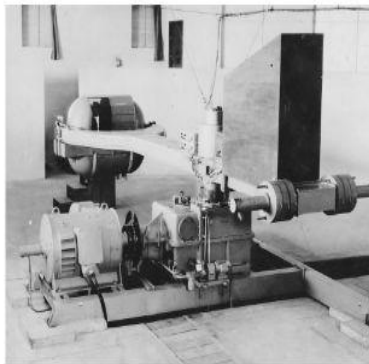
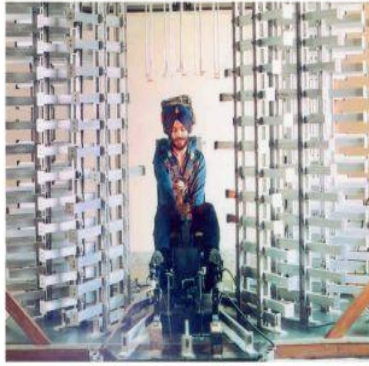


60th Annual Conference of The Indian Society of Aerospace Medicine 25-27 November 2021



Souvenir





**60th Annual Conference
of
The Indian Society of Aerospace medicine**



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

25 to 27 November 2021

Institute of Aerospace Medicine Indian Air Force



A warm welcome to all the participants

Conference logo



Designed and conceptualised by
Wg Cdr AVK Raju



1. This logo is to commemorate the rich and illustrious years of the Society, and to celebrate **60th Annual Conference of the Indian Society of Aerospace Medicine**.
2. Keeping in mind the special place that this 'Diamond Jubilee Conference' would hold for its members, colours, Gold & Royal Blue, and glitter of the diamond have been chosen for the logo.
3. Description of the individual elements of the logo:-
 - (a) **Diamond** – Gold, Royal Blue and 'Sky' Blue coloured Diamond in the centre forms the sterling backdrop of the logo. It signifies 'Diamond Jubilee Conference' of the Society. The compartments of the Diamond indicate various subsets of Aerospace Medicine, which work in unison to give indomitable strength to the niche speciality of Aerospace Medicine.
 - (b) **Digits 60** – 60 in gold, with ISAM insignia and a sparkling diamond mark the 60th Annual Conference, an important milestone in the Society's history. Circles of digits six and zero represent 'aircraft wheels' which give a perfect take-off, for the aircraft to reach out to people and places far and wide. Putting the same in context, it is indicative of the continuing support which the Society has been making to the aviation industry, and the assurance that it will continue reaching out to the industry whenever called for.
 - (c) **Golden Wings** – Wings are synonymous with the business of flying. While the wing feathers represent the Society's members, Society acts like wind beneath the wings to help its members soar high and scale greater heights in the field of Aerospace Medicine.
 - (d) **Golden Banner** – Golden banner indicate the glorious golden years of the Society since its inception. Words 'Aerospace Medicine: Atmosphere and Beyond' indicates the theme of ISAM Diamond Jubilee Conference and spell out the momentous academic extravaganza that awaits unfolding in days to come.

Conceptualised and designed by:-

Wg Cdr AVK Raju, Classified Specialist (Aerospace Medicine), Life Member and Fellow, Indian Society of Aerospace Medicine.



MESSAGES





एयर चीफ मार्शल वी आर चौधरी
पविसेमे अविसेमे वासेमे एडीसी

Air Chief Marshal VR Chaudhari
PVSM AVSM VM ADC

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



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

1. I am pleased to learn that the Indian Society of Aerospace Medicine (ISAM) is organising its 60th Annual Conference at Bangalore from 25-27 Nov 21. The role of Aerospace Medicine in enhancing operational preparedness and optimising human performance is very relevant considering the technological leap that military aviation is witnessing in modern times.
2. The conference theme, 'Atmosphere and Beyond,' is apt because IAF aircrew are being trained for the first Indian manned space flight. It is now incumbent on the community of aerospace medicine experts to solve complex problems in multiple domains as diverse as human space programme, fatigue management, and mental and physical fitness in combat aircrew.
3. I am certain that the conference will give us crucial insights. These must be translated on ground into getting aircrew back to flying at the earliest, as well as equipping them to interface with modern cockpits to maximise their operational effectiveness. We must also use our collective experience of long duration operations to push human boundaries in the manned space flight programme.
4. I convey my best wishes to the organisers as well as delegates of ISAM 2021 and wish this conference a grand success.

Jai Hind!

21 Nov 21

Air Chief Marshal
Chief of the Air Staff



एयर मार्शल मानवेन्द्र सिंह अ वि से मे वीर चक्र वि से मे ए डी सी

Air Marshal Manavendra Singh AVSM VrC VSM ADC

वायु अफसर कमांडिंग-इन-चीफ

Air Officer Commanding-in-Chief

Telefax : (O) 080-23412821

AFNET : 4111-7202

प्रशिक्षण कमान मुख्यालय, भा वा से
जे सी नगर पोस्ट
बेंगलुरु - ५६०००६

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



MESSAGE

1. The Indian Society of Aerospace Medicine is organising its 60th Annual Conference from 25-27 Nov 21.
2. On the occasion of the Indian Society of Aerospace Medicine's Diamond Jubilee, I would like to recognise the Society's exceptional contribution to the Indian Air Force. Aerospace Medicine is focused on improving human capacity to do complicated activities in potentially hostile working environments, such as those seen in civil and military aviation. The response of an Aerospace Medicine specialist to the issues confronted by air warriors must be rapid and prompt. The Conference theme this year, '**Atmosphere and Beyond**', is very apt because it will allow experts to discuss not only aeromedical difficulties faced by aircrew in the field, but also the challenges of launching India's first astronaut into space.
3. I am convinced that the Conference will be incredibly instructive and will showcase the tremendous advancements made by this developing speciality.
4. I wish the organisers the best of luck and wish the Conference great success.

