**0930h–
1030h** **Poster Session I**

Post-mortem whole-body CT scan as an adjunct to autopsy interpretation: A valuable tool in fatal aircraft accident investigations *Wg Cdr Neha Gupta*

C130J: IAFs Hercules in Cas/ Med Evacuation *Sqn Ldr Moin Sakre*

Preparing for the unprepared: Fatal Aircraft Accident at the base *Wg Cdr Ajay Kumar*

Incidence of G-Induced Loss of Consciousness in the Indian Air Force: A retrospective study *Sqn Ldr Avinash Gowda*

The curious case of Restraint System in crew seat for Flight Engineers in a helicopter *Sqn Ldr Rahul Dev*

**1130h–
1330h**
1130h

Plenary Session

Arrival of the Chief Guest

Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC
Chief of the Air Staff, Indian Air Force

1131h–
1135h

Audio visual Presentation

1136–
1141h

Welcome Address

Air Commodore Vipin Sharma
Commandant, IAM IAF

1142h–
1152h

Presidential Address

Air Marshal Prashant Bharadwaj AVSM VSM & BAR PHS, DGMS (Air)

1154h–
1204h

Address by Chief Guest

Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC
Chief of the Air Staff, Indian Air Force

1206h–
1218 h

Presentation of Awards, Trophies, Mementoes, Release of Journal, TMS & E- souvenir

1221h–
1224h

Vote of Thanks

Wg Cdr Stuti Mishra
Organising Secretary

1225h–
1327h

Air Mshl Subroto Mukerjee Memorial Oration

Chairperson: Air Mshl Prashant Bharadwaj AVSM VSM & BAR PHS, DGMS (Air)

Speaker: Dr. Gary G Kay Ph.D

Topic: Analysis and Evaluation of the Cognitive Demands of Flying

**1430h–
1530h**

Session III - Medical Screening through New Lens

Chairpersons: Air Cmde Sandeep Arora
Gp Capt SS Mohapatra

Contrast Sensitivity assessment of military aircrew aspirants on induction: Reinforcing the visual standards *Wg Cdr Biplab Bhowmick*

Addictive drug testing and their outcome– *Dr. BK Umesh Kumar*
Commercial airliner experience

Analysis of Major Ocular Conditions Leading to Rejection in the Air Force Aspirants *Wg Cdr Atul Kumar Singh (Online)*

A comparative study between an indigenously developed Psychometric Test Battery 'PSUMEDHA' and 'CogScreen-AE' *Sqn Ldr Anitha T*

1530h–1630h **Session IV - Human Factors Solutions – Tape & Stick Approach!**
Chairpersons: Maj Gen VV Joshi VSM
Gp Capt NK Tripathy

Duration for Visual Adaptation to various light conditions during Night Flying Operations *Lt Col Binu Sekhar M*

Study of relation between scores of IAM-EMP with Musculoskeletal Disabilities *Dr Suryakiran*

Cockpit Design Customization, Modifications or Upgrade: Impact on Anthropometric accommodation *Sqn Ldr BN Vasudev*

Work Domain Analysis: An Abstraction Decomposition Space (ADS) & Abstraction Hierarchy (AH) based approach on AWACS *Sqn Ldr Srihari E*

1430h–1530h **Poster Session II (RAM)**

Dilemma in Aeromedical Disposal of Incidentally detected Arachnoid Cyst *Dr Ruchika Rana*

Unexplained Loss of Consciousness: A continuing dilemma for Aeromedical Decision Making *Dr Akshay CS*

Migraine without aura – A case report in a fighter pilot *Dr Harshini Hariharan*

A case study of Kikuchi Fujimoto disease in a naval aircrew: Aeromedical perspective *Dr Preethi*

Fitness for Fighter Flying in a resolved case of Neurocysticercosis (NCC): Dilemma in Aeromedical Disposition *Surg Lt Cdr Karthikeyan*

**1530h–
1630h** **Poster Session III**

- A case of small intestine malignancy in Civil Aviation cabin crew: An approach to Aeromedical Disposal *Dr A Pramanik*
- HBOT as a treatment option for intractable hemorrhagic cystitis in a paediatric patient: A case report *Sqn Ldr D Rai*
- Aeromedical aspects of Sarcoidosis in an aircrew *Maj Hemanth*
- Heamoglobinopathies in Flight Cadets: Clinical presentations, disposal & role of screening modalities *Wg Cdr Omesh Nath*
- Guillain-Barre Syndrome: in an aircrew *Wg Cdr HPS Sahota*

04 NOV 22

**0830h–
0930h** **Session – V: Free Papers**
Chairpersons: **AVM Renuka Kunte**
 Gp Capt Mona Dahiya

- Manifestation of Ocular Muscle Imbalance after flying Apache 64E aircraft *Wg Cdr SS Khatua*
- Eliminating criteria during +Gz acceleration selective test *Lt Col Nenad Bacevic (Online)*
- Case of pilot trainee aspirant with fingers amputation: Aeromedical Decision Making *Sqn Ldr YS Thakur*
- Comparison of parameters of ergonomic interest between manual Anthropometry and 3D Digital Anthropometry *Sqn Ldr Shruthi Chandran*

**0930h–
1030h** : **AVM MM Srinagesh Memorial Oration (Video-recording)**

Chairperson: **AVM Sadhna S Nair VSM**
Speaker: **Dr. James M Vanderploeg**

Topic: **Private Human Space Flight: Opening Space for all**

1100h–
1200h

Session VI - Innovations & Recent Advances in Human Factors

Chairpersons: **Air Cmde A Jeyachandran VSM**
Gp Capt Rahul Pipraiya

RAF C-17 pilot fatigue: Measurement, assessment of Operational Risk Matrix efficacy and relationship to Flight Data Monitoring parameters. *Wg Cdr Ian Mollan (Online)*

Fatigue Free Occupational Time (FFOT): An objective measure for predicting Fatigue Risk in military flying *Gp Capt SS Mohapatra*

Rudder pedal modification to mitigate toe strike: Lessons learnt *Sqn Ldr Devdeep Ghosh*

A comparison of subjective and objective measures of Vestibular Adaptation in Rotary Chair among Aircrew *Sqn Ldr Nandishwar Rathore*

1200h–
1300h

AVM JHF Manekshaw Panel

Aerospace Safety: Mission Planning & Operations

Chairperson: AVM A Agarwal VSM

Risk based Approach to Managing Safety in India *Mr. Maneesh Kumar, JDG DGCA*

Glimpses of ISRO's Inspiring Missions *Ms Nandini Harinath, ISTRAC, ISRO*

1100h–
1200h

Poster Session IV

A study on the effect of Suryanamaskar on orthostatic tolerance and neurovestibular Functioning upon exposure to HDT *Sqn Ldr Gaurab Ghosh*

A retrospective study of Air Sickness cases at IAM: Psychological Perspective *Ms Anjana Biju Thattil*

Obesity and co-morbid Hypertension: Impact on cognition *Dr Kallavarapu Vincent*

Challenges in casualty evacuation during COVID-19 pandemic in overseas peacekeeping operations in remote areas of Eastern Africa *Lt Col TS Rana*

Validation of 3D laser Anthropometric parameters using manual anthropometric data *Mr S Nayak*

1200h– 1300h	Poster Session V	
	Case Study: Fatal Aircraft Accident	<i>Sqn Ldr Billa Nanda Kishore</i>
	Body Composition Analysis: A significant parameter for examining the fitness of aspiring pilots	<i>Dr Ketan L Pakhale</i>
1400h– 1530h	Session VII Devices and Instruments – Optimal Utilization	
	Chairpersons: AVM Tanmoy Roy VSM Gp Capt MS Nataraja	
	Effectiveness of oto-acoustic emissions as a screening tool for NIHL in the field set-Up (Air Bases)	<i>Surg Capt Ranjan Sarkar</i>
	Use of Moment of Inertia as a parameter of prediction of neck injury potential in HMD helmets	<i>Mr Sabyasachi Nayak</i>
	A Case of mis-fitment of Flying Clothing: Aeromedical evaluation and disposal	<i>Gp Capt Murtaza</i>
	Analysis of a common defect of the Flying Mask	<i>Sqn Ldr Isha Sah</i>
	Comparison of EMG changes in neck muscles on exposure to simulated vibration stress	<i>Lt Col AB Singh</i>
1400h– 1530h	Closed Door Session	
	Chair persons: Surg RAdm R Ravi Air Cmde Mukul Bhatia	
	Human Factors in Aerospace Safety	<i>Air Cmde VS Choudary VM</i>
	Imaging in disaster victim identification: Field experience	<i>Wg Cdr Sneha Dinakar</i>
1530h– 1700h	ISAM General Body Meeting	
<u>05 NOV 22</u>		
0825h– 0830h	Group Photograph – MOs & Dental Officers	
0830h– 1100h	SMO's Conference	
1035h– 1100h	HONEST (Healthcare Online Near Miss and Sentinel Events Tracker)	<i>Air Cmde S Souche</i>

1130h–
1300h

CME Session: Indian Space Mission – A Step Forward!
Chairpersons: Air Cmde Vipin Sharma
Wg Cdr Stuti Mishra

Development of real-time Psychomotor Function *Mr Abhishek Jha*
Evaluation test for a Space Mission

A roadmap to astronauts' Water Survival *Sqn Ldr Gaurab Ghosh*
Training & Strategic Rescue post splashdown

Post-flight rehabilitation of an astronaut after *Sqn Ldr Polash Sannigrahi*
long duration mission in Space: Through the
eyes of a Flight Surgeon

Design of extrication device for crew rescue *Mr Satyam Malhotra*

Analysis of deep learning algorithms for Crew *Mr Vishal Shukla*
Health Monitoring applications



ORATIONS



Air Marshal Subroto Mukerjee Memorial Oration



Air Marshal Subroto Mukerjee, OBE

Air Marshal Subroto Mukerjee OBE (05 Mar 1911- 08 Nov 1960) lived a life of determination, dedication and total commitment to the cause of the service that he guided from its inception until its transformation into the Air Arm of independent India. In the early 1930's, when the British government in India could no longer ignore the growing demands of the Indian people for greater representation in the higher ranks of the defence services, it grudgingly began the process of 'Indianisation' of the services. As a result, the Indian Air Force (IAF) came into being on 08 October 1932.

While the older services were marked for partial Indianisation, the IAF became the first truly Indian service, as only Indians could be granted commission or enrolled in its ranks. In those early days, a career in the Air Force was an uncharted path for Indians, made all the more difficult by the prevailing discriminatory and obstructive mindset of the majority of the British in India who were extremely skeptical of the ability of the 'natives' to fly military aeroplanes. Air Marshal Subroto Mukerjee was one of the six Indians selected for training as pilots at the RAF College, Cranwell. The date of commission of this small pioneering band coincided with the date of formation of the Indian Air Force. In July 1938, he was put in command of 'B' Flight of the No.1 IAF Squadron in the rank of Flying Officer. He became the first Indian Officer to command a Squadron when he took over No.1 on 16 March 1939. After converting to the Hawker Hart, the Squadron moved to Miranshah in the North West Frontier Province (NWFP). It was here that he led the Squadron into action against the tribals of the NWFP. When the war broke out in the East, Mukerjee was at the Air HQ as a Wing Commander. He served in various staff assignments during the war and for his services, during World War-II, Mukerjee was given the Order of the British Empire (OBE) in 1944. At the time of Independence,

Mukerjee was the senior most Air Commodore serving with the IAF. On 15 August 1947, when India achieved Independence, the Armed Forces too became independent forces. They were no longer under the British Army or the King. However, as there was a lack of senior officers, it was decided to put serving British Officers as Commanders. Accordingly, Air Marshal Sir Thomas Elmhirst became the Air Force Chief. Air Commodore Mukerjee was promoted to Air Vice Marshal and posted as the Deputy Chief of the Air Staff at Air HQ. He served as the Vice Chief for over 6½ years. Working under three different British Chiefs helped him groom himself for the top post. On 01 April 1954, he took over from Air Marshal Gerald Gibbs as the Chief of the Air Staff of the Indian Air Force. At that time, he was just about 43 years old. Upon him fell the task of re-equipping and restructuring the Air Force with newer aircraft & equipment. Under his tenure, the Air Force inducted a variety of state-of-the-art aircraft. The Dassault Mystere, the Hawker Hunter, the BAe Canberra and even the Folland Gnat was inducted during his tenure. Over the next few years, he was to lead the fledgling service through its trials and tribulations, taking it from strength to strength, till it was ready to take its place amongst the leading Air Forces of the world. Mukerjee took care to see that even the personnel and human resources planning, and development received much attention. His task was commendable for he had to deal with the post-independence non-violence driven defence policy.

Tragically, Air Marshal Subroto Mukerjee's brilliant career was cut short in its prime in 1960 at the age of 49. Yet, his legacy lives on, and forms the cornerstone of the hallowed traditions of the service whose very foundations he laid, and whose edifice he built in the early years of its history.

Air Marshal Subroto Mukerjee not only laid the foundation of our Air Force but also the Medical Services of IAF. It is largely due to his unfailing interest and foresight that a well-established medical service, to cater to the needs of the Air Force was formed. The well-known Institute of Aerospace Medicine, which is the first of its kind in Asia, owes its existence mainly due to his patronage and support.

The Aeromedical Society of India (now Indian Society of Aerospace Medicine) was formed in 1952. Air Marshal Subroto Mukerjee was its first patron and remained so till his untimely demise in 1960. He took keen personal interest in the affairs of the Society and was the main pillar of support in its formative years.

As a gesture of the Society's gratitude and appreciation, in 1971, the Aeromedical Society of India instituted an oration in his name to be delivered during the inaugural function of the annual meeting of the Society. A medal is also presented to the eminent personality who delivers the oration.

Air Marshal Subroto Mukerjee Memorial Orations

1972-2021

SI No	Year	Orator	Topic
1.	1972	Mai Gen Inder Singh	Rehabilitation of Cases of Ischemic Heart Disease in The Armed Forces
2.	1973	Dr Rustom Jal Vakil	Electro-Cardiographic Abnormalities in Normal and Apparently Normal Individuals
3.	1974	Gp Capt Peter Howard	Current Research in Aviation Medicine In The Royal Airforce
4.	1975	AVM MM Srinagesh	The Values of Aviation Medicine In The Changing World
5.	1976	Dr PN Chuttani	Alcohol: The First Drug of Addiction
6.	1977	Lt Gen RS Hoon (Retd)	Incidence of Cardiovascular Problems Among Flying Personnel and Their Evaluation
7.	1978	Dr Raja Rammanna	Aviation and Radiation Hazards
8.	1981	Dr MS Ahuja	The Art and Science of Adaptation
9.	1986	Dr Madan Mohan	Recent Advances in Ophthalmology and The Development World
10.	1989	Dr MR Girinath	Role of Coronary Bypass in The Treatment of Ischaemic Heart Diseases.
11.	1990	Padmashri Dr S Kameshwaran	Vertigo: Recent Advances
12.	1992	Dr MS Devanandan	Peripheral Organization of Movements of The Hand
13.	1995	Dr CA Varghese	Perspectives of Aeromedical Research
14.	1996	Air Mshl MS Boparai AVSM (Retd)	Horizons of Visual Performance and Aviation
15.	1997	Dr Kenneth N Ackles	Ultimate Air Combat Protection of Pilot
16.	1998	Dr SK Sikka	On Indian Explosions 11-13, 1998
17.	1999	Padmashri Dr Naresh	New Frontiers in The Management of Cardiac

SI No	Year	Orator	Topic
		Trehan	and Cardiovascular Disorders
18.	2000	Dr K Kasturirangan	Space Medicine and Exobiology: Emerging Scenario
19.	2002	Padma Bhushan Dr VK Atre	Aeronautics Technologies – Present and Future1
20.	2002	Prof Douglas Weigmann	A Human Factors: Accident Analysis and Prevention
21.	2003	Dr Ulf L Baldin	How Important Is Scientific Research and Testing of Life Support Equipment for High Performance Aircraft?
22.	2004	Mr. MB Varma	Ergonomic Design of Cockpit of An Advanced Combat Aircraft
23.	2005	Dr Devi Shetty	Converting Atom into Bytes
24.	2006	Shri G Madhavan Nair	Indian Space Programme
25.	2007	Capt GR Gopinath	Integrating Civil Aviation and India's Economic Growth: A Vision and Perspective
26.	2008	Dr K Radhakrishnan	Human Presence in Solar System Director, VSSC
27.	2009	Dr SNA Zaidi	Challenges & Opportunities in Civil Aviation Sector
28.	2010	Wg Cdr Rakesh Sharma AC (Retd)	Space Exploration: Where Do We Go from Here?
29.	2011	Dr AK Gupta	Role of Interventional Radiology in Present Day Medicine
30.	2012	Bharat Ratna Dr APJ Abdul Kalam	Aerospace System: A Possible Profile
31.	2013	Dr AK Chaturvedi	Aerospace Toxicology: An Emerging Multidisciplinary Field of Medical Sciences
32.	2014	Dr Prabhat Kumar, IAS, DGCA	How to Keep Indian Skies Safe
33.	2015	Ms Shikha Sharma MD & CEO Axis Bank	Beyond Glass Ceilings: Challenges and Opportunities for Women In 21 st Century
34.	2016	Dr Soumya Swaminathan	The Relevance of Making Data Relevant Translational Research in Medicine

Sl No	Year	Orator	Topic
35.	2017	Air Cmde Harish Malik (Retd)	Civil Aerospace Medicine in India
36.	2018	Air Mshl NB Amaresh VSM(Retd)	The Pilot Physician – What Has Been and What Can Be!
37	2019	Prof K Vijay Raghavan	The Role of Science & Technology - From India – Forthe Future of Our planet
38	2020	Dr Scott Shappell	Developing Novel Intervention Strategies Using Human Factors Intervention Matrix (HFIX)
39	2021	Dr Quay Snyder	Pilot Physician’s Evolution to Human Intervention Motivational Study (HIMS)

BIODATA

Dr Gary G Kay, Ph.D.



After serving as a clinical neuropsychologist with the US Navy, Dr. Kay joined as Director of the Neuropsychology Division in the Department of Neurology at Georgetown University School of Medicine. He received his Ph.D. in Psychology (Clinical Neuropsychology) at the University of Memphis. His research activities focused on development of computerized methods for assessing higher cortical functions, and investigation of the neuropsychological sequelae of traumatic brain injury, fibromyalgia, multiple sclerosis, Diabetes, Eosinophilia Myalgia syndrome, alcoholism, and normal aging. He developed the CogScreen computerized cognitive test battery. In 2006 he co-founded Cognitive Research Corporation, an organization that focused on drug development in Neurology and Psychiatry. Dr. Kay is a diplomat of the American Board of Professional Neuropsychology and American Board of Assessment Psychology. He is a Fellow of the National Academy of Neuropsychology, Associate Fellow of the Aerospace Medical Association, and a Member of the International Neuropsychological Society and American Psychological Association. Dr. Kay was awarded the 2019 Lifetime Achievement Award of the American Board of Professional Neuropsychology. He was the recipient of the 2021 Henry L. Taylor Founders Award by the Aerospace Human Factors Association. He has presented to the Institute of Medicine of the National Academy of Sciences, testified to U.S. Congressional committees and the Canadian Senate, provided testimony at US Food and Drug Administration hearings, and

serves as a consultant to numerous governmental, corporate, and medical organizations. Dr Kay is the co-editor of the book, *Aeromedical Psychology* (2013), and is the author of numerous book chapters and peer-reviewed articles that have appeared in *Archives of Internal Medicine*, *American Psychologist*, *Human Psychopharmacology*, *British Journal of Pharmacology*, *Aviation Space and Environmental Medicine*, *Annals of Allergy*, and the *American Journal of Managed Care*. He was accepted into the US Navy's Health Professional Scholarship Program and completed his psychology internship at the National Naval Medical Center in Bethesda, Maryland. Dr Kay has served as a consultant to the Federal Air Surgeon of the US Federal Aviation Administration since the mid-1980's. He was the founder and organizer of the Annual Aviation Psychology Seminar from 2013-2020. He continues to see pilots in his clinical practice.

ABSTRACT

Analysis and Evaluation of the Cognitive Demands of Flying

Aviation safety and performance are dependent upon the cognitive functioning of pilots. This presentation will address determination of the cognitive demands of flying, the factors that impact pilot cognitive functioning, and the assessment of pilot cognitive functioning. It is indisputable that cognitive functioning plays a key role in pilot performance. Factors which degrade pilot cognitive functioning (e.g., fatigue and task saturation) are known to adversely impact flight performance. The presenter will share the methodology and initial findings from an approach used to analyze the cognitive demands of flight performance. Military and civil aviation pilots with experience in single and multi-pilot cockpits were extensively interviewed to identify and evaluate the cognitive ability demands at each phase of flight. The objective of this process is to determine which cognitive abilities are essential and the level of the cognitive ability demanded to safely perform aviation operations. In addition, the subject matter experts are identifying factors that moderate the level of cognitive performance demanded, such as the level of pilot skill (e.g., Top Gun versus below-average aviator). Advances in the specification of the essential cognitive abilities and the level of ability demanded can be aimed at optimizing pilot performance. Assessment of aero-medically significant declines in pilot cognitive functioning requires application of valid and standardized neurocognitive tests. The current

effort at specifying cognitive demands better informs the selection of those tests. Normative data for Military, Airline, and General Aviation pilots is currently available for many of these measures. Knowing that a pilot has performed worse than 95% of healthy aviators is crucial to aviation safety. Research will be presented showing that reliance on self-report of declines in cognitive functioning is not sufficiently reliable. Results will be shared from clinical trial research showing a lack of correspondence between self-report and actual performance following administration of cognitively impairing drugs. Assessment tools which survey the cognitive demands of flying are critical to aviation safety and optimization of pilot performance.

Air Vice Marshal MM Srinagesh Memorial Oration



Air Vice Marshal MM Srinagesh

Air Vice Marshal MM Srinagesh PVSM AVSM VSM was born on 02 Oct 1912. As a young Lieutenant, Madhukar Mallanah Srinagesh was among the first Medical Officers of the IAF who volunteered to join the IAF Medical Service in 1940 while serving in the Indian Medical Service (IMS). He was the first Medical Officer to be posted as Deputy Principal Medical Officer (DPMO) IAF with the creation of this post on the RAF PMO's staff at Air HQ. He was promoted to the rank of Squadron Leader, to fill this appointment, in 1943. Subsequently, in 1945, Sqn Ldr MM Srinagesh was promoted to the rank of Wing Commander to fill the same appointment. On 15 Aug 1947, he was appointed PMO Air HQ in the rank of Gp Capt and he later became DMS (Air) with the same rank. He retired from IAF at the rank of Air Vice Marshal on 10 Sep 1971.

Trained in Aviation Medicine in USA, AVM MM Srinagesh was keen practitioner of the then fledgling specialty of Aerospace Medicine. He contributed enormously to the progress and advancement of this area of expertise in India. The fruits of his labour are being reaped even by the present generation of Aviation Medicine specialists. He was truly the father of Aviation Medicine in India.

As a gesture of our thankfulness and gratitude, the Indian Society of Aerospace Medicine (ISAM) instituted an Oration in his name in 2007. The Oration is delivered during the Annual Conference of the ISAM. A memento is also presented to the eminent personality who delivers this oration.

Air Vice Marshal MM Srinagesh Memorial Orations

2007-2021

Sl no.	Year	Orator	Topic
1.	2007	Dr CA Varghese	50 Years of Aeromedical R&D in India: A Ring Side View
2.	2008	Mr M Madhavan Nambiar	Civil Aviation In India In 2020
3.	2009	Dr Ashok Seth	Coronary Intervention – Is the Interventionalist a Threat to The Cardiac Surgeon
4.	2010	Dr PD Navathe (Retd)	From Srinagesh To Srinagesh: The Journey from Operation Aviation Medicine to Clinical Aviation Medicine
5.	2011	Dr Jeffery R Davis	An Earthling to An Astronaut: Medical Challenges
6.	2012	Prof Stephen DR Harridge	Skeletal Muscle in Aviation Medicine
7.	2013	Dr Manas K Mandal	The Cognitive Science of Uncertain and Unknown Environment
8.	2014	Dr Jarnail Singh	Fatigue Risk Management in Airlines Operations
9.	2015	AVM G Gomez VSM (Retd)	“The Earthlings Are Coming” Mission Mars Challenges
10.	2017	AVM P Kharbanda VSM (Retd)	Stress and Fatigue In Aviation
11	2018	AVM Pankaj Tyagi VSM (Retd)	Indian Space Program: Past, Present, Future
12	2019	AVM JS Kulkarni (Retd)	Aeromedical Research in India: Past, Present and Future
13	2020	Wg Cdr SN Sharma (Retd)	Coronary Artery Disease: Pathophysiology & its Therapeutic implications
14	2021	Steve Roberts	Head & Neck Protection – the Evolving Science

BIODATA

Dr James Vanderploeg



Dr. James Vanderploeg, Chief Medical Officer, Virgin Galactic, has over 42 years of experience in aerospace medicine with a career spanning, governmental and commercial medical operational support from the beginning of the Shuttle program to serving as Chief Medical Officer for Virgin Galactic. He is recently retired from Professor of Aerospace Medicine and Director of Clinical Preventive Medicine at the University of Texas Medical Branch in Galveston, Texas. He now serves as Senior Faculty and Executive Director of Aerospace Medicine in Baylor's Center for Space Medicine. His research has demonstrated that virtually all individuals of all age groups whose medical conditions are well controlled can safely withstand the acceleration forces of a space flight. He is an Academician and the President-elect of the International Academy of Aviation and Space Medicine. His previous leadership activities included President of the Aerospace Medical Association, member of the Board of Directors of the American Board of Medical Specialties, and Trustee and Executive Director of the American Board of Preventive Medicine. He is the Executive Director and principal investigator on multiple research projects of the FAA Center of Excellence for Commercial Space Transportation. He is also involved in evaluation of airline pilots seeking special issuance authorization for medical certification following recovery from medical or psychological problems. He actively trains physicians in the specialty of aerospace medicine. As Virgin Galactic's Chief Medical Officer, Dr. Vanderploeg is responsible for developing and implementing the medical programs for spaceflight participants, Virgin Galactic pilots, and other employees. He is an FAA Senior Aviation Medical Examiner, and is Board Certified by the American Board of Preventive Medicine in both Aerospace Medicine and Occupational Medicine. He has numerous publications, the most recent being the medical results from research projects using centrifuge exposure to simulate the G forces of a Virgin Galactic space flight.

ABSTRACT

Private Human Space Flight: Opening Space for All

Private human space flight is generally agreed to have begun with the flight of Dennis Tito to the International Space Station in 2001. Since that time over 50 private citizens have undertaken space flights. These people have ranged in age from 18 to 90 years of age. To enable and support private individuals flying to space a great deal of activity has occurred over the past 20 years to develop medical criteria and standards. In addition, research studies have been performed to ascertain whether individuals within this vast age range and with a variety of medical conditions can safely undertake suborbital and orbital space flights.

This oration will review the history and status of private human space flight, including the following points:

1. The history of private space flight development,
2. the research results that have underscored the ability to safely conduct such flights,
3. the development and status of medical acceptance criteria and medical standards for Space Flight Participants,
4. the process for evaluating and mitigating medical risk,
5. case examples of individuals who have already flown to space with significant underlying medical problems, and
6. the ongoing efforts to enable people with disabilities to safely fly to space.

The oration will conclude with a few predictions for the future and the challenges that lay ahead to open space travel for all.

Air Vice Marshal JHF Manekshaw Panel



Air Vice Marshal JHF Manekshaw

Born on 28 Oct 1916, Air Vice Marshal Jemi Harmusji Framji Manekshaw, PVSM, AVSM joined Air Force as a doctor after doing MBBS from Punjab University on 22 Jul 1943. He became an Aviation Medical Specialist and served the Armed Forces Medical Services (AFMS) with distinction. He was associated with the School of Aviation Medicine (later Institute of Aviation Medicine) while the transformational changes in the form of advanced simulators were commissioned. He was instrumental in establishing the first Hyperbaric Oxygen Therapy (HBOT) facility at the Institute of Aviation Medicine (IAM).

He commanded the Institute of Aerospace Medicine from 29 Sep 1959 to 05 Sep 1960 and 14 Apr 1967 to 28 Feb 1973 as a Sqn Ldr, Wg Cdr, Gp Capt & Air Cmde. After this he was posted at the office of DGAFMS as the DMS (Medical Research) as an AVM. The Unit Crest with 'Nabahsi Arogyam' was given by the then President of India Shri VV Giri during his command of the Institute of Aviation Medicine. He was awarded the AVSM in 1971 and PVSM in 1976 by the President of India. Field Marshal Sam Hormusji Framji Jamshedji Manekshaw, MC, the Chief of Army Staff was his brother.

In the field of Aerospace Medicine, JHF Manekshaw achieved heights no lesser than his brother, whom the nation reveres. In the memory of this exceptional professional in the speciality of Aerospace Medicine, the Indian Society of Aerospace Medicine, in its 57th Annual Conference has decided to start a Panel on Emerging Trends in Aerospace Medicine dedicated to the memory of JHF Manekshaw.

In the Panel of 57th ISAM Conference in 2019, Dr Girish S Deodhare, Director CA & ADA delivered a talk on *Challenges in Development of Modern Fighter Aircraft* and Dr Unnikrishnan Nair, Director HSFC delivered a talk on *Human Space Programme*.

Air Vice Marshal JHF Manekshaw Panel Orations

2018-2021

Sl no.	Year	Orator	Topic
1.	2018	Dr S Somnath	Human Space Programme
		Dr Kotesw TM	Emerging Trends in Flying Clothing
2.	2019	Dr Girish S Deodhare	Challenges in development of modern fighter aircraft
		Dr Unnikrishnan Nair S	Human Space Programme
3.	2020	Dr VR Lalithambika	Human Space Missions: Design Challenges and Strategies
		Dr Taslimarif Saiyed	Building Cutting-Edge Healthcare Innovations: Discussion on Efforts Towards a Point-of-Care Test for Detection of Sleep Deprivation
4	2021	Dr AK Ghosh	Human Interface in 5+ Generation Fighter Aircraft
		Dr Pratima Murthy	Mind Matters in Modernity

BIODATA

Mr Maneesh Kumar



Mr. Maneesh Kumar is Joint Director General in DGCA-India since the year 2021. The Joint Director General is in charge of Air Safety Directorate and heads the division for implementation of SSP India. He holds a Bachelor's Degree in Aeronautical Engineering, a Master's Degree in Rotodynamics and a Bachelor's Degree in Law. In his aviation career spanning over a period of 30 years he has served in various capacities in the DGCA-India. He has been the lead Investigator in many major accidents, a prolific auditor of the Aviation organisations and he is instrumental in development of the State Safety Programme, related regulations, guidance material and publications. At present, among his other assignments he is handling the implementation of State Safety Programme in India at State level and implementation of SMS among service providers. He has been instrumental in the establishment of the National Aviation Safety Plan, State Safety Priorities, Performance Indicators and Safety Action Plan. He also heads the DGCA-India Training Directorate, Information & Regulation Directorate and Flying Training Directorate. He has also worked as ICAO expert for developing State Safety Programme for other countries. He is member of GASP- Steering Group. He was the member of the ICAO task force for developing the requirements on the subject "Assistance to the victims of Air Accident".

ABSTRACT

Risk Based Approach to Management of Safety in India

Mr Maneesh Kumar, JDG DGCA

India has established State Safety Programme (SSP) in accordance with ICAO Annex 19, a process for proactive identification of the aggregate aviation

hazard and resultant risks at State level and proactively mitigates them before they result in accident and incident. As part of ICAO Annex 19 and SSP requirements, DGCA requires aviation service providers to have Safety Management System (SMS) in place commensurate with the size and complexity of their aviation activity. These processes enable a clear understanding of each entity of its safety role and help in prioritizing actions to address safety risks and more effectively manage their resources for the optimal benefit of aviation safety. The cornerstone of India Safety Policy is to promote positive safety culture as it enables effective safety management implementation, through open channel communication within the organisation and between service provider & the regulator. Effectiveness of actions taken to manage the safety risks and safety issues, Safety Performance Indicators have been developed at State level and at service provider level which are measured with respect to agreed targets periodically.