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 : 011-23093331
ASCON : 33080



MESSAGE

कार्यालय महानिदेशक
सशस्त्र सेना चिकित्सा सेवा
रक्षा मंत्रालय
'एम' ब्लॉक, नई दिल्ली-११०००९
Office of Director General
Armed Forces Medical Services
Ministry of Defence
'M' Block, New Delhi-110001

1. At the outset I complement the Indian Society of Aerospace Medicine for its Diamond Jubilee Annual Conference that is being conducted in a hybrid platform 25-27 Nov 2021.
2. Aerospace Medicine is a discipline of medicine that is mostly practised in forward flying units. Field-based research and new ideas are critical components of the art and practice of Aerospace medicine, since they contribute to the common goal of optimal aircrew care and aerospace safety. Since a long time, specialists in Aerospace Medicine have been sharing their perspectives on the various challenges posed by the ever-changing aviation environment. At regular intervals, significant achievements from the past, present and future are successfully represented.
3. The theme for this year's conference has been appropriately chosen as 'Atmosphere and Beyond' in which a variety of aeromedical issues, in the aviation and space sectors, and their potential solutions will be discussed by the professionals in the field of aerospace medicine.
4. On the occasion of the Society's Diamond Jubilee, I extend my gratitude to all veterans who have made significant contributions to the society and to the present generation of Aeromedical professionals to raise the professional goal further further.

'Jai Hind'

Station : New Delhi

Date : 11 Nov 2021

(Rajat Datta)
Surg VAdm
DGAfMS



75
Azadi Ka
Amrit Mahotsav

एयर मार्शल वी पी एस राणा वी एस एम

प्रशासनिक प्रभारी वायु अफसर

Air Marshal V P S Rana VSM

Air Officer-in-charge Administration

Tele (O) : 011-23010231 / 7134
Tele & Fax : 011-23012934
AFNET : 21115100
Mob. : 9968207859, 9868111891
Email : aoaweb@iaf.nic.in

वायु सेना मुख्यालय

वायु भवन

नई दिल्ली-110 106

Air Headquarters

Vayu Bhawan

New Delhi - 110 106



MESSAGE

1. I am delighted to learn that the Indian Society of Aerospace Medicine will hold its 60th Annual Conference on 25-27 Nov 21. The conference's theme is 'Atmosphere and Beyond', which will highlight all aspects of activity in the field of Aerospace Medicine aimed at improving aerospace safety.

2. Flying is a dynamic activity that requires an aircrew to have an extraordinarily high level of physical conditioning and mental agility. Flight stressors, if not addressed correctly, can have a detrimental effect on the aircrew's performance and jeopardise Aerospace Safety. The sustained efforts of the Aerospace Medicine professionals and the 'Squadron Docs' to keep the aircrew healthy in the flying stations is commendable.

3. On this auspicious Diamond Jubilee Anniversary of the Indian Society of Aerospace Medicine, I wish to congratulate everyone who has worked tirelessly to maintain the speciality and attain such patronizing heights.

4. I wish the Diamond Jubilee Conference of ISAM a grand success.

Jai Hind !

(VPS Rana)

Air Marshal

Air Officer-in-charge Administration

Date: 09 Nov 21



एयर मार्शल प्रशांत भारद्वाज वि से मे एवं बार

महानिदेशक चिकित्सा सेवा (वायु)

Air Marshal Prashant Bharadwaj VSM & BAR

Director General Medical Services (Air)

Tele : 011-26168098 (Off)
011-23010231/8152

Mobile : 9650833737

Fax : 011-26168098

E-mail : prashantbharadwaj@



वायु सेना मुख्यालय

वेस्ट ब्लॉक - VI

आर के पुरम

नई दिल्ली - 110 066

Air Headquarters

West Block - VI

RK Puram

New Delhi - 110 066

MESSAGE

1. It is my privilege and honour to organise the 60th Annual Conference of the Indian Society of Aerospace Medicine at the Institute of Aerospace Medicine in Bengaluru from 25-27 Nov 21.
2. The introduction of technologically superior high-performance aircraft and technologies into the world's main air forces, including the IAF, has transformed them into a formidable force. However, multi-role missions and extended periods of operation have significantly increased operational complexity. Aerospace Medicine professionals' effort to keep war fighters flying safely and effectively are commendable and will go a long way toward accomplishing the IAF aim of 'Touch the Sky with Glory!' The theme of the conference is 'Atmosphere and Beyond' – very aptly chosen considering the diverse research in the field of Aerospace Medicine aimed to resolve aeromedical difficulties encountered by aircrew and astronauts.
3. The Aerospace Medicine Specialist involved in addressing the aeromedical issues at Squadron level. In addition the specialists at the Institute of Aerospace Medicine are involved in consultation towards development of newer aircraft / modifications. The members of ISAM are contributing towards enhancing the goal of Aerospace Safety in civil aviation as well. The niche speciality and its specialists are being recognised by other institutes and organizations across the globe. A large number of the members of the Society are giving aeromedical consultancy abroad.



4. I am sure the deliberations of the conference will encompass all facets of the art of practicing Aerospace Medicine. Various challenges encountered at the field will be discussed along with possible remedies that may overlay the way forward to positively utilize opportunities through active interaction by all participants.

5. As the President of the Society, I extend a warm welcome to all delegates and veterans in the field of Aerospace Medicine and wish the Conference every success.

Jai Hind !