Air Vice Marshal JHF Manekshaw Panel Speaker

BIODATA

Ms. Nandini Harinath



Nandini Harinath, M.Sc. (Hons.) Physics, Delhi University is a Senior Scientist working in the Indian Space Research Organization (ISRO) for the past 27 years. She is presently the Deputy Director, Spacecraft Operations, at ISTRAC, ISRO, responsible for the tracking and control of 29 low earth orbiting satellites and their daily operations. Nandini has worked on over 20 satellite missions in key designations to date and is well known for her contribution as the Project Manager and Mission Design Deputy Operations Director for the Mars Orbit Mission (MOM), popularly known by the name of the Mangalyaan mission. She is currently planning and executing Science payload operations in the Martian orbit. She was the **Mission Director for Risat 2B constellation** of satellites and Resources at-2A satellite and was responsible for end-to-end operationalization of the satellites, and was the Mission Systems lead for NASA - ISRO collaboration satellite called NISAR. Nandini has several Publications related to the above work and has won several awards over the years including the “*ASI Gold medal*” 2019, “*India Today Woman in Science*” award 2015 and “*ASI/ISRO team awards*”. She was awarded “*Kannada Mahila Rathna*” award by Kannada Sahithya Parishad. She was Appointed as one of the ‘**Board of Governors**’ for Maulana Azad National Institute of Technology, Bhopal, has featured in a movie by ‘Science Friday’ (an American radio channel), premiered on 12 Dec 16, called “Breakthrough Snapshots from Afar.....” and in a book “*Those Magnificent women and their Flying machines*” by Minnie Vaid.

ABSTRACT

Glimpses of ISROs inspiring missions

Mrs Nandini Harinath, ISTRAC, ISRO

Having worked in the Mission Planning and Operations team, the speaker will lead you through the journey of some of ISROs important missions like the "Mangalyaan". A firsthand account of the challenges faced in the mission and how

the teams overcame them. Robust Mission Design and efficient planning are key components of any successful mission. The talk is a sneak preview into the design and analysis of some the inspiring missions by ISRO.



ABSTRACTS: PODIUM PRESENTATIONS



Session-I

A Case of Incidentally Detected Spina Bifida at DV1 level in a Fighter Pilot: Aeromedical Deliberations

Neha Rao, Deepan Rai, Suryakiran, Gaurab Ghosh, Binu Sekhar M

A failure of closure neural tube normally results in Spina Bifida. The lesions may occur anywhere along the spine but are more common in the lumbosacral region (90%) in comparison to the thoracic (6%) or cervical (3%) spines. According to policy guidelines, all cases of Spina Bifida are unfit for all branches and trades of Indian Air Force, except for Spina Bifida in sacrum and LV5, if completely sacralised. When various congenital defects are considered Spina Bifida at SV1 level is relatively innocuous. However, anomaly in upper spinal regions is associated with narrowing of spinal canal which may be accompanied by herniation of meninges. This may be exaggerated when such a spine is exposed to high +Gz accelerations or to ejection forces and may result in sudden in-flight incapacitation. This paper highlights a case of a fighter aircrew who was incidentally detected to have Spina Bifida at DV1 level during evaluation for cervical PIVD and the aeromedical deliberations for its disposal.

Analysis of ST-elevation Myocardial Infarction occurring in Soldiers during Strenuous Military Training

Navreet Singh

Background. At our tertiary care Cardiology center, we are receiving soldiers who sustained acute ST-Elevation Myocardial Infarction (STEMI) during the strenuous Battle Field Efficiency Test (BPET) and other such activities. **Methods.** This was a single center, observational study to assimilate and analyze the precipitating causes, risk factors, symptoms, and the efficacy of the management protocols in soldiers sustaining STEMI during the BPET or other forms of strenuous military training. **Results.** All 25 soldiers with documented STEMI following the strenuous military training presented with chest pain as the primary symptom. 88% had symptoms either during or within 1st hour of the strenuous activity. 76% underwent thrombolysis with a angiographic success rate of 95%. Primary PCI was possible in only 3/25 (12%) of the cases of which 2 (66%) did not require stenting after thrombus-aspiration. 88% soldiers reported 'training for the event' for less than 4 times/week. **Conclusion.** STEMI precipitated by strenuous unaccustomed military training have exclusively single vessel affection with an excellent response to thrombolysis and thrombus aspiration. Thus, timely institution of pharmacological or mechanical revascularization therapy has dramatic results in preservation of ventricular function. The lack of training for the strenuous event, provides strong evidence for comprehensive, graded, physical training prior to strenuous military activities, to prevent acute coronary syndromes.

A Disabling Dive: A Physician's Nightmare

Ajith Kumar

A 34-year-old male fire and safety officer, a trainee scuba diver, presented to us in a semi-comatose state, right-sided weakness and aphasia following a deep dive. Patient presented to us 5 hours after the incident, with a history of rapid ascent during the diving and symptoms, a clinical diagnosis of Decompression sickness (DCS) was made. We immediately commenced him on Hyperbaric oxygen therapy (HBOT) according to the standard protocol. He was able to talk normally and walk with support from day 3. The patient recovered without any sequelae following multiple sessions of HBOT (Total 18 sessions) and supportive care. He was discharged on day ten and was advised to avoid flying for a week and diving for a period of 4 - 8 weeks. Early recognition of DCS and its prompt management with HBOT and rehabilitation is the key to complete recovery.

Surge Fighter Flying at an Operational Base: Aeromedical Aspects

Ashu Chandra, Murtaza, Sadhna S Nair

Introduction. Surge flying in an operational context implies sudden wave-like, more than usual, all-out maximum effort of aircrafts and equipments within available resources. The duration may range from hours to days depending upon the strategic objective. This study was carried out in one such real time scenario at an active operational base during surge flying operations to identify aeromedical issues peculiar to it and possible remedies. **Methodology.** All 35 aircrew participating in exercise volunteered as subjects for the study. Phase-1 (Preparatory) of the study included non-pharmacological intervention in the form of aeromedical briefing, sleep cycle adjustment, developing activity chart, monitoring and obtaining baseline parameters which started 48 hours before commencement of the exercise. Phase-2 initiated with first reporting of aircrew for flying task and lasted till completion of operations which included continuous monitoring and recording of aeromedical stressors and suggesting on-spot remedies. Chalder Fatigue and Groningen Sleep Quality scales were used at different stages of exercise to study aspects of acute fatigue. Modafinil and Zolpidem were administered on required basis as pharmacological measure. **Results and Discussion.** Total duration of surge exercise was 22:45 hrs with 118 sorties and 150:70 hrs of flying. Phase-1 could be applied on 21 aircrew and Phase-2 on all 35 aircrew. Fatigue being the major factor was noticed more in aircrew not participating in phase-1. Other concerns included heat stress, gastrointestinal disturbances, diminished performance, etc. Interventions in both phases were found to be effective. Inter-agency coordination and cooperation was an important positive

Session II

A Randomized Trial: Does Tadalafil and/ or Acetazolamide Help Prevent HAPE

Savina Oommen, Singh K, Malhotra VK, Kumar B, Jha V

High Altitude Pulmonary Edema is noncardiogenic pulmonary edema caused by exaggerated hypoxic pulmonary vasoconstriction and abnormally high pulmonary artery pressure. Some patients who develop HAPE have more chances to develop HAPE again on reinduction to HA (susceptible). In Armed Forces once a serving soldier develops HAPE at HA he becomes unfit to serve at HA and there was a huge loss of manpower. This was a pilot project to look for a suitable drug (Acetazolamide, Nifedipine and Tadalafil) which could be used prophylactically in HAPE patients on re-induction to HA. One hundred and twenty soldiers, thirty in each group, with history of one episode of clinically and radiologically diagnosed HAPE were randomly distributed in the Nifedipine, Acetazolamide, Tadalafil and Placebo groups. HAPE, on reascent did not develop in patients given either of the three drugs. Hence, a fully conscious person with mild-to-moderate HAPE could be effectively managed at altitude if the appropriate expertise and facilities are available and re-induced with either of the three drugs.

Anthropometric Changes in a Male Subjects on Exposure to 24 Hours of Simulated Microgravity

Manu N, A Agarwal, Vineet Kumar Malhotra

Introduction. Condition of weightlessness remains one of the primary environmental concerns of space flight. A variety of ground-based studies using analogues of weightlessness have been carried out to investigate the effects of weightlessness on human body. Significant data is available on anthropometric changes that occurs on exposure to microgravity. However, there has been scanty data on the anthropometric changes that occurs after 24 hrs of exposure to microgravity. This study was designed to assess the changes in anthropometric parameters of human male subjects on exposure to 24 hrs of microgravity using dry supine immersion.

Methods. A total of 10 volunteer subjects were exposed to 24 h of microgravity that was simulated by dry supine immersion. Anthropometric parameters like weight, supine body length, BMI, leg girth, calf girth was measured pre and post exposure to simulated microgravity. The results were collated and analysed using independent t-test. **Results.** The results showed a statistically significant increase in the supine body length (Effect size=0.096, p value = 0.009). The study also showed a statistically significant decrease in the weight (Effect size= -0.07, p value = 0.0001), BMI (Effect size= -0.15, p value = 0.0006), calf girth (Effect size= -0.59, p value = 0.0001) & thigh girth (Effect size= -0.33, p value = 0.016). **Discussion.** The significant increase in the supine body length may be attributed to expansion of the unloaded intervertebral disks and loss of the thoracolumbar curvature. A significant

reduction of weight after 24 hrs of exposure to dry supine immersion may be attributed to fluid loss in the initial 24 hrs by means of increased micturition. A significant decrease in limb girth may be attributed to cephalad fluid shift on exposure to microgravity.

Comparison of Intermittent Hypoxia Exposure at High Altitude and routine Acclimatisation - A pilot study

Srinivasa AB

Background. Rapid ascent of personnel to high altitude (HA) can lead to acute HA illnesses like Acute Mountain Sickness (AMS), High Altitude Pulmonary Edema (HAPE) and High Altitude Cerebral Edema (HACE). The preventive strategies of staged ascent and pre-acclimatisation are time consuming and logistically challenging. The present study compared routine acclimatization at 4500 meters with Intermittent Hypoxic Exposure (IHE) at 3100 meters, with/without chemoprophylaxis. **Methodology.** Forty-five healthy males residing at 3100 meters for ≥ 01 month were randomized into three groups-IHE with Cap Acetazolamide 250mg SR OD prior to IHE for 72 hours(IHE-A), IHE with Cap Placebo OD(IHE-P) & control group(STG) undergoing routine acclimatization in the form of staged ascent at 4500m. Baseline heart rate, blood pressure, respiratory rate, SpO₂(vital parameters) and cycle ergometer time trial(TT) test for 6km against fixed 75 watt load at altitude of 3100m were recorded. IHE-A & IHE-P were given seven day IHE at 3100m-2 hours/day at rest at PO₂ equivalent of 4500m followed by two 25-min bouts of cycle exercise at $60 \pm 5\%$ of peak heart rate at PO₂ equivalent of 3500m. After IHE, vital parameters, Lake Louise Score and TT at an altitude of 4500m was recorded. STG group were taken to 4500m for routine acclimatization. On 5th day morning vital parameters and TT was recorded. **Results.** There was no difference between groups except exercise (IHE-A:10.57(1.5), IHE-P:9.67(0.96), STG:12.69 (1.41) $p < 0.000^{***}$) and SpO₂(IHE-A:89.73(1.44), IHE-P:90.40(2.56), STG-83.47(5.34) $p < 0.000^{***}$). Participants with IHE showed better exercise capacity and SpO₂ compared to routine acclimatization. **Conclusion.** IHE at HA could serve as a strategy for performance enhancement at HA.

Effect of Acute Normobaric Hypoxia on Passively Simulated Illusions during Spatial Disorientation Training: A Double-blind Randomized Interventional Study

Srihari Iyer, A Kumar, SS Mohapatra

Introduction. A number of accidents in the past four decades in rotary wing flying in high altitude areas in the Indian Air Force have been attributed to spatial disorientation (SD) or hypoxia or both. Though the two issues, hypoxia and SD have been studied separately, there is very little if any, literature available regarding the interplay/ synergism between both the notorious factors in military aviation. Passive illusions, autokinesis time (AT) and vestibular adaptation time (VAT) were used as surrogates for SD and the effect of normobaric hypoxia on these passively simulated

illusions were studied. **Materials and Methods.** In a double-blind randomized control design, 32 healthy volunteers divided into two groups of 16 subjects each participated in the study. Randomization was carried out at various levels. Subjects in the hypoxia group were exposed to normobaric hypoxia with pre-mixed gases in cylinders with nitrox gas (simulating altitude of 22,000ft) and the normoxia group were exposed to normal air. VAT (acceleration and deceleration) in both clockwise and counter-clockwise turns and AT were recorded for all the subjects in the AirFox DISO® Simulator and analyzed. **Results.** There was a significant difference in AT and VAT between Normoxia and Hypoxia groups. **Discussion.** Hypoxia, possibly, increases the propensity for passive illusions as seen by a decrease in AT and VAT. Hypoxia also possibly affects the adaptation of the vestibular system to the motion environment as observed by apparent increase in VAT scores (Deceleration in both clockwise and counterclockwise turns) in the hypoxia group. **Conclusion.** Hypoxia appears to make the subjects more prone to SD by decreasing the AT and VAT but further studies need to be done to obviate the limitations of this study.

Session III

Contrast Sensitivity Assessment of Military Aircrew Aspirants on Induction: Reinforcing the Visual Standards

B Bhowmick, D Gaur, B Sinha

Background. The requirement of optimum vision for military aircrew operating in difficult terrain and marginal weather condition cannot be overemphasised. Research carried out over the past decades brings out the fact that Contrast Sensitivity (CS) correlates better with air-to-ground or ground-to-air visual tasks compared to conventional visual acuity tests. Despite this, most of the aero-medical evaluation guidelines are silent about this parameter. While flying over a featureless terrain or low contrast environmental conditions (i.e., haze, fog, dawn, dusk) CS takes the upper hand over visual acuity for optimal performance. Vibration is an unavoidable stressor in aviation and higher levels of this stress experienced by helicopter and transport aircrew may put their visual performance in jeopardy. This study, assesses the changes in CS under simulated low frequency whole body vibration, encountered in operational scenario. **Material and Methods.** 30 healthy volunteers were assessed for their CS under low frequency whole body vibration using Multi-axial Vibration Simulator. Vibration frequency along the Z-axis varied from 4-20 Hz (fixed at X, Y-axes) for a period of 30 min. CS was measured in no vibration, under vibration and on recovery, using CSV-1000 equipment at spatial frequencies of 3, 6, 12 and 18 cpd in photopic condition. **Results.** Statistically significant changes in CS were observed across some vibration and spatial frequencies. No significant detrimental effect was recorded on CS post 30 min of continuous vibration as compared to baseline. **Conclusion.** As optimal contrast perception is an integral part of vision while carrying out aviation tasks, any significant amount of deterioration in this visual parameter, as an effect of vibration or any other aviation stressor, is of

aeromedical significance. Testing Contrast Sensitivity as a part of routine vision assessment in candidates will ensure selection of a superior military aircrew.

Addictive Drug Testing and their Outcome – Commercial Airliner Experience

BK Umesh Kumar

Drug addiction or substance abuse is common in aviation sector which is increasing day by day. Aircrew are prone for substance abuse due to schedule of work and irregular sleep cycles. Medication used for sleep or awakening might lead to drug addiction over a period. Drug abuse can have disastrous consequences in flying environment. It becomes mandatory for the medical personnel, airline authorities and aviation regulators to place adequate testing mechanism in place to identify the individual with drug abuse early so the rehabilitation of crew is better, and it also avoids accidents. All the drug testing done in national carrier of Middle eastern airline from Jan 2009 to Jan 2019 were studied. This study excluded alcohol testing. Urine sample used for the testing. There were 461 Drug testing carried out during the above said period. Four cases were Positive for drug testing. All the cases were found to be positive for amphetamine with two cases positive for other drugs also. Confirmation test done at Government police laboratory which found false positive in one case. Three cases were terminated from the airline and the license was withdrawn. Drug testing is mandatory in aviation industry to identify the drug abused individuals to make aviation environment safe.