Place: Air HQ (RK Puram)

Date: 02 Nov 21

(Prashant Bharadwaj)
Air Mshl
DGMS (Air)



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

Air Vice Marshal Sadhna S Nair VSM

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भारतीय वायु सेना
जे सी नगर पोस्ट
बेंगलूरु - 560 006

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



MESSAGE

1. On the occasion of the Diamond Jubilee Conference of the Indian Society of Aerospace Medicine, I extend my warm felicitations to all the members of the society. The theme of the Conference this year is '**Atmosphere and Beyond**'. It has been planned with a view to strengthen the interaction between Aerospace Medicine specialists and other professionals involved in enhancing Aerospace Safety.
2. Given the current geopolitical environment, the IAF is required to operate quickly in a variety of tough situations. Aeromedical issues associated with long-haul flights and a wide range of operations necessitate quick and effective solutions to overcome these obstacles. Involvement of Aerospace Medicine experts in the field is therefore a must for accomplishing these goals.
3. Changing warfare paradigms have brought about a change in key aeromedical focus areas. The Society through its members at IAM has embarked on application based research in novel areas such as development of better computerised pilot selection battery test, preparation for 5th generation features in fighter aircraft and in depth research based prescription for optimizing aircrew fitness.
4. The Annual ISAM Conference is held not only to highlight accomplishments in this sector, but also to learn about fresh issues as they emerge in the field of Aerospace Medicine. The discussions and interactions during this academic session are sure to enhance and stimulate the fraternity's youthful enthusiasts.
5. It is my pleasure, as the Conference's Chief Coordinator, to welcome today all attendees, dignitaries and illustrious veterans in the field of Aerospace Medicine. Your presence on this occasion will help make the Conference a huge success.

Jai Hind!

Sadhna S Nair



एयर कमोडोर विजय वि जोशी वी एस एम
समादेशक

Air Commodore Vijay V Joshi V S M
Commandant

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Fax : +91 - 80 - 2522 4659
AFNET: 4313 7200
Mob. : 94069 71211
95996 00516
E-mail : mangesh82@gmail.com

वांतरिक्ष औषधि संस्थान

भारतीय वायु सेना

विमानपुरा पोस्ट

बेंगलूरु - ५६० ०१७

Institute of Aerospace Medicine IAF

Vimanapura Post

Bengaluru - 560 017



MESSAGE

1. It is an honour and privilege for me to serve on the organising committee for the Indian Society of Aerospace Medicine's Diamond Jubilee Annual Conference, which will be held in the garden city of Bangalore from 25-27 November 21.
2. The ISAM Conference has served as a forum for debate, discussions and exchange of ideas among Aerospace Medicine specialists from India and throughout the world. The newly developed concepts for addressing diverse aeromedical difficulties will contribute significantly to the development of fresh approaches for improving aircrew health care.
3. This year's Conference theme is 'Atmosphere and Beyond.' Space is the new frontier for the society and hence the theme, lesson learnt in Indigenous Human in Space programme will be deliberated in the conference. This year we have also focused on mental health in aircrew and organized two prestigious Orators to enlighten us on these issues. We have also focused on the next big thing of design & development of an indigenous stealth fighter aircraft and its aeromedical issues. Future is built on the lesson learnt in the past. Towards better understanding of future escape systems we have also arranged an oration on past, present and future of aircraft escape systems. Other scientific papers have also been carefully chosen to address the existing and emerging aeromedical Challenges.

4. As the Conference's Executive Coordinator, I would like to extend a warm greeting to all dignitaries and delegates. I am sure the conference will provide adequate food for thought.

Jai Hind !



A handwritten signature in blue ink, consisting of a stylized 'W' or 'M' shape with a horizontal line extending to the right.



COMMITTEES



ISAM Conference 2021
Aerospace Medicine: Atmosphere & Beyond

Conference Advisory Committee

Society President

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

Society Secretary

Gp Capt Prathu Rastogi

Chief Coordinator

AVM Sadhna S Nair VSM

Executive Coordinator

Air Cmde Vijay V Joshi VSM

Conference Organising Committee

Organising Secretary

Gp Capt Piush Renjhen

Asst Organising Secretaries

Wg Cdr Biplab Bhowmick
Wg Cdr V Raghunandan

Organising Secretariat

Surg Lt Cdr Vanjaria Harsh
SqN Ldr Ashish Nagpurkar
SqN Ldr YS Thakur
SqN Ldr T Anitha

Scientific Programme Committee

Gp Capt NK Tripathy
Dr CHN Sowgandhi, Sc F
Sqn Ldr Gaurab Ghosh
Dr Suryakiran

Stage Committee

Wg Cdr Stuti Mishra
Sqn Ldr Gaurab Ghosh
Sqn Ldr N Rathore

MC

Wg Cdr Stuti Mishra
Wg Cdr V Raghunandan
Sqn Ldr Gaurab Ghosh
Sqn Ldr Polash Sannigrahi
Surg Lt Cdr Vinod
Dr Neha Arun Rao

Invitation& RSVP Seating and ushering

Gp Capt Rahul Pipraiya
Lt Col Suhasini Reddy
Wg Cdr Sushree S Khatua
Sqn Ldr Tanuja Rajkumar
Lt Col Swapnil Misra

Slide Projection & Photography

Gp Capt M Asuti
Lt Col N Manu
Sqn Ldr Shobhana Gupta

Poster Presentation

Col VK Malhotra
Maj Savina George
Dr Sanjay

Souvenir

Lt Col Binu Sekhar M
Maj Hemanth KA

Boards, Banners &Printing

Lt Col Binu Sekhar M
Wg Cdr SP Waghmare
Lt Col Mithun Kumar
Sqn Ldr Deepan Rai

Society Dinner

Surg Cdr Ranjan Sarkar
Surg Lt Cdr PS Reddy
Dr Akshay C Shirur

PRO

Dr Biswajit Sinha, Sc F

Treasurer

Wg Cdr Indu Gautam

Ladies Function

Wg Cdr Sneha Dinakar
Sqn Ldr T Anita

Reception & Registration

Dr SR Santhosh, Sc F
Sqn Ldr Tanuja Rajkumar
Dr Kumari Pooja

Delegate Kits & Folders

Wg Cdr Vinitha Binny
Sqn Ldr Pooja Negi

Accommodation

Org Secretariat
Surg Cdr Ranjan Sarkar

Transport

Gp Capt M Asuti
Sqn Ldr Pooja Negi
Maj Hemanth KA

Business meetings

Sqn Ldr S Praveen Kumar

TMS Co-ordination

Gp Capt NK Tripathy
Wg Cdr Sneha Dinakar

Technical Support

Gp Capt M Asuti
Sqn Ldr Shobhana Gupta

Administrative Support

Gp Capt Vandana Hatwal
Wg Cdr Mrinal Tirkha

Medical Cover

Lt Col Shravan TS

Facilitation of BAIL

Wg Cdr VL Srivastava

Officers Institutes Support

Gp Capt PK Sharma

Beverages

Sqn Ldr Pooja Negi

Catering

Gp Capt PK Sharma
Gp Capt Zaidi
Surg Cdr Ranjan Sarkar
Sqn Ldr Kshitij
Flt Lt Ankur Upadhyay

Orations

Org Secretariat

Trophies & Awards

Wg Cdr TD Khaling
Dr Pooja Kumari

CME Credits

Wg Cdr V Raghunandan

ISAM Video

Wg Cdr Sneha Dinakar
Sqn Ldr N Rathore
Dr Sanjay P



SCIENTIFIC PROGRAMME



60TH ANNUAL CONFERENCE OF
THE INDIAN SOCIETY OF AEROSPACE MEDICINE

SCIENTIFIC PROGRAMME

25 NOV 21

**0800h –
0900h**

Session I - Clinical Aerospace Medicine

Chairpersons: **AVM MS Sridhar**
 Gp Capt MS Nataraja

- | | |
|--|----------------------------------|
| Incidence of Cerebral Venous Thrombosis in Armed Forces Personnel Deployed at High Altitude | Col S Bhardwaj |
| Study of Physiological Parameters in Individuals with Anemia and it's Correlation with Acute Hypoxic Hypoxia | Wg Cdr A Kumar (<i>Online</i>) |
| A Case of Low-G Tolerance in a Fighter U/T Aircrew: An Approach to Aeromedical Disposal | Dr Kumari Pooja |
| Adie's Tonic Pupil: Significance in Aviators and Aeromedical Disposal | Wg Cdr Juhi Borgohain |

**0900h-
1000h**

Session II - Free Papers

Chairpersons: **AVM Ashutosh Sharma**
 Air Cmde Renuka Kunte

- | | |
|--|-------------------------------------|
| Work-Life Balance and Burnout Among IAF Women Officers: A Preliminary Study | Dr K Anand |
| The Republic of Singapore Air Force COVID-19 Pandemic Response and Lessons Learnt | Maj Benjamin Seah (<i>Online</i>) |
| Physical Activity and Sleep Quality Among Military Aircrew During COVID-19: A Cross-sectional Pilot Survey | Wg Cdr CS Guru (<i>Online</i>) |
| The Role of Emotion Regulation in Mediating the Relationship Between Aggression and Aviation Safety Attitude in Pilots | Ms A Gautam (<i>Online</i>) |

1000h – 1200h	Pre-Lunch Poster Session	
	Diagnosing In-flight G-LOC: Dilemma in Aeromedical Decision Making	Wg Cdr Ajay Kumar
	Cerebral Venous Thrombosis in Civil Aircrew: Aeromedical Disposal	Wg Cdr AVK Raju
	Adopting COVID-19 times in Ophthalmological Examination of Candidates	Wg Cdr Atul Singh
1100h- 1200h 1100h	Inaugural Function	
	<u>Arrival of the Chief Guest</u>	
	Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC Chief of the Air Staff, Indian Air Force	
1101h	Audiovisual Presentation	
1105h	<u>Welcome Address</u>	
	Air Commodore Vijay V Joshi VSM Commandant, IAM IAF	
1115h	<u>Presidential Address</u>	
	Air Marshal Prashant Bharadwaj VSM & BAR PHS, DGMS (Air)	
1125h	<u>Address by chief guest</u>	
	Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC Chief of the Air Staff, Indian Air Force	
1140h	Award of Trophies and Releases	
1145h	<u>Vote of Thanks</u>	
	Group Captain Piush Renjhen Organising Secretary	
1200h – 1300h	<u>JHF Manekshaw Panel (live)</u>	
	Chairperson: Air Mshl Prashant Bharadwaj VSM & BAR PHS	
	Human Interface In 5+ Generation Fighter Aircraft	Dr AK Ghosh, OS & PD (AMCA), ADA
	Mind Matters in Modernity	Dr Pratima Murthy, Director NIMHANS

**1400h –
1600h** **Post-Lunch Poster Session**

Ejection During Spin Recovery: Injury Pattern Analysis and Lesson Learnt	Wg Cdr A Chandra
Outcome of Motion Sickness Desensitization Therapy: A Comparison of Two Different Approaches	Wg Cdr B Bhowmick
Heterotrophic Ossification: A Case Report	Sqn Ldr B Nandakishore
A Field Experience on Casevac of a Patient with Burst Fracture of Spine using Stretcher Based PTU with Spinal Column Stabilizer	Sqn Ldr E Srihari

**1400h –
1500h** **Session III - Civil Aviation Medicine**

Chairpersons: **Air Mshl CK Ranjan AVSM VSM (Retd)**
 Air Cmde Sandeep Arora

Current Practice of Testing for Consumption of Psychoactive Substances Amongst Civil Aviation Personnel: An Update from DGCA India	Gp Capt YS Dahiya
Random Psychoactive Substance Testing for Aviation Personnel - Are We Ready?	Dr Punita Masrani (<i>Online</i>)
Coping Styles and Subjective Well-Being of Indian Civil Aircrew in the Context of COVID-19	Dr Ch N Sowgandhi
Occupational Injuries to Flight Attendants in a Middle Eastern Airliner	Gp Capt BK Umesh Kumar (Retd) (<i>Online</i>)

**1500h –
1600h** **Session IV - Operational Aerospace Medicine**

Chairpersons: **AVM P Kharbanda VSM (Retd)**
 Air Cmde A Jeyachandran VSM

Ejection Over High Altitude Area - An Aeromedical Perspective	Lt Col Binu Sekhar M
Upgradation of Musculoskeletal Injuries in the Operational Bases: Need for a Re-look	Flt Lt Rahul Dev (<i>Online</i>)