Analysis of Major Ocular Conditions Leading to Rejection in the Airforce Aspirational Candidates

AK Singh

Background. The armed forces offer a great career opportunity to the aspirants. It is a matter of pride to serve the nation. Unfortunately, a significant number of Air Force aspirants fail to clear their medical examinations. The ophthalmological examination remains one of the leading causes of rejection of these candidates. In this article, we have tried to find out the major ocular conditions that have led to the rejection of these candidates. **Method.** This retrospective study was done from the examination records of the Department of Ophthalmology at the boarding centre of the Air force from 01 Jan 20 to 31 Mar 2022. These records consisted of the personal particulars of the candidate, his registration number, the stream individual has applied for, the findings of the ophthalmologists, and his remarks (highlighted in bold) regarding the fitness and signature with date. The data was then tabulated and analysed. **Result.** Out of 2003 candidates, 251 candidates (12.5%) were declared unfit due to various ophthalmic conditions. Substandard vision remains the leading cause of rejection. Defective colour perception, lattice degeneration, Post LASIK criteria not meeting the laid down standards are other major causes of rejection. **Conclusion.** Since a considerable majority of them would have chosen an alternative stream if they had

known that their ocular condition, the authors suggest that every individual must be thoroughly ophthalmologically examined at around 14-16 years of age equating to 10-12 standards during their studies. This will help them to choose their carrier in the armed forces or civil stream.

A Comparative Study between an Indigenously Developed Psychometric Test Battery 'PSUMEDHA' and 'CogScreen-AE'

Anitha Durai

Introduction. In today's combat environment, a pilot's duty necessitates a higher level of precision, agility, speed, attention, memory, situational awareness, risk assessment, and planning. As a result, the ability to evaluate critical aspects of cognition is essential. The present study was conducted with an aim to compare performance measures in two different cognitive test batteries namely 'pSuMEDhA' and CogScreen AE. **Material & Methods.** 50 selected healthy adult volunteers were made to undergo two cognitive test batteries; CogScreen AE and pSuMEDhA. The comparable variables pertaining to speed, accuracy and process measures were identified between the two tests and analysed. The variables include speed measures pertaining to Dual Task Test (DTT), Digit Symbol Substitution Test (DSST) and Mackworth Clock Test (MCT) of pSuMEDhA with Dual Task Test, Symbol Digit Coding (SDC) and Continuous Performance Test (CPT) of Cogscreen AE. Similarly, the accuracy measures of Aircraft Orientation Test (AOT) and DSST of pSuMEDhA with Matching to Sample (MTS) and SDC of CogScreen AE and the process measures of Card Sorting Test (CST) of pSuMEDhA with Shifting Attention Test (SAT) of CogScreen AE respectively were compared. **Results.** The mean age of the sample was 31.78 ± 0.74 yrs with gender distribution of 64% males and 36% females. Using Bland-Altman plot analysis, the speed and accuracy measures of DSST and SDC were found to be congruent implying that both the test batteries i.e. pSuMEDhA and Cogscreen AE would assess working memory optimally. Other comparable tests showed insignificant correlation. Further, the exclusive variables of each test battery demonstrated uniqueness in the design of the tests fulfilling the purpose for which they were developed. **Conclusion.** Some of the tests of IAM pSuMEDhA and CogScreen AE assess the same cognitive ability with distinct administration methods. However, each cognitive test battery measures individual differences with respect to cognitive abilities effectively. pSuMEDhA, designed for military aviators, has a test that assesses the risk index of the individual. CogScreen AE is designed for screening of neurocognitive dysfunction and Taylor's aviation factor score in an aviator.

Session IV

Duration for Visual Adaptation to Various Light Conditions during Night Flying Operations

Binu Sekhar M, Raghunandan V, Tripathy NK

Introduction. The varied duration for visual adaptation to changes in ambient light conditions during night flying operations is of aeromedical concern. It's known that the adaptation is immediate for bright light conditions while takes longer for lower levels of ambient illumination and the same could be substantially improved by use of NVGs. However, practical values of the duration for visual adaptation with respect to ambient illumination levels during night flying have not been well quantified. This study was planned to estimate the duration for visual adaptation during various changes in ambient light conditions possibly encountered in night flying operations.

Material and Methods. 14 subjects (11 males and 3 females) with normal visual acuity and colour perception participated in the study. Gen 2++ ANVIS NVG was used for aided night vision and USAF 1951 Tribar chart was used to measure visual acuity. Baseline visual acuity was recorded for different light conditions such as bright light, different moon light levels (full moon, half-moon and quarter moon) and NVG vision. Duration to achieve the same baseline visual acuity of respective light condition during change from a different light condition was considered as visual adaptation time for that change in light scenario. **Results.** The recorded mean unaided visual acuity were 20/25 in bright light and 20/266, 20/96 and 20/74 for quarter, half and full moon respectively. The aided visual acuity were 20/41, 20/37 and 20/34 for quarter, half and full moon respectively. The post de-goggling visual adaptation time were 5 min 55 sec (\pm 1 min 02 sec), 2 min 20 sec (\pm 1 min 22 sec) and 1 min 23 sec (\pm 32 sec) respectively for quarter, half and full moon ambient light conditions. Adaptation from NVG vision to bright light as well as unaided quarter moon vision to bright light occurred within 2-3 sec. Adaptation to unaided quarter moon vision from bright light occurred in 19 min 20 sec (\pm 8 min 42 sec) while adaptation to NVG vision from bright light occurred in 13 (\pm 6) sec. **Conclusion.** The duration for visual adaptation during different light scenarios in night flying has been quantified in this study. The adaptation from bright light to unaided night vision was significantly longer while adaptation to bright light was almost instantaneous. Meanwhile, the adaptation time to ambient light post de-goggling was inversely proportional with moon light intensity levels.

Retrospective Analysis of Individual Test Scores of IAM EMP and their Correlation with Different Musculoskeletal Disabilities

Suryakiran, Binu Sekhar, Gaurabh Ghosh, B Vinod

Introduction. Aviators by virtue of their work, have increased exposure to environmental and physical stressors like G-forces, vibration stress, prolonged sitting in awkward postures, extreme temperatures, has to maintain a high level of musculoskeletal fitness for optimum flying operations. Therefore, meticulous assessment and rehabilitation of aircrew is to be

followed subsequent to any musculoskeletal disability. At present, the functional evaluation of aircrew are being carried out using IAM-EMP, which consists of 08 sub tests with an overall score out of 24. Aircrew with a minimum score of 18 are considered functionally fit. However, the overall scores may overlook the recovery status of a specific disability. Therefore, a study has been planned to understand the correlation between score of sub tests and the type of the musculoskeletal disability. **Materials and Methods.** The IAM-EMP data of 249 aircrew, aged <50 yrs (21-50 years), who have been functionally evaluated at IAM IAF in the last one year was analysed. The disabilities were categorised into Upper Limb Disabilities, Lower Limb Disabilities and Spinal Disabilities, further, Spinal Disabilities are categorised into Cervicodorsal and Lumbosacral Disabilities and they are correlated with the scores of individual tests in IAM-EMP. The score equal to 3 is considered as full recovery, <3 score is considered as not fully recovered. These scores were compiled and the data was analysed. **Results.** Statistical analysis of the compiled data revealed that, in cases with Upper Limb Disabilities the scores of Shoulder Mobility (OR – 2.15, P value – 0.01) and Trunk Stability Push Up (OR – 2.37, P value – 0.006) showed significant correlation when compared to other sub tests. Similar statistical results were found in Inline Lunge (OR – 2.21, P value – 0.006) and Jump Test (OR – 2.99, P value – 0.00017) for Lower Limb Disabilities, Active Straight Leg Raise Test (OR – 1.79, P value – 0.04) and Rotary Stability Test (OR – 2.15, P value – 0.009) for Spinal Disabilities. Further analysis revealed, Active Straight Leg Raise Test (OR – 3.0, P value – 0.02) and Hurdle Step tests (OR – 4.85, P value – 0.004) to be significantly correlated to Lumbosacral Disabilities. **Conclusion.** Study shows that sub tests involving the muscle groups related to the disabilities were correlating. Therefore, those specific sub tests can be used to monitor the recovery status during the rehabilitation of the musculoskeletal disabilities.

Cockpit Design Customization, Modifications or Upgrade- Possible Impact on Anthropometric Accommodation of Aircrew

BN Vasudev, Binu Sekhar M

Aircrew anthropometry is an important aspect for cockpit ergonomics and for optimum utilization of aircraft. Anthropometric database of aircrew gives essential inputs to designers to match the workstation and its environment to fit human component comfortably so that aircrew can perform his duties optimally and to enable safe escape from aircraft during ejection. During indigenous design of aircraft or in off-the shelf procurement, the anthropometric accommodation of the aircrew population has been carefully studied and the anthropometric accommodability limits have been carefully specified in order to identify the aircrew population suitable for the aircraft. However, during the acquisition process or subsequent to a period after acquisition of the aircraft there could be design customisation, modifications or upgrades in the cockpit or in aircrew equipment ensemble to meet several operational requirements. During such process, there would be a possibility of changes in the previously defined anthropometric compatibility criteria for the aircraft cockpit. There have been instances where the same has been overlooked and resulted in incompatibility issues later. This paper discusses four pertinent examples of similar issues in four different classes of aircrafts. Based on the lessons learned

from these instances, the authors suggest requirement to undertake anthropometric compatibility studies prior to envisage any such modifications.

**Work Domain Analysis of Complex Socio-Technical System: An
Abstraction Decomposition Space (ADS) and Abstraction Hierarchy (AH)
based Approach on AWACS**

Sri Hari E, Biswal P, Agarwal A

Working in complex socio technical system requires simultaneous processing of large sums of information and giving instructions or directions which are complex and are dynamic in nature which sometimes can change/alter the outcome of a scenario/situation. These complex systems often require multifactorial approach for optimized performance output. This study aims at understanding work domain of one such system i.e, AWACS. Work domain analysis which is the first step in the cognitive analysis framework was done using both the Abstraction Decomposition space (ADS) and Abstraction Hierarchy (AH) models. The results in the current study show that all the physical objects operating in the system who are placed in the lower level of the model are performing a specific task ultimately leading to achieving overall functional purpose of the AWACS placed in upper most level of the model which is to provide surveillance, command, control, and communications functions for tactical and air defence forces. This study also gives insight into the approach for conducting a comprehensive study on cognitive work analysis framework.

Session V

**Manifestation of Ocular Muscle Imbalance
in APACHE 64E Aircrew**

Sushree SK, Murtaza, Choudhry N

The U.S. Army Apache attack helicopter (AH-64A) is a 1970s vintage airframe that has undergone numerous upgrades and modifications over the last three decades resulting in its current configuration as the AH-64 E. It is a twin engine, four bladed, attack helicopter designed to operate during the day, night and in adverse weather through use of nose-mounted, forward looking infrared (FLIR) pilotage and targeting sensors that provide a thermal image of the outside world to the pilot. This imagery is presented to the pilot by a unique design of monocular helmet-mounted display (HMD) that is an integral part of the Integrated Helmet and Display Sighting System (IHADSS). The IHADSS is the primary source of pilotage, targeting imagery, and aircraft flight data for the pilots. IAF has recently inducted AH-64 E aircraft at Pathankot air base in 2019. In past 3 years after induction 2 of the aircrew have reported visual issues related to ocular muscle balance after flying the aircraft for some hours. The present articles highlight the visual standards for entry into IAF as an aircrew, the development ocular muscle imbalance the aircrew faced after the use of IHADSS and the need to revisit the visual standards for Apache aircrew.

Eliminating Criteria During +Gz Acceleration Selective Test

Nenad Bačević, Jelena Vidaković, Marina Bačević, Pavle Stepanić

Introduction. The initial selection process for the pilot candidates in the military is of crucial importance. There are significant individual differences in Gz tolerability. The centrifuge for the primary selection of the pilot candidates has been in use at Aeromedical Institute (AMI) since 1985. As a functional centrifuge “End Points” (values of significant parameters that are used as indicators for stopping the test runs) AMI uses the following criteria: Loss of peripheral vision, heart rate above 180 bpm, arrhythmias and loss of consciousness (G-LOC). **Methods.** From 2017 to 2019, AMI examined 54 candidates for the Serbian Air Force Academy for flying duties. All subjects have successfully passed aeromedical and psychological evaluations before commencing Gz-stress testing. Candidates were exposed to centrifuge runs with Gz-acceleration of 2G within 60 seconds period, as well as Gz-acceleration of 5.5 G using the gradual-onset rate of acceleration of 0.1 G/s. ECG from two leads, respiration and heart rate were continuously monitored during the test. **Results.** Out of the 54 candidates, 33 (61.11%) met the Gz-tolerability criteria for the initial training on the jet aircraft. The loss of peripheral vision (more than 60° of central visual axis) was observed with 13 candidates (24.07%), extreme pulse rate (bpm greater than 180 bpm) was observed with 6 candidates (11.11%), one candidate (1.85%) demonstrated arrhythmia (bigeminy), and one candidate (1.85%) experienced G-LOC. **Conclusion.** Existing training methods that may improve pilots’ G-tolerance failed to keep pace with the development and requirements of the modern fighter aircraft regarding G acceleration. It is a clear indication for the development and implementation of the best possible selection process for the military pilot candidates. The primary selection process determines the quality of all subsequent selections and the possibility of a successful flying career.

A Case of Student Pilot with Fingers Amputation: Aeromedical Decision Making

*YS Thakur, Surya Kiran, Gaurab Ghosh, Raghunandan V
Binu Sekhar M, Karthikeyan S*

Our hands are capable of wide variety of functions: touching, grasping, feeling, holding, manipulating and more. For pilots, this has paramount importance for controlling an aircraft. Whether a pilot with amputated/ missing/ deformed fingers can be given certification for flying is an important question that needs to be answered by the Aviation Medical Examiner (AME). Historically, there are cases of certifying pilots with missing limbs or digits. But, in regard with current stringent medical fitness standards, this poses a challenge for Aeromedical Decision making by AMEs. This paper describes a case Complete Amputation of Middle & Ring finger, Partial Amputation of Index finger of Left Hand – Post Reconstruction Surgery status and the factors considered for Aeromedical Disposal.

Comparison of Analogous Parameters between 3D Digital Anthropometry and IAM Anthropometric Platform

Shruthi B Chandran, Hemanth KA, V Raghunandan, Binu Sekhar M, S Nayak

Introduction. With the immense amount of pressure to complete large amount of data acquisition – including the future Gaganaut selection- a sleeker method for faster and accurate measurement of anthropometric parameters are the need of the hour. However, Manual anthropometry remains the gold standard and anyone can fall back onto that for a cross verification of the data. The drawback of this system is that it is time consuming. The present study was carried out to assess the reliability of VITUS 3D Anthroscan newly installed at the Dept of Human Engineering, IAM in comparison to the Manual anthropometer. **Methods.** 207 healthy volunteers after ensuring that they were free from any musculoskeletal deformity by clinical examination participated in this study. The values for 30 parameters were initially obtained using Manual anthropometer, Vernier callipers, spreading callipers, measuring tape, followed by VITUS 3D whole body scanner in appropriate clothing. Scan was obtained in the 07 standard positions. The data obtained from both the methods were compared and analysed using Bland Altman analysis. **Results.** Out of the 30 parameters studied 09 parameters were found to have Digital anthropometry values in disagreement with manual anthropometry. The reasons for this were found to be varied like: Intra observer error, wrong postures acquired by the participants while left alone in the scanning machine, shadow cast of body part on measuring area etc. **Conclusion.** Though Digital anthropometry is the fastest and accurate mode of measuring anthropometric values, this needs more exploration in its proper use and manpower needs to be enlightened and trained on the same. This will help in further upgradation of the same for example avoiding shadow areas to be overcast onto the measuring areas. Once it is bloomed into its full potential the amount of data collection done will see no leaps and bounds. This is especially helpful for future needs like selection of large number of candidates for Gaganauts, where the number can be in many ten-thousands to be screened from the mother country for further Russian evaluation and selection.