Air Sickness Desensitisation Therapy Using Barany's Chair and DISO Simulator: A Comparative Analysis

Wg Cdr Omesh Nath
(Online)

A Comparative Study of Cardiovascular Changes on Exposure to +Gz Stress Between Ab-Initio and Experienced Fighter Aircrew of Indian Air Force

Wg Cdr Sushree SK

26 NOV 21

**0830h-
0930h**

Subroto Mukerjee Memorial Oration

Chairperson: Surg Vice Admiral Rajat Datta AVSM SM VSM PHS, DGAFMS

Pilot Physician's Evolution to Human Intervention Motivational Study (HIMS)

**Dr Quay C Snyder,
President AMAS (Online)**

**0900h –
1100h**

Poster: Pre-Lunch Session – I

Neurovestibular Laboratory: Potential Research Application in Aerospace Medicine

Wg Cdr Sneha Dinakar

Android Phone Based Audiometry for Screening of Hearing Loss

Gp Capt Angshuman Dutta

Relationship of Physical Parameters & Flying Experience with Incidence of G-LOC in Centrifuge Training: A Retrospective Study

Dr Sanjay P

Low G Tolerance in an Ab-Initio Aircrew: A Sqn Level Preparedness

Sqn Ldr Isha Sah

**0930h –
1030h**

Session V - Space Medicine

**Chairpersons: AVM Sadhna S Nair VSM
 Air Cmde A Agarwal VSM**

Analysis of Electromyographic Changes in Gastrocnemius Muscle on Exposure to 24 hours of Dry Supine Immersion

Lt Col Manu N

A Study to Examine Intraocular Pressure Changes During 24-hour Dry Supine Immersion and its Correlation with Cardiac Output and Leg Girth	Wg Cdr S Mishra
Cardiopulmonary Responses to Centrifuge Simulated Parabolic Flight	Flt Lt Harshith HS
Snow Survival Training of Astronauts: Through the Eyes of a Flight Surgeon	Sqn Ldr P Sannigrahi

**1100h-
1200h**

Session VI - Aircraft & Aircrew Equipment Assembly: Trials & Evaluations

Chairpersons: **Air Cmde S Chowdhary (Retd)**
 Air Cmde Vipin Sharma

Integration of FRILJ with EED: An Aeromedical Appreciation	Surg Cdr Ranjan Sarkar
Retro-fitment of an Oxygen System in a Transport Aircraft of IAF: Decompression Chamber Trials	Wg Cdr B Bhowmick
Study of Performance Characteristics of ANVIS Gen III NVG and its Comparison with Existing NVGs in the IAF	Wg Cdr V Raghunandan
Inadvertent Operation of Ejection Seat Firing Handle: Aeromedical Aspects	Gp Capt Murtaza

**1200h –
1300h**

Session VII - Innovations & Recent Advances

Chairpersons: **AVM Tanmoy Roy VSM**
 Gp Capt YS Dahiya

Gender Based Difference in Computerised Dynamic Visual Acuity: A Pilot Study	Sqn Ldr Anitha T
Development of a Simple and Specific Method for Estimation of Cyanide in Post Mortem Blood: Implications as an Aid to Aircrash Investigations	Wg Cdr Neha Gupta (<i>Online</i>)
Localisation of Centre of Gravity of Helmet Systems in Human Anatomical Coordinate Frame using 3D Scanners	Mr S Nayak

	Application of Piezoelectric Sensor to record Orthostatic Changes in Carotid and Dorsalis Pedis Artery on Tilt Table	Dr M Khan(<i>Online</i>)
1100h – 1300h	Pre-Lunch Poster Session – II	
	A Study on Stress Among Commercial Airline Pilots	Dr Swathy Kuppala G
	Social Media Engagement & Well Being among Military Aviators	Lt Col Srihari Iyer K
	Critical Thinking Training Module for the Indian Air Force	Dr Gurpreet Kaur
	Situational Awareness & its Enhancement in the Indian Air Force	Miss Subh Priya Pal
1400h-1500h	<u>Srinagesh Memorial Oration</u>	
	Chairperson: Air Mshl JK Gupta PVSM AVSM (Retd)	
	Evolution of Escape System: A Safety Perspective	Mr Steve Roberts (<i>Online</i>)
1530h–1700h	ISAM General Body Meeting	
1400h–1600h	Post-Lunch Poster Session	
	Simultaneous Bilateral Femur Fracture: Case Report on Post Aircraft Accident Injury	Wg Cdr Pankaj Rai
	Four Cases of Multisystem Inflammatory Syndrome in Adults Associated with SARS-CoV-2 Infection – An Overview of Clinical Features, Diagnosis & Treatment	Wg Cdr Varadaraj
	Aeromedical Evaluation of Aircrew Post Ejection at Field Level	Sqn Ldr E Srihari
	Lattice Degeneration – Clinical Entity with Variable Criterion for Civil vs Military Aviation	Dr Anjali Maheshwari

27 NOV 21

**0830h–
1030h**

Aeromedical Support to Human Spaceflight Programme

Chairperson: **Air Cmde Vijay V Joshi VSM**
 Gp Capt Piush Renjhen

Gaganyaan: A 360 Degree Approach to Aeromedical Challenges	Gp Capt P Biswal
Crew Health Monitoring and Maintenance of Physical Fitness	Sqn Ldr P Sannigrahi
Mental Wellbeing and Mental Health Monitoring	Dr Ch N Sowgandhi
Gaganaunts Aeromedical Training	Sqn Ldr Gaurab Ghosh
Aeromedical Consultancy: Our Contribution	Wg Cdr S Mishra

**1100h–
1200h**

Aircraft Accident Investigation

Chairpersons: **AVM Narinder Taneja VSM**
 Gp Capt Rahul Pipraiya

Overview of IAP 4305 & Recent Changes	Gp Capt P Rastogi
Role of MO as First Responder in an Aircraft Accident	Wg Cdr P Goel
A Representative Case Discussion	Gp Capt YS Dahiya
Scoring, Coding & Assigning Severity to Aircraft Accident Injury Using Abbreviated Injury Scale (AIS)	Flt Lt R Dev (Online)