Session VI

RAF C-17 Pilot Fatigue: Measurement, Assessment of Operational Risk Matrix Efficacy and Relationship to Flight Data Monitoring Parameters.

Ian Mollan

Introduction. Fatigue kills and accidents are more likely with increasing levels of fatigue. Fatigue is the number one UK C-17 air safety concern. **Methods.** This longitudinal study objectively measured C-17 pilot fatigue using actigraphy and the SAFTE-FAST model. It analysed its relationship with the existing Squadron Operational Risk Matrix, Samn-Perelli Scale (SPS) at the Top of descent, and specified Flight Data Monitoring parameters. All UK C-17 pilots were invited to participate. Data was collected during a 3-month window in 2021. A total of 436 Operational sectors were eligible for analysis. **Results.** A total of 29 pilots

participated. The response rate was 69%. Pilots were male (97%), aged 36.4 years (SD 5.6) and 34% held a Squadron Executive role. The median service length was 13.5 years (IQR 11-18), and total flight experience was a median of 2900 hrs (IQR 2100-3800). From the 436 operational sectors, 159 flight rotations were undertaken: Over half (51%) were to the Broader Middle East. Forward-based aircraft rotations comprised 29% of the total flight rotations. Median FAST effectiveness on landing was 85 (IQR 76-90). The number of landings were 191 (73%) in 'safe' category (FAST effectiveness > 77%), 43 (16%) in 'sub-optimal' (FAST 70-77%), and 27 (10%) in 'unsafe' (FAST < 70%). SPS at TOD was related to effectiveness ($p < 0.001$). There was no relationship between effectiveness and the Existing Sqn ORM ($p = 0.54$). Fatigued pilots (FAST < 77%) with and unstable approach recorded on FDM data occurred with OR 1.4 (0.6-4.1). **Discussion.** Window of Circadian Low (WOCL) departures/arrivals comprised the majority of sub-optimal/unsafe subsequent landings. Previous modelling work was validated in this study. Improvements to task scheduling could reduce fatigue risk. Further refinements could be made to the study ORM. This study was under powered to detect a statistically significant relationship in FDM parameters.

Fatigue Free Occupational Time (FFOT): An Objective Measure for Predicting Fatigue Risk in Military Flying.

SS Mohapatra, NK Tripathy, DD Ghosh, V Raghunandan, Rahul Dev

Background: Application of objective fatigue detection tool in the aviation bases is limited. This study was envisaged in order to conduct a systematic comparative analysis between a well-established objective method and short fatigue questionnaires which are used in fatigue research with the aim of employing them as fatigue screening tool for aviation personnel. **Material and Methods:** 38 aviation personnel had volunteered for this cross-sectional observational study. Work-rest/sleep data collected using actigraphy over one week was fed to a PC running Fatigue Avoidance Scheduling Tool (FAST). Objective fatigue parameters in form of Fatigue Risk Time (FRT) and Fatigue Free Occupational Time (FFOT) were retrieved. Fatigue questionnaires Groningen Sleep Quality Scale (GSQS) for assessing sleep quality and Stanford Sleepiness Scale (SSS) to detect day-time sleepiness were used as subjective fatigue parameters. Comparative analysis was carried out using appropriate statistical tests. **Results:** A consistent TST ranging from 353 to 378 minutes in the week of the study with no statistically significant differences between the nights were recorded. The increasing trend of FRT and decreasing trend of FFOT over the week was observed. The GSQS, SSS (morning) and SSS (afternoon) also demonstrated progressive increase in the scores but only the increase from Day 1 to Day 2 was statistically significant. **Discussion:** Gradual increase in FRT with reciprocal decrease in FFOT, which were observed in this study could be attributed to progressive increase in sleep debt over the week. A consistent TST of the duration, which is less than the optimal duration of 7 to 8 hours for night sleep, can lead to gradual increase in sleep debt. The regression equations

computed for FFOT was: $FFOT = 657 + (0.24 \times TST \text{ in min}) - \{(0.27 \times \text{Morning GSQS}) + (0.73 \times \text{Day factor})\}$. This regression equation could be used to extrapolate the fatigue free occupation time for the aviation personnel. **Conclusion:** The study has confirmed that the effectiveness of both GSSQ and SSS as the fatigue prevention tool and its application in the field set-up especially in the absence of any objective fatigue detection tool.

Rudder Pedal Modification to Mitigate Toe Strike: Lessons Learnt

Devdeep Ghosh, Binu Sekhar M

LCA Mk-1 functional operational clearance version aircraft cockpit is anthropometrically compatible to accommodate 3rd to 95th percentile aircrew with additional anthropometric limitations in thigh length, knee height and shoe length. For LCA Mk1-A version, HAL-ARDC proposed and configured a static cockpit with removal of false floor, lowering of rudder pedal heel point and trimming of MIP. Hypothetically it was expected by the designing agency to mitigate toe strike and anthropometric restriction of LCA Mk-1. Assessment of reach, operation and comfort of rudder pedal by IAM IAF revealed that 3rd percentile pilots had mixed opinion about reach and comfort of the rudder pedals, in addition, comfort with respect to rudder pedal angle was felt low especially for long brake application. As per discussion of IAM with HAL ARDC, NFTC and Flt Ops, a wedge of defined dimension was added at the bottom of each rudder pedal. It effectively changed the pedal angle at the bottom where heel was placed without affecting clearances of the aircraft. Post modification, the same parameters of the previously assessed aircrew were re-assessed by IAM in the modified static cockpit. Significant improvement was observed with respect to reach as well as ankle comfort during rudder application and long brake application. Compromise in design in the developmental stage of aircraft has long standing repercussions. Timely detection during human engineering assessment by IAM and appropriate intervention by HAL ARDC have mitigated a potential aircrew-aircraft compatibility issue at an early stage of development of LCA Mk-1A.

A Comparison of Subjective and Objective Measures of Vestibular Adaptation in Rotary Chair among Indian Air Force Pilots

Nandishwar Rathore, Akshay Shirur, Neha Rao, Sneha Dinakar, B Sinha

Introduction: Vestibular Adaptation Time (VAT) is the simplest method of subjective assessment of vestibular stimulation in motion environment. However, being a subjective measure of vestibular stimulation, it is less reliable and can be biased. Using a rotary chair in Velocity Step Test, nystagmus is induced due to Vestibulo-Ocular Reflex (VOR) in the absence of visual cues. Time constant (TC) is the time taken for the nystagmus to reduce to 37% of its peak. This is an objective parameter to reflect vestibular adaptation. There is an ongoing effort to use this test to quantify the level of vestibular adaptation. Therefore, this study was aimed at comparing the VAT and TC and determine any significant difference in the outcomes of the two methods. **Methods:** Healthy pilots of Indian Air Force, after giving written informed

consent were enrolled in the study. In Rotary Chair, Velocity Step Test was performed, in which the subjects were rotated at an angular velocity of 100 deg/sec. On reaching this constant angular velocity, participants reported perceived stopping of rotation (per-rotatory). Subsequently, on stopping of the chair, the subjects perceived rotation in opposite direction (post-rotatory). Test was repeated by rotating the participant in opposite direction. The period of time from the beginning of horizontal rotation till the time of cessation of perceived motion is the Vestibular Adaptation Time. Simultaneously the time taken for induced nystagmus to reduce to 37% of its peak was noted as Time Constant. Values of Vestibular Adaptation Time and Time Constant were statistically analysed to assess any differences in the outcomes. **Results:** Data of 52 pilots of IAF with mean age 25.7 years and average flying experience of 549.8 hours was analysed and mean VAT for right rotation (28.22 ± 6.95 s) and left rotation (27.74 ± 6.55 s) was found. Also mean TC for right rotation (19.50 ± 5.01 s) and left rotation (18.59 ± 3.99 s) was found. Mean VAT was found to be 27.98 ± 6.74 s and mean TC was found to be 19.05 ± 4.54 s. Using Shapiro Wilk test, data of VAT & TC in right & left rotation was found to be normally distributed. Bland-Altman graph was plotted comparing four sets of data & it was found that 95% of the data points were within the upper & lower limits of agreement with bias ranging from 6.57 to 10.85. Intraclass correlation coefficient (ICC) was found to be 0.428 ($p=0.024$, 95% CI: 0.004 to 0.672). **Discussion:** Hulk & Jongkees (1948), Brand et al (1968) & Howard et al (1998) reported VAT of 21.2s, 24.5s & 24.4s, and mean time constant of 11s, 15.1s & 15.5s, respectively. In our study, a mean VAT of around 28s and mean time constant of 19.5s was obtained. The slight variation can be attributed to the varying angular accelerations and velocities being used in different studies. Also, normative data for both parameters among Indian IAF Pilots is not available. Interpretation of results indicates good agreement and mild to moderate reliability between the two tests. So, even though both VAT & TC measure vestibular adaptation, they cannot be used interchangeably for estimating vestibular adaptation.

Session VII

To Study Effectiveness of Oto-Acoustic Emissions as a Screening tool for Noise induced Hearing loss in the Field Set-up (Air Bases)

Ranjan Sarkar, SS Mohapatra, Angshuman Dutta, P Promod, Shazia Khan

Background. All aircrew undergo a yearly audiometry testing. As a part of “Hearing Conservation Program. The limitation of puretone audiometry as a diagnostic tool is that it can detect the threshold shift in various frequency domains only when a substantial number of outer hair cells (OHC) are damaged. There is also a need for a sound proof audiometry room and a qualified audiologist which are the other administrative limitations towards employing it as a screening tool for the noise exposed personnel in the aviation bases. Therefore, there is a need to have an alternate screening tool having better yield for larger beneficiaries in a field setup.

Material and Methods. 100 serving aviation personnel in the age of 20 to 50 years from a military air base were selected randomly using convenient sampling method. A total of 200 ears from 100 participants were screened by employing Pure

Tone Audiometry (PTA) and Oto-Acoustic Emission (OAE) technology. **Results.** Out of 200 ears of 100 participants, 18 ears were PTA +ve NIHL Risk-ears. On screening the participants using OAE, 79 were OAE +ve NIHL Risk-ears. Sensitivity, Specificity, PPV, NPV, LR (+ve & -ve) and Youden's Index were 83.3%, 64.8%, 18.4%, 97.1 %, 2.3 times, 0.22 times and 0.47 respectively. The area under the ROC curve was .741 for screening NIHL Risk-ears it was statistically significant ($p = .001$). **Discussion.** These findings are indicative of effectiveness of OAE as a screening tool for screening NIHL Risk-ears and thereby NIHL Risk-personnel.

Use of Moment of Inertia as a Parameter of Prediction of Neck Injury Potential in HMD Helmets

Sabyasachi Nayak, Binu Sekhar M

Introduction: Aircrew helmets are critical safety equipment for pilots operating helicopters and fighter aircraft. Addition of Helmet Mounted Devices (HMDs) can lead to increase in total Head Supported Mass (HSM). This increased weight can lead to an increase of the Neck injury potential due to neck posture deviations and due to high head and neck loads during adverse events like ejection. So far, only the Helmet weight and Center of Gravity (CoG) of the Head-Helmet System have been considered as the critical parameters affecting Neck injury potential. In this study we explore the role played by the Moment of Inertia (Mol) of the helmet system in increasing the possibility of neck injury. **Material and Methods:** The Center of Gravity (CoG) and Moment of Inertia (Mol) measurements were done using the Trifilar Pendulum Mass Property Measurement System. The helmets used were the conventional Russian OEM supplied helmet, the presently in-use Indian Helmet and an indigenously developed Indian helmet. The CoG was measured using the method of moment balance after placing the helmet system on the Trifilar plate and the Mol was measured by measuring the time periods of small torsional oscillations of the helmet system on the Trifilar plate. A medium size ATD head representative of the 50th percentile Indian aviator was also used as a proxy for a real head in order to measure the combined CoG and Mol in the anatomical frame as well as to measure the force and mass moments. **Results and Observation:** The indigenously developed Indian helmet with HMDs marginally exceeded the helmet safety criteria of x-axis CoG and mass moments. In order to do a comparative analysis the OEM supplied Russian helmet was used which showed similar deficiencies with the Indian helmet having better safety criteria. The presently in-use Indian Helmet exceeded the weight limits and the mass moments as well. We also did a comparative Mol study as Knox box criteria was exceeded in both cases. The Mol study showed similar parameter values for both the Indian helmets as well as the Russian helmet, thereby suggesting similar neck injury potentials. We were also able to predict the principal moments of inertia using the various CoG parameters as inputs by developing a multiple linear regression model and hence obtain the theoretical estimates of Moment of Inertia for Helmets along with HMDs.

A Case of Mis fitment of Flying Clothing: Aeromedical Evaluation and Disposal

Murtaza

Introduction. Aircrew of a fighter stream projected fitment problem with use of Oxygen mask. A study was conducted to look into the problem from aeromedical point of view. A trial and analysis was carried out to provide appropriate solution and recommendations. **Methodology.** Aircrew facing fitment problem was evaluated as subject. Materials used were digital vernier calliper, helmet and mask pertaining to that fleet, flying clothing test stand (MK-3, ser no 3106) and helmet mask sizing schedule. Study was conducted in two stages – ground and flight trials. Aircrew was assessed for various parameters like fitment, face mask seal, gap between visor and mask, breathing resistance, communication etc. Findings were tabulated and analysed. **Results and Discussion.** Aircrew was found to be using wrong helmet size. Change of helmet size to correct one and mask attachment to lower setting improved comfort level of aircrew. Subsequently no evidence of mask leak, breathing resistance was found on subjective and objective assessment. Flight trial was found satisfactory in terms of sliding of mask under “G”, communication, oxygen leak etc. No flying clothing issue creating flight safety hazard was identified. **Conclusion.** A oxygen mask misfit issue was reported by an aircrew of fighter stream which led to a study to evaluate the problem from aeromedical point of view and recommend solutions. An analysis was carried out for helmet mask integration through ground and flight trial. After identifying problem and remedial actions, helmet mask integration was found satisfactory. Certain lessons learnt and recommendations are highlighted in the paper.

Analysis of a Common Defect of the Flying Mask

I Sah, R Kumar

Introduction. Flying clothing comprises of flying overall, helmet, mask, anti G suit, gloves and boot. Flying mask is an important part of the flying ensemble and inspection of the flying clothing is an important aspect of the duties of aviation medicine spl. It is required that the mask should be stable and comfortable, and there should be no leak, especially inward inboard leak. The finding of the common physical defect in the masks is suggestive of possibility of inboard leak, in case the defect is not noticed early by the user. **Materials and methods.** During flying clothing inspection at Sqn level, it was observed that few of the oxygen masks are developing defect in a particular pattern and are being returned to logistics well before their expiry period, the normal shelf life of which is 5 yrs. This paper retrospectively examines the pattern of defect in the returned flying masks over past 1 yr duration i.e wef Jul 2021 to Jul 2022, which were returned by the squadrons. Total 30 (n=30) of HM 2000 oxygen masks, developed by DEBEL and manufactured by Shakti enterprises, of different sizes, both original and spare which had developed defects were studied. The face piece, exoskeleton, hose and the valves were examined thoroughly. The tabulated data includes the comparison of the number of

flying hours and the type of defect beyond which the masks could not be used. **Results.** The analysis reveals 24 of the 30 masks had developed the physical defect in the conical part of the face piece and rest 6 masks either had RT conn defects/ unserviceable mic or others. The maximum no of masks which were returned had sustained more that 400h of flying (54%) followed by 25% in the range of 200-400 h. However, 3 masks were found which had developed defect at the life of as low as <100h (12%). All these masks were within the recommended shelf life. This paper aims to draw an analysis of the common defect of this particular flying mask and the various aspects of on aircrew safety.

Comparison of EMG Changes in Neck Muscles on Exposure to Simulated Vibration Stress Following Two Neck Muscle Strengthening Exercise Regimes in Subjects Wearing NVG

AB Singh, Rahul Pipraiya

Introduction. Neck pain is an aeromedical problem in modern military aviation and is recognized as a challenging problem in modern Air Forces. Neck pain in pilots can cause personal suffering and reduce pilot's operational capabilities and productivity. Inherent design of flight controls in many helicopters predispose helicopter aircrew to unfavourable ergonomic positions for discernible durations, with sophisticated helmets and helmet mounted devices adding to the neck loading. Along with the vibration stress the added load leads to tension in the neck muscles that manifest as fatigue of the neck muscle. The present study was undertaken to find the usefulness of two different neck muscle strengthening exercise and comparing their efficacy using sEMG changes on exposure to simulated vibration stress following two neck muscle strengthening exercise in subjects wearing NVG. **Material and Method.** 30 healthy male volunteers aged between 25 to 35 years participated in the study. After explaining the protocol, the sample was divided randomly into two groups of 15 each. Maximal Voluntary Contraction (MVC) of the neck was recorded and sEMG of Splenius capitis at 70% of MVC was recorded bilaterally on four occasions before and after exposing to vibration stress one before exercise and the other after three months of exercise protocol. The two groups were assigned two different set of neck muscle strengthening exercise protocol. The sEMG changes were compared between the two sessions. The data so obtained was analyzed using repeated measures ANOVA and Student's t-test. **Results.** PRE-MVC and POE-MVC was significant within the groups but not significant between the groups. The sEMG reading was compared for mean RMS value which showed significance between Pre and Post Exercise but no significance between Pre and Post Vibration & between Group A and B. **Conclusion.** The study suggests that both neck muscle strengthening exercise protocol may help in neck musculature strengthening thus reducing the incidence of neck injury and pain among the aircrew who are operating with NVG.

Closed Door Session

Human Factors in Aerospace Safety.

VS Choudary

Accident / Incident Data i/r/o Human Error. The major factors in Human error which contribute towards accidents and incidents will be covered with special emphasis on HE (A). Preventive measures which are suggested and implemented by IAF will also be covered. **Accident / Incident Data i/r/o Disorientation.** Cases of disorientation the primary reasons leading to disorientation and a few case studies will be covered. **Changes done to HFACS.** Existing HFACS was designed in 2003. It needed updating. The same has been undertaken and the salient changes will be highlighted. **Studies conducted by Psychologists at DAS.** The psychologists at DAS regularly carry out various studies concerning human factors. The studies carried out and the relevant take-aways will be covered. **Various initiatives undertaken at DAS towards enhancing / mitigating human factors.** Social influences and use of social media has become a bane for aviation and especially safety in aviation. Towards mitigating this aspect DAS has initiated a few steps like mindfulness and fatigue monitoring. A brief overview of the same will be covered.

Imaging in Disaster Victim Identification: Field Experience

Sneha Dinakar, Neha Gupta, GL Nair

An unprecedented fatal aircraft accident involving 14 serving personnel took place in the recent past. The victims included aircrew and other authorised serving armed forces personnel. It was necessary to identify the aircrew from non-aircrew as it aids in accident investigation. The victims of the crash were exposed to fire. The extreme heat resulted in charred remains leading to unrecognizable physical features and obscuring any personal artefacts present. Furthermore, the bodies become fragmented and fragile. Fortuitously, the dependant hospital had a CT facility. Use of CT reduced handling of the body/body parts, thus, minimizing further disruption. However, the charred bodies from the fire were found in a pugilistic attitude, which made it difficult for the body to fit in the gantry of the CT scan. This review article brings out the importance of radio-imaging and dental records in disaster victim identification (DVI). It also suggests certain additions to the current policy in DVI in armed forces.



ABSTRACTS: POSTER PRESENTATIONS



Poster Session I

Post Mortem whole-body CT scan as an adjunct to autopsy interpretation: A valuable tool in fatal aircraft accident investigations

Neha Gupta

Introduction. A conventional autopsy is a comprehensive assimilation taking into account several aspects of aircraft accident investigation, concluding on the most probable cause of death. However, the efficiency of this gold standard is limited in burned fatalities associated with charring up to the internal organs. In this study, we explored the utility of Post mortem whole-body CT scan with 3D reconstruction (virtual autopsy) as a diagnostic modality compared to conventional autopsy during fatal aircraft accident investigation associated with post-crash fire. **Material & methods.** A retrospective study was performed comparing the conventional autopsy findings with those of a virtual autopsy. The inclusion criterion was all aircraft accident-associated autopsies associated with post-crash fire, with which a Post mortem whole-body CT scan with 3D reconstruction was also performed. Autopsies with evidence of putrefaction were excluded. The post-mortem CT and autopsy findings were tabulated and compared for all cases. Lesions exclusively found in one of the modalities were noted. **Results.** This study covered 13 autopsies. The lesions found exclusively on CT scan were air embolism in the right ventricle, air-fluid levels in the sphenoid sinus and subcutaneous emphysema. Metallic objects were found using a CT scan in three instances. Cardiac contusion (gross examination), bone marrow or fat embolism, myocardial fibre injury, ante mortem burns (skin tissue), renal acute tubular necrosis, soot in trachea and denudation of tracheal mucosa were findings exclusive to conventional autopsy. In cases where the conventional autopsy was limited due to extreme charring, a virtual autopsy helped diagnose solid organ laceration, haemothorax, haemopericardium, urinary bladder rupture, and rupture of diaphragm, all of which were deceleration injuries. **Conclusion.** The virtual autopsy proved helpful in accidents associated with post-crash fires where the conventional autopsy was limited due to the charring of bodies. It was an effective tool for detecting deceleration injuries and spinal injuries. It was also better in detecting small metallic objects and air-associated lesions in the body. Virtual autopsy's limitation was its inability to detect ante mortem burns, small-sized contusions and other microscopic findings. Virtual autopsy cannot wholly replace a conventional autopsy but is a valuable adjunct in fatal aircraft accident investigations involving extensive charring of the bodies. **Learning objectives for delegates.** Autopsy being a reference standard to concluding the cause of death, has its own limitations. CT scan is an accurate imaging modality which has become readily available even at smaller healthcare centers and is extensively used in forensic investigation worldwide. The literature available on the utility of post-mortem CT scan with 3D reconstruction in aircraft accident investigation is scarce. This study is an attempt to enumerate the pros and cons of this imaging modality as compared to autopsy in aircraft accident investigation.

C130J: IAFs Hercules in Casualty/ Medical Evacuation

Moin Sakre

Introduction This study looks to evaluate the Casualty/ Medical evacuation capabilities of the IAFs formidable C130J-30 in terms of Patient carrying capacity, patient support facility while also assessing its Aero-medical Issues. An attempt has also been made to draw certain comparisons with the other American aircraft used by the Indian Air Force in Cas/ Medevac; Pratt & Whitney Jet engine-based Boeing Globemaster C17. **Methodology** This descriptive report employs detailed and analytical evaluation of an on ground Parked C130J-30 Super Hercules aircraft in one of the most cardinaly paramount Air Force Stations of the Eastern Air Command, IAF. Additionally, manuals have been referred, data has been inferred from real life experiences and drills and inputs from the air crew via interview method have been incorporated. **Observations** The C130J has seated casualty carrying capacity of 98 and lying casualty carrying capacity of 97 patients. To facilitate transport of lying casualties, litters (stretchers) stacked on vertically laid stanchions with hooks are employed) in various arrangements of differing rows as per convenience. Medevac requires the use of a specially and specifically designed Patient Transport Unit (PTU) with a cumulative battery life of around 3.5 Hours. Additionally, the cargo compartment has Four 300 Psi cylinders and 30 LOX O2 systems for emergency use. Individual passengers are also provided with an EPOS (emergency passenger oxygen system). Available ports in the cargo compartment supply 115 V AC 3 phase 400 Hz. The vibration profile of the aircraft ranges up to 85 - 100 Hz and cargo compartment noise levels ranging between 80 to 118 Hz. **Discussion** Casualty carrying capacity of the C130J is more than that of its American counterpart C17 Globemaster. The inbuilt LSS of the C17 comprises of on-board facility for stowage of litters and a SFC (static frequency convertor) that can be used to charge the consortium of the PTU. The same can be facilitated on the C130 as well. **Conclusion** After conscientious and meticulous observations and thorough deliberation, this paper satisfactorily concludes that the C130J is undoubtedly an unmatched asset in casualty/ medical evacuation capabilities of the Indian Air Force. **Recommendation** To enhance the casualty/ Medical evacuation capabilities of the C130J, employment of specifically designed patient carrying modules may be considered such as the ones employed in the US (Knight aerospace Ltd). To facilitate on-board mid-air charging of the equipments of the PTU, a static frequency convertor may be a constructive addition.

Preparing for the Un-prepared: Fatal Aircraft Accident at the

Ajay Kumar

The fatal aircraft accident at any base is the most unfortunate and difficult time for everyone at the base. The Station needs to be always geared up for this, though, this is not the one situation anyone would like to talk about or consider during normal times. The medical services are geared, and Medical Officers (MOs)

are trained to handle casualties as a doctor. But the young MOs not trained in Aerospace Medicine are at a loss when they suddenly encounter such a situation. It must be emphasized that managing a fatal accident is much more challenging than a situation where the aircrew has survived as the system at most of the bases is well-oiled for it. Everyone rises to the occasion as a precious life is at stake which can be saved with whatever they can contribute. However, the same may not be true for a fatal aircraft accident. The incident itself is shocking and the loss of dear ones that results in incomprehensible emotional trauma for the entire station, especially, those involved in crash rescue or the first responders as per the post-accident plan of the station. This poster will attempt to provide a brief overview of actions to be taken by the MO and may act as a pocket guide for all MOs involved in such a scenario. A ready-made list of items required for the collection of mortal remains for post-mortem and samples to be sent to IAM is also provided for easy reference.

Incidence of G-induced Loss of Consciousness in the Indian Air Force: A Retrospective Study

Avinash B Krishnegowda, Mona Dahiya, Prathu Rastogi, Sushree S Khatua

G-induced loss of consciousness (G-LOC) in an aircrew on exposure to high +Gz stress has been studied worldwide. To combat this deleterious effect, High G training is imparted to all fighter Aircrew in Indian Air Force (IAF). However, there is scarcity of literature with regards to prevalence of G-LOC after implementation of training. A questionnaire survey was performed to assess the prevalence of visual symptoms and G-LOC among the fighter aircrew of IAF serving in field to determine the effectiveness of current High G training. Anonymous Questionnaires were mailed to almost all the fighter flying squadrons of IAF and about 300 aircrew replied. 45 (15%) aircrew reported at least one episode of G-LOC. Reporting of symptoms related to +Gz exposure other than G-LOC, included 223 (74.33%) with visual blurring, 202(67%) with tunnelling of vision, 220 (73.33%) with grey out and 75 (25%) with blackout. G-LOC Incidences were most common in aircrew with 50h-100 flying hours and were more prevalent among trainees. G-LOC was most reported between 6.15 ± 1.1 +Gz. The results indicate a high prevalence of visual symptoms and G-LOC among IAF aircrew. There remains considerable scope for +Gz education, particularly in the early centrifuge training and selection of rational physical exercises.

The Curious Case of Restraint system in Crew seat for Flight Engineers in a Helicopter

Rahul Dev

Introduction. Seat harness and restraint systems in an aircraft help in preventing an aircrew from getting injured during incidents or accidents. Legacy Mi-17 helicopters have a restraint belt with two hooks (one hook on each side providing two-point attachment) which a Flight Engineer (Flt Engr) wears during routine flying operations. This arrangement has been a point of concern and has often led to Flt Engrs getting

injured in emergent conditions. **Material & Methods.** Injury pattern analysis of crew involved in a recent Mi-17 accident was carried out and compared with each other. **Results.** The restraint belt assembly was found to be ineffective in preventing the injuries sustained by the Flt Engr during the accident. **Discussion.** Flt Engrs in Mi-17 legacy helicopters are at an increased risk of getting injured during aircraft emergencies due to safety and mobility issues related to restraint system used by them. The present arrangement limits the maneuverability of these aircrew inside the helicopter cabin as a result of which they tend to utilize the restraint system in a manner that compromises personal safety. Certain modifications to enhance crew safety and mobility considering the workspace geometry and associated human factors are discussed.

Poster Session II

Dilemma in Aeromedical Disposal of Incidentally Detected Arachnoid Cyst

Ruchika Rana, Neeraj Balaini, P Sannigrahi, Binu Sekhar M

Arachnoid cysts are benign, cerebrospinal fluid-filled sacs that are located between the brain parenchyma/ spinal cord and the arachnoid membrane & are usually incidentally detected as most of them remain asymptomatic. Sequelae of Arachnoid cyst under stressful environment like aviation has not been evaluated. Here are 03 cases of military aircrew with Arachnoid Cyst, who were reviewed, evaluated and aeromedically disposed at IAM. These aircrew were incidentally detected while undergoing evaluation for other disabilities. They were asymptomatic for arachnoid cyst and no abnormality was detected on clinical and psychological evaluation (only for intracranial arachnoid cyst). Arachnoid cysts are asymptomatic and remain quiescent over a long period of time but possibility of sudden in-flight incapacitation due to rupture, cannot be ruled out. Two cases were downgraded medically based on size of arachnoid cyst and potential of cyst rupture. Aeromedical Decision making in such cases becomes difficult as there are no set guidelines for evaluation and disposal of such incidental findings. So, the aeromedical disposal of a case of arachnoid cyst should be dealt on a case-to-case basis based on their evaluation findings. However, a consensus statement or a broad guideline is strongly needed to avoid differences in opinion and medical categorization

Unexplained Loss of Consciousness: A Continuing Dilemma for Aeromedical Decision Making

Akshay CS, Sarkar R, PS Reddy, Nandishwar Rathore

28-year-old Fighter pilot had a single episode of loss of consciousness for 8-10mins in-flight during a 2V2 close combat sortie (race course pattern max 4.92G) while being seated in rear cockpit in SU-30 MKI. As the aircrew was not on active controls the aircraft was safely landed and the patient was taken to SMC. At SMC, pilot gave a history of sudden onset severe grade piercing type of unilateral headache behind left eye during the maneuvers of the aircraft thereafter he had no recollection of the event. He had no prior history of any associated neurological

disease. His CECT head revealed chronic lacunar infarct in left Lentiform nucleus, however clinical examination by Neurologist did not reveal any abnormality and further neurological disposal was A2G2 after a period of on ground observation. Aeromedical Decision making in loss of consciousness is always fraught with dilemmas especially if episode is not indicative of G- LOC. The risk assessment always zeroes onto future risk of any such episodes and the question of re-fighting. A risk stratification matrix is an established and scientifically rationalized method of arriving at a decision. This paper discusses the decision-making matrix and the risk stratification followed in the case based on a RCAF matrix of classification of medical events in aviation scenarios.

Migraine without Aura in a Fighter Pilot - A Case Report

H.Harshini, Anitha.T, B.Vinod

Incidence of even a single episode of migraine without aura in a fighter pilot entails prolonged observation in restricted flying. The pilot is thereafter considered for re-streaming to twin cockpit flying only. In accordance with the guidelines for aeromedical disposal of aircrew, there is a mandatory 2 year period of observation in nonflying category before the aircrew is considered fit for fighter flying. Historically, migraine patients who have returned to flying duties claimed to have had no symptoms for periods ranging from 6 months to several years. When considering the appropriateness of a waiver, the primary aeromedical and operational concerns are twofold – the individualized risk for future recurrence, and the degree of incapacitation that a recurrent headache is likely to cause. In manned aviation, concern is greatest for those flying single-seat aircraft or for those in aircraft where complete crew participation and coordination are essential for mission completion and for individuals who are required to function in austere environments without prompt access to medical care. A case report of a fighter pilot evaluated at Institute of Aerospace Medicine is hereby presented as an example for suggested amendment to the existing approach of aeromedical decision making. It is proposed that asymptomatic, medication free cases without structural changes in neuro imaging, the prolonged period of observation in non-flying category maybe curtailed to 6 months only. This would ensure an early return to cockpit and prevent loss of man hours particularly in young aircrew.