**1200h–
1300h**

Aeromedical Evaluation

Chairpersons: **Air Cmde R Ravi**
 Gp Capt NK Tripathy

Revised IAP 4303 (5 th Edition) Section VI: Major Changes and Fresh Additions	Sqn Ldr Gaurab Ghosh
Aeromedical Evaluation and Disposal of Hearing Loss: A Paradigm Shift	Wg Cdr Sushree SK

	Field Disposal: Temporary Restrictions, Local and Field Upgradations	Wg Cdr Sneha Dinakar
	Incidental Findings During Aircrew Evaluation at IAM and Its Impact on Aeromedical Disposal	Lt Col Manu N
1000h – 1200h	Pre-Lunch Poster Session	
	Multifeed Manifold for Oxygen Supply to Multiple Patients	Wg Cdr Bhaskar Das
	To Study the Pattern of Meal Timings Amongst Employees Related to Aviation	Wg Cdr Aniket Kulkarni
	Analysis of Psychological Stress in Aviators: A Multi-centric Study	Sqn Ldr Devdeep Ghosh
1400h – 1600h	62nd SMOs' Conference	



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

1972-2020

Sl 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	GpCapt 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 MMS 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

SI No	Year	Orator	Topic
16.	1998	Dr SK Sikka	On Indian Explosions 11-13, 1998
17.	1999	Padmashri Dr Naresh Trehan	New Frontiers in The Management of Cardiac 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 Future ¹
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	Bharath Ratna Dr APJ Abdul Kalam	Aerospace System: A Possible Profile
31.	2013	Dr AK Chaturvedi	Aerospace Toxicology: An Emerging Multidisciplinary Field of Medical Sciences

SI No	Year	Orator	Topic
32.	2014	Dr Prabhat Kumar, IAS, DGCA	How to Keep Indian Skies Safe
33.	2015	Ms Shika Sharma MD & CEO Axis Bank	Beyond Glass Ceilings: Challenges and Opportunities for Women In 21 st Century
34.	2016	Sr Soumya Swaminathan	The Relevance of Making Data Relevant Translational Research in Medicine
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)

Air Marshal Subroto Mukerjee Memorial Oration: Speaker

Quay Snyder



Dr. Quay Snyder is President/CEO of Virtual Flight Surgeons, [Aviation Medicine Advisory Service] providing medical certification and aviation safety guidance for pilot and air traffic controller unions as well as business and general aviation pilots. Dr. Snyder has been the Air Line Pilots Association, International Aeromedical Advisor since 2010, after serving as Associate Aeromedical Advisor since 1994. Since 2015, he has served as the FAA / ALPA HIMS Program Manager and has over 20 years experience sponsoring and monitoring substance addicted pilots. Quay holds board certification in Aerospace Medicine, Addiction Medicine, Family Practice and Occupational Medicine. He is a graduate of the United States Air Force Academy, Duke University School of Medicine and the University of Colorado Health Sciences Center. He served in the USAF, USAF Reserve and Colorado Air National Guard for 25 years as a flight surgeon, glider instructor pilot and in leadership roles. Dr. Snyder is active in many aviation safety committees and organizations, both nationally and internationally. He is an AsMA Fellow and member of several of AsMA's Constituent and Affiliate organizations. He serves on the Board of Directors of the International Academy of Aviation and Space Medicine and on the Board of Trustees of the National Aviation Hall of Fame from 2014-2020. He has chaired the National Business Aviation Associations Safety Committee's Fitness for Duty Working Group and served on both the medical expert group for the FAA's Pilot Fitness Aviation Rulemaking Committee and co-chairs AsMA's Pilot Mental Health Working Group. He is a member of the Flight Safety Foundation's Business Advisory Council and is on the faculty of the University of Southern California's Viterbi School of Engineering in the Aviation Safety and Security Program. Dr. Snyder has been an FAA Certified Flight Instructor (Gold Seal) since 1975.

and actively serves as a Designated Pilot Examiner since 1998 and FAA Safety Team representative since 2003. He received the Soaring Society of America's World Distance Award for 40,000 km (Earth's circumference) of solo cross country flight in his ASK-24B glider. He is also active in triathlons qualifying for the 2016 and 2020 Ironman Hawaii World Championships and in 2020, qualified for the International Triathlon Union's World Championships representing Team USA in every triathlon distance from sprint to long course as an age group amateur.

Pilot Physician's Evolution to Human Intervention Motivational Study (HIMS)

Recent aviation tragedies and world events have highlighted the need for proactive support for the mental wellbeing of all aviators. Lack of mental wellness compromises the mood and performance of the individual aviator and reduces the efficiency of flying operations while compromising aviation safety. A pilot-physician's journey through the worlds of aviation and medicine has led to realizations of the importance of mental health as a strategy for safety, but also for personal wellbeing and organizational efficiency. Historically, aviation physicians have focused on the physical health of airmen while minimizing or ignoring the more prevalent and serious nature of mental health. Airmen have many barriers to optimizing their mental health. Some barriers include the pilots' personality features, fear of adverse medical certification actions, the lack of aviation savvy mental health providers and few peer support programs designed for and by aviators. We are now recognizing the need for such programs while studying the success of exiting aviation mental wellness programs, particularly those utilizing peer support strategies and cooperative programs between pilots, employers, the CAA's and aviation medical professionals. Four nearly five decades the FAA's HIMS program has successfully led to the effective treatment and monitoring of pilots with the disease of substance dependence with the safe return to flying of thousands of recovering pilots. The HIMS program is led by peer pilots, most in recovery themselves, which reduces barriers to entry. Likewise, the Critical Incident Response Program is led by peer pilot volunteers and evolved from an aviation tragedy. Most recently, Peer Pilot Support Programs have received recognition for effectiveness, funding for implementation and support from CAA. This presentation will discuss the evolution of PPSP's and strategies to support aviation mental health.