A Case Study of Kikuchi Fujimoto Disease in a Naval Aircrew: Aeromedical Perspective

Preethi R, Ghosh G, Anitha T

Introduction: Kikuchi Fujimoto disease is a rare disorder characterized by tender regional lymphadenopathy with associated fever, night sweats and leukopenia in about 50%cases. It's a self-limiting and benign disorder with no clear etiopathology. The paper presents a case of a male aircrew who was diagnosed with this disorder and how his aeromedical assessment was carried out at the Institute of Aerospace

Medicine. A similar case study in an aircrew has little available literature. **Case Report:** A 36-year-old male naval helicopter pilot with no known comorbidities developed fever with generalized rashes and swelling in the inguinal region. On examination there was tender inguinal lymphadenopathy and generalized blanchable erythema. He was not responding to symptomatic treatment. Further evaluation with PET scan revealed multiple FDG avid lymph nodes above and below diaphragm. Inguinal lymph node biopsy was suggestive of Kikuchi Fujimoto disease. He was started on systemic steroids. Subsequently, he developed steroid induced pancytopenia and transaminitis. There was also mild encephalopathy. He was managed as a case of Macrophage Activation Syndrome and was treated with IV Immunoglobulins and pulse steroids. The aircrew, thereafter, achieved clinical recovery. Repeat FDG PET imaging done after 02 months showed complete resolution of the disease. The steroid medication was tapered off and he was started on oral hydroxychloroquine for another 02 months. After initial observation in non-flying category, he was upgraded to a restricted flying status and was further evaluated with a Medical Flight Test. After a satisfactory performance in the in-flight evaluation, he was assessed fit for unrestricted flying. **Discussion:** Kikuchi Fujimoto disease is a rare disorder which usually affects females. This paper brings out the manifestations and acute complications of the disease and its treatment in a male aircrew. The aeromedical considerations in re-certification of the case are highlighted. Fitness for Fighter Flying in a Resolved Case of Neurocysticercosis (NCC)

Fitness for Fighter Flying in a Resolved Case of Neurocysticercosis: Dilemma in Aeromedical Disposition

Bhowmick B, Karthikeyan S, YS Thakur, Sarkar R

Background: Neurocysticercosis (NCC) is the most common helminthic infection of the human central nervous system and its the leading cause of acquired epilepsy worldwide. The clinical manifestations vary depending on the location, cyst stage and host immune response. Seizure is the most common clinical presentation, but many patients present with focal deficits, intracranial hypertension or cognitive decline. Neuroimaging is the mainstay of diagnosis. Cysticidal treatment along with steroids has shown increased and faster resolution of lesions. Seizure responds well to single antiepileptic drug and its recurrence rate is low with single lesions. Multiple and calcified lesion have recurrent seizures and requires AED for longer duration. Aeromedical concerns of disease include occurrence of any neurologic or cognitive symptoms and signs and AED can have CNS depressant effect. In-flight seizure can cause unsustainable aircraft attitude, accidentally altering controls or engaging weapon system and compromising the flight safety. **Case Summary:** A 33 years old fighter aircrew of IAF with a flying experience of approximately 950 hours had an episode of generalized tonic clonic seizure. His MRI Brain revealed ring enhancing lesion in left inferior temporal gyrus (<20mm) and was diagnosed as a case of Neurocysticercosis (Parenchymal NCC). He was managed conservatively

with cysticidal therapy along with steroids and AED. During his follow up after six months his CECT Brain revealed no residual lesions and was advised to stop AED. He has been observed adequately in non-flying medical category for a period exceeding one year post stoppage of AEDs without seizure recurrence and now he was upgraded to restricted flying category for another one-year period of observation before considering him for awarding full flying category. **Discussion:** The aeromedical concern in a case of Neurocysticercosis with seizure is a risk of sudden in-flight incapacitation due to seizure. In military/ civil flying, the aircrew can be considered for unrestricted flying category for transport and helicopter. In this case, the aircrew had only single episode of seizure which was his presenting symptoms and had complete resolution of brain lesion. However, after careful deliberation and considering all aeromedical concerns, the decision was taken to reflight the aircrew in fighter flying with restriction.

Poster Session – III

A Case of small intestine malignancy in civil aviation cabin crew: An Approach to Aeromedical Disposal

Anindya Pramanik

Background: As is the case with other human being, the cabin crew also suffered from small intestine malignancy. The regulatory guideline states that aircrew who are suffering from any active malignant disease or under any active chemo or radiotherapy treatment, should not be considered any kind of certification. Similarly, any kind of relapse of the disease may incapacitate the cabin crew from flying duty. Thus, it poses significant aeromedical risk and concerns in relation to safety and effectiveness during flying duty. **Case Summary:** The crew had no comorbidities. She was apparently normal till mid-June 2021. Once she developed acute epigastric pain which was relieved after medication. She again developed acute upper abdominal pain with vomiting on 29.06.2021 and consulted a physician. USG W/A done on 30.06.2021. Findings were GB polyp with mild ascites. Next day UGI endoscopy done. findings were grade A esophagitis. CECT W/A done on 03.07.2021. Findings were mass in jejunum with dilatation of proximal bowel loops-? Lymphoma? Carcinoma? Lymph node? metastatic deposit in cardio-phrenic recess on right side along with mild ascites, mesenteric lymphadenopathy, tiny calculus in left kidney. Single balloon enteroscopy done on 06.07.2021 showed 4 ulcer-proliferative growth noted in jejunum which compromise 50-60% of lumen. Multiple biopsies taken showed adenocarcinoma grade II. On 07.07.2021 laparoscopy assisted resection of jejunal mass with anastomosis of gut done. Intraoperative findings hard mass approx. (4X5 cm) in proximal jejunum with multiple enlarged draining LN in mesentery. Liver and diaphragm normal. Ascites present. Specimen sent for HPE. HPE shows jejunal adeno CA Gr II. Post operative period was uneventful. Opinion of Consultant Medical Oncology taken who advised PET scan after 03 weeks to decide the course of chemotherapy. PET CT done on 10.08.2021

showed no active disease. Chemotherapy started with: Inj. Dacotin (Oxaliplatin) used for the treatment of colon and rectal cancer. Other medicine given: Cap Aprecap for nausea and vomiting / Inj. Palzen to control nausea and vomiting / Inj. Decmax (Dexamethasone) / Inj Neukine (Filgrastim) used to improve WBC count during cancer treatment. Also used to prevent infection after chemotherapy. 8 cycle of chemotherapy was completed on 01.02.2022. Thereafter 01 month of rest advised for post-chemotherapy fatigue and neuropathy. On 28.03.2022 tumor marker CEA and CA 19-9 done. Both are WNL. CT W/A done on 30.03.2022 showed elongated low-density lesion at rt. Cardio-phrenic angle 2.8 cmX1.4 cm- likely benign cyst. On 06.04.2022 the treating Oncologist issued fitness certificate. Asked for review after 03 months with the report of CBC/ CEA / CA 19-9. As the latest Hb% was 9.8 so the crew was kept on ground due to low Hb%. Repeat test of Hb% was done on 02.06.2022 shows 13.0

Discussion: DGCA Guidelines: As per the DGCA guideline, no certification is considered for the Pilot under active disease phase or under ongoing radio or chemotherapy treatment. After completion of treatment, certification considered case to case basis. No separate recommendation is available for cabin crew in DGCA guideline. ICAO Guidelines: Current curative or adjuvant chemotherapy is incompatible with certification, and recovery from the effects of such treatments will demand a period of unfit assessment after they have finished. Crew should be assessed as unfit during any period of treatment with cytotoxic chemical agents. If the crew has recovered from the primary treatment and, as far as can be assessed with available techniques, there is no residual tumour, then the level of certification will depend on the likelihood of recurrent disease. The medical assessor may consider earlier recertification if recovery is complete, the applicant is asymptomatic, and there is a minimal risk of complications. The relapse or active progression of certain tumours may be effectively followed by measuring tumour markers. The most common example in pilots and controllers is adenocarcinoma of the prostate where levels of Prostate Specific Antigen (PSA) can be tracked over a period of time. Analysis of the tumour marker is very useful in determining the risk of relapse for an individual. EASA Guidelines: Before further consideration is given to their application, applicants with primary or secondary malignant disease shall undergo satisfactory oncological evaluation. Such applicants for a class 2 medical certificate shall be assessed in consultation with the medical assessor of the licensing authority. Applicants who have been diagnosed with a malignant disease may be assessed as fit provided that: after primary treatment, there is no evidence of residual malignant disease likely to jeopardize flight safety; time appropriate to the type of tumour and primary treatment has elapsed. the risk of inflight incapacitation from a recurrence or metastasis is sufficiently low; there is no evidence of short or long-term sequelae from treatment. Special attention should be paid to applicants who have received chemotherapy; satisfactory oncology follow-up reports are provided to the medical assessor of the licensing authority. Applicants receiving ongoing chemotherapy or radiation treatment should be assessed as unfit. Before recommending for the disposal of the crew, following points were taken into consideration. PET CT done on 10.08.22 shows no active disease. CECT done on

30.03.22 shows presence of benign cyst So there is nil presence of residual tumour. Both the tumour markers CEA and CE 19-9 are WNL. Hb% also WNL. Crew has completed the full treatment and currently not under any active chemotherapy. Fitness certificate issued by treating Oncologist. Chance of recurrence: in about 35% to 40% of people who get surgery with or without chemotherapy, the cancer may come back within 3 to 5 years of treatment. If this happens, it could be in the colon or rectum, or in another part of the body, such as the liver and lungs. After considering all the above-mentioned factors, disposal recommendation given as: Crew can be released for flying duty with Review with report of CBC with Consultant Oncologist opinion every 03 months. Any recurrence of disease, certification for flying duty will be discontinued.

Hyperbaric Oxygen Therapy as a Treatment Option for Intractable Hemorrhagic Cystitis in a Pediatric patient: A Case Report

Deepan Rai, Ranjan Sarkar, Manu N, Neha

Hyperbaric Oxygen therapy is gaining importance as treatment modality for Hemorrhagic cystitis. The administration of 100% oxygen at pressures greater than 1ATA initiates neovascularisation, mucosal layer formation and also reduces edema from the direct pressure effect. Hemorrhagic cystitis (HC) is a pathological condition manifested with recurrent hematuria, urinary urgency and supra pubic pain. HC can be caused after radiation exposure, chemotherapeutic drugs, viral and bacterial infections. HC is a common sequela after Stem Cell Transplant (SCT). The use of immunosuppressants post SCT makes an individual susceptible for opportunistic infection which in turn causes diffuse inflammation and vascular injury of bladder mucosa leading to HC. HC is classified into two types based on the time of onset of the disease following chemotherapy/radiotherapy: Early and Late onset of HC, which appears within 48–72h and 2-3 months respectively. HC is one of the approved indications for administration of HBOT from the Undersea and Hyperbaric Medicine Society (UHMS). There is scanty evidence of HBOT being effective in paediatric cases of hemorrhagic cystitis, however, the effectiveness of the therapy in a paediatric patient on opioid analgesic and active bladder irrigation was debatable. This paper highlights a case of 6-year-old male child, treated with Haploidentical Stem Cell Transplant for X- linked Adrenoleukodystrophy was followed up with Post Transplant Cyclophosphamide. He developed intractable Grade IV Hemorrhagic cystitis 02 weeks after transplant. The decision making in assessing the fitness of this child to undergo therapy and the results achieved are discussed in detail in this paper.

Aeromedical Aspects of Sarcoidosis in Aircrew: A Case Report

Hemanth KA, Karthikeyan, Choudary MSK, Rohith KP, Akshay CS, Shruthi

A 29yrs old helicopter pilot was incidentally detected to have B/L hilar lymphadenopathy on routine chest x ray, as he was undergoing special medical examination for jungle snow survival (JSS) course. On extensive evaluation he was diagnosed as a case of Pulmonary Sarcoidosis Stage II. There was no involvement of other organ systems. He was asymptomatic and continued to be. He was placed in ground medical category and started on immunosuppressant medication. The aspect of duration of observation in ground category after cessation of immunosuppressant medication, for recurrence and subsequent re-fighting pose a dilemma in aeromedical decision making. The dilemma in re-fighting the aircrew in aviation scenario is also compounded by the future complications of a particular disability. Sarcoidosis is a Multi organ system disease viz. Cardiac, cutaneous and has high risk of recurrence. The possibility of recurrence and complication needs to be considered in view of risk of sudden in-flight incapacitation. This paper aims to discuss the issues related to sarcoidosis and its risk in military and civil aircrew.

02 Cases of Haemoglobinopathies in Flight Cadets: Clinical Presentations, Disposal and Role of Screening Modalities

Omesh Nath, HMK Murthy

Introduction. This paper deals with 02 clinical cases of hemoglobinopathies with diverse clinical presentations. The cases were evaluated and managed during the course of flying training. The cases were given disposal as per the existing medical guidelines. An attempt has been made to deliberate into the existing screening methods during initial medical examinations and suitable recommendations.

Discussion: Thalassemia arises from mutations that impair production or translation of globin mRNA, leading to deficient globin chain biosynthesis. Due to inadequate supply of Hb, there is imbalance in the production of individual globin chain, leading to premature destruction of erythroblasts and RBC. Thalassemia's are the most common genetic disorder in the world. The mutant Hb can usually be characterized by HPLC.

Summary & Impression. Referring to IAP 4303 5th edition, para 3.13.4, candidates with hemoglobinopathies are to be considered unfit for service. If any cadet, UTFO/ ab-initio trainee during, the course of his/ her training, is placed in permanent low medical category which is incompatible with his/ her branch/ trade, invalidation out of service will be done. **Recommendations.** Flight cadets undergo thorough clinical and lab evaluation prior to attaining medical fitness for flying course. Initial screening is done at IAM/ AFCME. After being ascertained medically fit, they report for the training. After 06 months of ground training prior to the start of flying training, a repeat medical evaluation is carried out at 2AMTC and 14 AFH at AFA. This also includes complete haematological evaluation. The cases discussed above are a food for thought as they were diagnosed as thalassemia during the course of their flying training although the prior medical evaluation at both the centres did not

reveal any evidence of anemia or any hemoglobinopathy. Considering the duration of flying training, cost commodity of flying hours and persistence of the hemoglobinopathies as a permanent disability, it is proposed to include HPLC as a mandatory inv in pre course medical evaluation. It is a cost-effective investigation, easily accessible, rapid and reliable results and would possibly go a long way in early detection of thalassemia and similar disabilities without affecting the time and cost of precious flying training.

Guillain–Barre Syndrome: A Case Report in an Aircrew

HPS Sahota, Y Dinkar

Guillain-Barré syndrome (GBS) can be described as a collection of clinical syndromes that manifests as an acute inflammatory polyradiculoneuropathy. It is an acquired condition that is characterized by progressive, symmetrical, proximal, and distal tingling and weakness. We report a case of a 34-year-old male patient an aircrew of the fighter stream who presented with pins and needles sensations in his feet and hands with subsequent development of weakness in lower extremities and later diagnosed as case of GBS. Patient received standard treatment and has responded to the therapy. Current status and Aero-medical disposal of the aircrew are discussed.

Poster Session – IV

A Study on the Effect of Suryanamaskar on Orthostatic Tolerance and Neurovestibular Functioning upon Exposure to Simulated Microgravity Condition

Ghosh G, Pipraiya R

Introduction: Yoga has been widely accepted as a practice to modulate human physiology in varied professions. One of the fields of modern medicine where there is an adaptive physiological response is in the microgravity environment of space. Two important changes due to space adaptation are orthostatic intolerance and neurovestibular desynchronization. The study aimed to find out whether effective practice of *Suryanamaskar* was able to allay the cardiovascular and neurovestibular deconditioning that take place upon exposure to simulated microgravity. **Methods:** Ten age-matched, healthy participants voluntary took part in the study. Initial baseline readings of their responses to Head-up tilt and a disorientation run on Barany's chair to calculate the Coriolis Time Interval were taken. The responses were re-evaluated after exposure to 4 hours of simulated microgravity by Head-down tilt, before and after practice of *Suryanamaskar* for 21 days. The findings were then compared using repeated measures ANOVA and paired t-tests. **Results:** Mean age of the participants was 34.2 ± 3.9 years. The findings suggested that there were significant reductions in heart rate (-5.8 beats/min), systolic blood pressure (-3.1 mm Hg), mean arterial pressure (-2.8 mm Hg) after yogic intervention on exposure to microgravity. The comparisons of diastolic blood pressure, Coriolis time interval and

motion sickness rating scale evaluation pre and post *Suryanamaskar* practice did not yield statistically significant results. **Discussion:** Yoga is an easy, economic, less space occupying, and effective way to mitigate the cardiovascular changes that take place in space and the outcome of this study gravitates its usefulness. However, repeated trials, both on ground and during short duration space missions, are necessary to validate the outcome and implement use of *Suryanamaskar*, both pre-flight and in-flight, as a countermeasure to microgravity induced physiological deconditioning.

A Retrospective Study of Air Sickness Cases at IAM: Psychological Perspective

Thattil A, Chaturvedula S

Air Sickness is normal response to an abnormal stimulus. It is caused by a disagreement between the information received by the eyes and information from the organs in inner ear. It is seen more among ab-initios, as with more exposure to flying, the body becomes accustomed to the “foreign” stimulus, causing lesser reaction. However, there may be other reasons that make one susceptible to air sickness, which are psychogenic in nature such as, stress and anxiety, low motivation and Manifestation of Apprehension to fly. In cases where these factors have led to motion sickness, it is worth re-looking at the appropriate diagnosis and disposal. A retrospective analysis of Air Sickness cases referred to IAM over the last 5 years was carried out. It is found that out of 35 cases, 10 cases cleared the Air Sickness Desensitization Therapy (ASDT) protocol, while 25 failed. The data showed that 34% of cases were of Permanent Commissioning (PC), while 31% were of Short Service Commission (SSC). Out of this 34% PC officers, ASDT was terminated for 75% cases. Further, 82% of SSC officers were unsuccessful in completing the ASDT protocol out of the 31%. It was observed that 44% of cadets, who were unsuccessful, had defence family background. The mean Motion Sickness Assessment Questionnaire (MSAQ) score of successful cadets was found to be 58.2, while that of unsuccessful cadets was 72.45. As certain demographics and psychological test results point towards level of motivation to fly, it is prudent to re-look at the diagnosis of Air Sickness itself and consequent Desensitization Therapy being offered. Discretion to change the diagnosis and accordingly dispose the case based on findings of the psychological evaluation would reduce false positives.

Obesity and Co-morbid Hypertension: Impact on Executive Functions of the Individuals

Kallavarapu Vincent

Obesity and hypertension are the most prevalent chronic illnesses in India, which are known to have immense negative impact on the executive functions of the individuals. Executive functions are pivotal for aviators to exhibit accuracy and speed in decision making while flying. Adiposity and cardiorespiratory health are

interrelated and pose as risk factors for developing both obesity and hypertension. The Indian population is shown to have high vulnerability for both obesity and hypertension for which aviators are no exception. The present study aimed at understanding the differences in the executive functions in individuals with obesity and comorbid hypertension. The sample consisted of 90 adults (age group of 20-58 years), divided into three groups of 30 each, viz. obesity, obesity with comorbid hypertension, and hypertension. In this quasi-experimental study, the selected participants were administered with modified Wisconsin card sorting test, comprehensive trail making test, and digit span individually. The age was matched between three groups and socio-economic status, medium of instruction and years of education were no bar. The results of this study indicated that there is a significant difference among the three groups in executive functions, where, the group of obesity with comorbid hypertension showed the lowest levels of executive functioning. Further analysis revealed that group of obesity has significant differences upon these dimensions when compared with group of hypertension. The implications with regard to life style modifications providing psycho education were discussed.

Challenges in Casualty Evacuation During COVID-19 Pandemic in Overseas Peacekeeping Operations in Remote Areas of Eastern Africa

TS Rana, RN Hiremath, Mahesh Kulkarni, Rishi Raj

Introduction: With the spread of COVID-19 disease in the world, the number of positive cases increased in overseas deployment of peacekeeping operations also, as there were people from different countries. **Objective:** The objective of the study was to discuss the challenges faced during evacuation of patients to higher medical echelons during COVID-19 Pandemic in overseas peacekeeping operations in remote areas of Eastern Africa. **Materials and Methods:** Our study was carried out at secondary care Hospital, deployed in remote area of Eastern Africa, where medical officers and Paramedics were deployed as a part of United Nations Peace Keeping Forces Mission. The qualitative and quantitative data was collected from the 14 cases that were evacuated to higher medical echelons from Jan 2021 to May 2022 and experience and challenges are discussed during succeeding paras. **Results and Discussion:** A total of 14 cases were air evacuated from remote hospital to secondary/tertiary hospitals. The COVID RTPCR was a mandatory requirement before evacuating the patients. In all the evacuations, the average time taken was 3-4 hours starting from sample collection and then getting the result. The medic/paramedic who went as medical escort with a covid positive patient was required to wear the PPE, which was cumbersome due to hot and humid weather, if the evacuation was done in helicopter. The medical escort was quarantined after finishing the duty. This resulted in extra workload on the other staff, in a field hospital that was already functioning with limited manpower. Thus, many challenges were faced pertaining to Prioritization and isolation of the patients, RT PCR Testing, Human resources management, transportation chamber/isolation Pod, personal protective equipment (PPE), Health education and med evac training. **Conclusion:**

Medevac/Casevac of patients to higher echelons was challenging every time, as it resulted in extra time and utilization of extra manpower from a remote hospital that has limited manpower. Also, many procedural changes had to be added in the medevac process.

Validation of 3D Laser based Anthropometric parameters using Manual Anthropometric Data

Sabyasachi Nayak, Binu Sekhar M, Vinod B

Introduction: Anthropometry of Aircrew is of fundamental importance in order to ensure pilot-cockpit compatibility for the purpose of aircrew selection and cockpit design, as well as to ensure safe egress in case of ejection. It is also important for the designing of aircrew clothing. So far, the measurement of these anthropometric parameters has been performed using classical manual anthropometry. 3D Laser based Whole-body Scanners allow the measurement of the same parameters in a much shorter time. The aim of this study was to ascertain the accuracy and validity of various parameters of interest, as measured by 3D Laser scanners by comparing them with the corresponding measurements obtained using manual anthropometry. We performed a study of 500 individuals, with measurements of 57 anthropometric parameters done using both the methods. Considering the manual anthropometry as the gold standard, a Bland Altman analysis along with Correlation analysis was carried out to find the parameters which can be reliably measured using the 3D Laser scanner. **Material and Methods:** The manual anthropometry platform was used to measure a set of 57 anthropometric parameters of the subjects and the Vitus 3D Laser Whole Body Scanner was used along with the Anthroscan software to measure the same set of parameters again. Once the two sets of data were obtained, a Bland-Altman analysis was performed on them by considering the manual anthropometric data as the gold standard in order to validate the measurements of the 3D Laser Scanner. **Results and Observation:** The mean and the standard deviation of the differences between the two anthropometric measurement methods were calculated for the list of 57 parameters, as well as the error rates of the 3D Laser based measurements as compared with the manual measurements. The correlation between the two measurement methods was also calculated for all the 57 anthropometric parameters. The correlation coefficient was used along with the error in order to develop a qualifying criterion for the validation of the 3D Laser anthropometric measurements for a given parameter. Based on this a set of parameters which could be reliably measured by Laser anthropometry were obtained.

Poster Session V

Case Study: Fatal Aircraft Accident

Billa Nanda Kishore

Case Study of a Fatal Aircraft Accident Introduction: Flying operations are a routine and the most important aspect of Indian Air Force. Human aspects and other aspects like technicality of operating machine, environment and many other aspects decide the operational efficacy and man machine performance. Aim: To know in detail the course of events occurred leading to a fatal aircraft accident, helping to avoid evident possible errors in future. Subject: A fighter pilot of MiG-21 Bison fleet. Discussion: (a) Pre-accident events (b) Human aspects (c) Environmental aspects (d) Date of accident events (e) Post accident events (f) Points to focus Conclusion: Swiss cheese model effect of all the possible factors finally lead to a fatal aircraft accident

Body Composition Analysis: A Significant Parameter for Examining the Fitness of Aspiring Pilots

Ketan L.Pakhale, Mustansir Bhorl

Pilot training takes years of dedication, preparation, hours in the sky, and hard work. A pilot's life is thrilling with many rewards, but it's also stressful. Changeable scheduling and occupational stress might affect a pilot's health. Being a pilot has its ups and downs, and not only in the air. A healthier and more competent pilot is the one who prioritises his own well-being. The training sector should cultivate not only pilots but also leaders and whole individuals. Fitness training for aspiring airline pilots should include habit-building, goal-setting, and lifestyle changes. Anthropometric measurements are quantitative measurements of the body for which non-invasive tools and methods exist. Assessment of body composition can provide valuable information about one's general health, nutritional adequacy, and bodily development. Though being a direct predictor of wellness, body composition analysis has not been used as a compulsory parameter to assess the overall fitness of aspiring pilots. Thus, we have collated body composition analysis data from 55 candidates who aspire to be pilots. On the basis of the data evaluated, we suggest that body composition analysis can extend a significant insight on general fitness of the candidates and thus should be incorporated as a mandatory assessment procedure.

SMO's Conference: Guest Lecture

HONEST (Healthcare Online Near Miss and Sentinel Events Tracker)

S Souche

Introduction. Ensuring safety of patients during their management is a most vital consideration as any accident during such care can seriously impact the outcome. Accidents occur due to active and latent errors. Learning from such errors helps us prevent/ mitigate their future recurrence. CHAFB is the nodal centre for patient safety in IAF. A software-based system named "HONEST" was conceived and developed as an incident reporting and Learning system to capture adverse events in healthcare and analyse them and make appropriate rec across the entire Med services in IAF. **Material & Methods.** The requirement for an incident reporting system were analysed. Maintaining anonymity of the reporter and feedback on rec to him/ her was defined as an indisputable criterion. The software was designed on AFNET platform using HTML, CSS, ASP, Javascript / JQuery & Visual Studio.Net Frontend and MySQL backend. Separate modules were made for reporting and analysis. **Results.** An online reporting system has been created for reporting and analysis of near-miss and sentinel events pertaining to patient care across entire IAF. Anonymity of reporter is ensured. Structured feedback allows for lucid root-cause analysis of the report. Recommendations made on the report will be available to the reporter. **Discussion.** Lessons learnt from each event will be disseminated pan IAF to avoid their repetition in every unit. Thus, patient care will become safer all over IAF.

CME Session: Indian Space Mission – A Step Forward!

Development of Real-Time Psychomotor Function Evaluation Test for a Space Mission

Abhishek Jha, Imtiaz Ali Khan, Ch N Sowghandi, Stuti Mishra

A trained and vigilant crew capable of executing the tasks as well as handling any off-nominal scenario is a vital asset for any manned space mission. Spaceflight is associated with its unique set of stressors to the crew such as isolation and confinement, periods of monotony and high workload, sleep deprivation due to disturbed circadian rhythm, etc. It may lead to neurocognitive changes, fatigue and increased likelihood of errors compromising the mission. Therefore, there is need for deployment of a tool for assessment of the neurocognitive state of the onboard crew. Few space agencies such as NASA have deployed computerized versions of Psychomotor Vigilance Task (PVT) to assess the impact of sleep loss and circadian misalignment on the crew's abilities in long duration mission assignments on the International Space Station (ISS). This paper discusses the development of a software tool based on short duration Real Time Self-Assessment which can help in

assessing various aspects of Crew's neurobehavioral state such as sustained attention, visuo-spatial organization and memory. This tool is envisaged to be a check-point to evaluate the awareness of the crew before any critical spaceflight operations during the mission as well as assess the impact of any-nominal event (physical injury, hypoxia, toxic exposure etc).

A Roadmap to Astronauts' Water Survival Training & Strategic Rescue Post Splashdown

Ghosh G, Mishra S, Sannigrahi P, Prusty P, Chandrawanshi S

Planet Earth offers two elements on which a spacecraft can carry out landing – land (touchdown) and water (splashdown). This means that the recovery techniques would have to be divided and therefore training to survive both on different terrain conditions and in water would also have to be imparted to the astronauts. Where the Russian Cosmonauts traditionally have been carrying out touchdown with their Soyuz MS space vehicle on the terrains of Kazakhstan border, the American counterparts have resumed splashdown re-entry with the latest partially reusable SpaceX Dragon Crew Capsule. Astronauts' water survival training has been a major component of mission preparation. It encompasses both nominal and off-nominal situations that the crew may encounter during their return. This paper highlights various past and present water survival and crew rescue training procedures followed by international space agencies, and also attempts to come up with recommendations for water survival training and rescue plan for Indian astronauts-to-be in preparation towards Gaganyaan Mission.

Post-Flight Rehabilitation of an Astronaut after Long Duration Mission in Space: through the Eyes of a Flight Surgeon

Sannigrahi P, Ghosh G, Mishra S, Renjhen P

Dwelling in the microgravity environment of space results in various physiological adaptations in the form of Cardiovascular deconditioning, Neurovestibular changes, loss of bone and muscle mass, etc. which effects the physiological functioning of the human body on return to earth. Hence, post-flight reconditioning programs are implemented by the International Space Agencies with an aim of returning the Astronauts to their pre-flight physical condition. This paper deals with the post-flight rehabilitation of an Astronaut conducted by a foreign Astronaut Training Centre, after his long duration mission of six months on-board International Space Station. The Rehabilitation program consisted of Post-flight Medical Evaluation and Post-flight Physical Reconditioning. With the advent of Human Spaceflight Programme, the lessons learnt in this rehabilitation program would be helpful in formulating post-flight rehabilitation protocol of Indian Astronauts after India's maiden Human Spaceflight mission as well as serve as a template for future exploration missions.

Conceptual Design of Extrication Device for Crew Rescue for Human Spaceflight Missions

Abhishek Jha, B Nagaraju, Satyam Malhotra, Sneha Dinakaran, Stuti Mishra

Identifying potential safety risks to the crew and devising suitable mitigation strategy is integral to human spaceflight mission planning and execution, considering paramount importance to crew safety. One such scenario which has to be catered is the off-nominal landing where extrication of a potentially injured crew is a possibility. This requires design of a specialized device to extricate a potentially injured crew from the Crew Module for further medical intervention. The design of the extrication device has to factor the limited space within crew module to the rescue team. One of the major design requirements for extricating a potentially injured crew is to prevent secondary mechanical spinal injuries during the extrication process. This requires implementation of mechanical design solution for immobilization of the spine. Ease of deployment and operational usage during a rescue scenario with minimum number of personnel as well as extrication path should also be considered in view of the limited space availability within the crew module. The paper discusses some of these design requirements for the extrication device and presents an engineering design solution which can not only be deployed in space missions but also in similar scenarios in trauma injuries in road as well as aviation related accidents.

Analysis of Deep Learning Algorithms for Crew Health Monitoring Applications in Human Spaceflight Missions

Abhishek Jha, Imtiaz Ali Khan, Vishal Shukla, Anurag Kumar Sinha, Stuti Mishra, Punyashlok Biswal

The effect of spaceflight on cardiovascular, neuro-vestibular, musculoskeletal system etc. has been a subject of study in previous as well as current human spaceflight missions. For missions in low earth orbit (LEO), near-real time communication and medical decision support from ground-based experts is possible. However, this requires continuous analysis of voluminous crew health data which is difficult even for trained ground expert. Real time medical support from Mission Control Centre for future human exploration missions to Moon, Mars and beyond will not be possible due to communication latency. Hence, there is a requirement for deploying a robust crew health monitoring and decision support systems for space missions. Artificial intelligence (AI) has emerged as a promising tool in this area. Deep learning is a subset of AI algorithms which is used to model complex data and comprises of multiple neural network layers. The objective of the current study is to review Deep Neural Network (DNN) based models for predicting cardiovascular anomalies using ECG data. Automated ECG analysis is a classification problem and, in this paper, two such DNN based models such as Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) are used to study ECG data and their respective capabilities in prediction of cardiac anomalies such as Arrhythmia are discussed.



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