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, MadhukarMallanahSrinagesh 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, Sqnl 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 a 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

2007-2020

Sl no.	Year	Orator	Topic
1.	2007	Dr CA Vargheese	50 Years of Aeromedical R&D in India: A Ring Side View
2.	2008	Mr M Madhavan Nambiyar	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

Steve Roberts



Steve Roberts grew up in Hong Kong, has lived in Portugal and schooled in England, graduating from University in London with a BSc (Hons) in Air Transport Engineering. He was commissioned into the Royal Air Force (RAF) as a Squadron Maintenance Officer working on Tornado, Hawk, Jaguar, Harrier & C-130 aircraft, prior to joining Martin-Baker 31 years ago, as a Project Engineer. At Martin-Baker, he has been responsible for the Ejection Seat development programs for the Dassault Rafale (MkF16F), Embraer EMB-314 Super Tucano (BR10LC), Panavia Tornado (Mk10A) and Eurofighter Typhoon (Mk16A) aircraft. From 1995, he has also been responsible for the Ejection Seat development programs for the Boeing X-32 CDP (US16B) and from 2001 the Lockheed Martin F-35 Lightning II (US16E) aircraft. In December 2018, he was promoted to become the Head of Business Development and is actively engaged in the escape requirements for future Fighter programs. Certified as a European Professional Engineer (Eur Ing), he is a member of several institutions: AIAA, ASMA and SAFE in the US, the RAeS in the UK, and FEANI in France. Extensively travelled, Steve speaks Cantonese, French and Portuguese and has presented at Symposia all over the world. Married with two teenage children, in his spare time he is an RFU Rugby coach, an EHA Hockey Umpire, an LTA Tennis coach and a PADI certified Rescue Diver.

Evolution of Escape System–A Safety Perspective

This paper describes the evolution of escape systems, from a safety perspective, how the requirements continue to evolve with new aero-medical research and how Martin-Baker is introducing innovative Seat designs to meet them. Canopy transparency

removal is the first factor in determining the critical time delays to initiate ejection. Three means of escape are in-service: canopy severance, canopy jettison and thro' canopy penetration. Which system is selected is decided by the mechanical properties of the transparency material, thickness, signature coatings, bird strike and pressure differential (aircraft ceiling) requirements. The Martin-Baker ejection seat range has evolved from the Mk1 of 1945 to the Mk18 of 2021. The 4 phases of ejection are unchanged over the last 76 years: catapult initiation/emergence, stabilisation, parachute deployment/inflation and descent/landing. Early seat designs used catapults/ejection guns which resulted in 20% lumbar injuries for ejectees. As physiological requirements have changed with continuous aero-medical research, ejection seat designs have also been updated to reduce this lumbar injury rate to below the currently accepted 5%. Post-ejection analysis drove the seat firing handle to be repositioned from above the head (face curtain) to down on the Seat bucket. This allowed the parachute to be repositioned higher up the Seat allowing a quicker deployment. Taken together with the constant development of emergency parachutes has led to improved terrain clearance. The introduction of wider aircrew accommodation ranges for both male and female aircrew, taken with the increase in head-borne mass (Helmet Mounted Displays) has led to much change in terms of physiological head and neck load limits and a lower acceptable ejection risk. These requirements have driven new innovative configuration changes to support the head during the different phases of the ejection sequence. Martin-Baker Seats have always been fitted with leg restraint systems. Arm flail injuries were being seen for ejections above 400kts, this has been rectified in the 1980's with the introduction of active arm restraint systems, and an update to the MIL-HNBK-516C to recommend arm restraint for all ejection seat equipped aircraft that can fly above 300kts. The risk of drowning post-ejection has been virtually eliminated after 1990 with the introduction of automatic life jacket inflation, automatic liferaft inflation and automatic harness release. Seat reliability has improved considerably, such that fatalities are very few and are only associated with out of envelope ejection (a function of late aircrew ejection attempt) and land dragging (torso harness release). 3D modelling has been used extensively for the design and manufacture of ejection Seat since the 1990's. In order to make the ejection sequence more predictable, 6 Degree Of Freedom (6DOF) modelling has been introduced for performance prediction, validation and post ejection analysis. These models enable the electronic sequencers to minimise the physiological loads and maximise terrain clearance. In summary, the evolution of escape systems has reduced the risk of ejection injury making ejection safer while simultaneously expanding the anthropometric range and escape envelope

Air Vice Marshal JHF Manekshaw Panel



Air Vice Marshal JHF Manekshaw

Born on 28 Oct 1916, Air Vice Marshal JemiHarmusjiFramjiManekshaw, 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 SqnLdr, Wg Cdr, GpCapt & Air Cmde. After this he was posted at the office of DGAFMS as the DMS (Medical Research) as an AVM. The Unit Crest with 'NabahsiArogyam' 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 HormusjiFramjiJamshedjiManekshaw, 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.

Sl No.	Year	Orator	Topic
1.	2018	Dr S Somnath	Human Space Programme
		Dr Kotesb TM	Emerging Trends in Flying Clothing
2.	2019	Dr Gireesh S Deodhare	Challenges in development of modern fighter aircraft
		Dr Unni Krishnan 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

Dr AK Ghosh



Dr AK Ghosh is a Graduate in Aeronautical Engineering from IIT Kharagpur. Subsequently, he completed Post-graduation and PhD in Aerospace Engineering from Indian Institute of Science. He joined ADA in the year 1987 as a Project Engineer and currently he is Outstanding Scientist and Project Director of AMCA, ADA. His area of work was numerical grid generation and Computational Fluid Dynamics (CFD). His experience stands more than 15 years towards CFD code development and CFD applications for LCA Design activities. Thereafter he is heading the Indian Fifth Generation Aircraft Programme namely AMCA (Advanced Medium Combat Aircraft) from its inception. Dr. A K Ghosh is responsible for initiation, planning, execution, obtaining Government approval for AMCA Feasibility project and subsequently execution and completion of the feasibility studies. He successfully completed the feasibility study of AMCA and submitted the report to Govt. of India. Subsequently re-obtained the sanction for design phase and it is in the last stage of completion. He is working extensively for achieving 'Make in India' goal for AMCA project. He is trying to build an ecosystem for Public-Private partnership for AMCA project. Simultaneously, he is leading various projects on future technologies like advanced stealth and other advanced technologies in collaboration with people from Academia and Armed forces. He has published more than 20 papers in national and international journals and has more than 100 technical reports to his credit. He was a guest speaker for many national and international conferences. He has guided several students for post graduate and doctoral programme from premier technology institutions like IISc and IITs for their research work. He was visiting faculty in IIT-Kanpur.

Human Interface in 5⁺ Generation Fighter Aircraft

AMCA is a Fifth generation, Medium weight, Multi-Role and Twin-Engine fighter aircraft with a swing role capability. AMCA performs A-A, A- G and A-S missions. AMCA is optimized for Strike in stealth mode as primary role. The secondary roles will be Air Superiority, Reconnaissance and Maritime operations in non-stealth mode. The advanced technologies that confer stealth capabilities in AMCA are Serpentine Air-Intake, Internal weapon bay, Radar Absorbing Materials (RAM), Frequency Selective Surface Radome, Conformal Antennae. The Avionics system features Net Centric Warfare capabilities, advanced Pilot Vehicle Interface (PVI), Active Electronic Pilot (Act EP). Pilot cockpit interface is driven mainly by considering ergonomics, mission controls and anthropometric data of IAF pilots has been discussed. Presentation covers 5th Gen fighter aircraft cockpit and its design evolution for efficient and comfort of the pilot operations. Maintainability and reachability studies for maintenance personnel attributed human factors are studied virtually to implement in real world for cost effective design. Cognitive ability of the pilot can be measured in the simulators and this can be mapped with real time flights and to optimize cognitive workload for efficient and effective mission. Conventionally fighter aircrafts are flown by two pilots namely navigation and mission controller. But all the 5th generation aircrafts are single seat and information flow in an evolving modern combat scenario is immense which will increase the pilot workload. In order to reduce the pilot workload, conceptual studies of Pilot Associate and Electronic Pilot (EP) are presented. Pilot associate and EP are the decision support system with different autonomy levels.

Dr Pratima Murthy



Dr Pratima Murthy, Director, National Institute of Mental Health and Neuro Sciences (NIMHANS), Bangalore, India, has made seminal contribution for over three decades in the field of mental health. She is an alumnus of the Bangalore Medical College. She completed her Diploma and MD in Psychiatry from NIMHANS and has a Diploma in Psychological Medicine from the University of Manchester, UK. She is a Fellow of the Royal College of Physicians, Glasgow, UK. She has earlier served as Professor and Head of the Department of Psychiatry at NIMHANS, Head of the Centre for Addiction Medicine, Head of Forensic Psychiatric services and chair of psychotherapy. Dr Murthy is a recipient of the World Health Organization Regional Director's special appreciation award 2021 for promoting tobacco cessation and control, the Raja Ramanna Award in for excellence in Science for outstanding contribution to science and society from the Govt of Karnataka in 2019, the Marfatia Award and the Tilak Venkoba Rao Oration awards of the Indian Psychiatric Society. She is the recipient of the "Rotary Lifetime Achievement Award in the field of De-Addiction" in 2020. She has undertaken several consultancies and assignments with several international organizations like the World Health Organization, the United Nations Office on Drugs and Crime, the International Labor Organization and other agencies. She is an international consultant to the World Health Organization for the mhGAP in mental health and addictions. She has also provided consultancy to the National Human Rights Commission, been a member of many task forces at the national level and served on several intramural committees of NIMHANS and extramural committees at the national level. Through her work on the human rights of persons with mental illness, she has contributed significantly to mental hospital reform and the programmatic expansion of mental health care in the country. As head of the forensic psychiatry services and been involved in improving mental health care in prison and other custodial settings. She has

also been involved in documentation of the history of NIMHANS and history of the development of mental health services in India. She has been involved in digital training and tele-health, through which she has provided expertise for the mCessation and tobacco quit line programmes in the country. She has been involved in about 40 research projects, guided more than 50 dissertations of postgraduate students in MD, DM and PhD courses and has about 250 peer reviewed publications.

Mind Matters in Modernity

The functioning of the mind has been a source of intrigue for centuries and there have been different historical notions about its functioning in health and disease. This presentation provides a historical understanding of the mind from different perspectives. It also alludes to the components of thought, emotion and behavior and how they interact. It underscores the importance of integrating physical and mental health. It ultimately focuses on contemporary understanding of the mind and how it can be 'trained'.



ABSTRACTS: PODIUM PRESENTATIONS



Session-I: Clinical Aerospace Medicine

Incidence of Cerebral Venous Thrombosis in Armed Forces Personnel Deployed at High Altitude

Bhardwaj Saurabh; Sud Saurabh

Aim: The aim was to study the incidence and the factors responsible for cerebral venous thrombosis in troops deployed at Siachen glacier. This was a cross-sectional descriptive study in a peripheral hospital located in high altitude area. **Method:** All patients who had cerebral venous thrombosis and were admitted in our hospital ($n = 24$) from August 2019 to May 2021 were included in the study. The data was analyzed as per the entries made in the central data base of medical department, intensive care unit (ICU) and central hospital admission and segregated as prehospital admission data, hospital admission data and discharge data. Analysis was done using SPSS software Version 22.0 (IBM Corp., Armonk, NY, USA). Categorical variables were tested using Chi-square test. **Conclusions:** Maximum cases of cerebral venous thrombosis occurred in age group between 18-30 years and first stage of high altitude. No significant relationship between Polycythemia and CVT could be established.

Study of Physiological Parameters in Individuals with Anemia and its Correlation with Acute Hypoxic Hypoxia

Kumar A, Sinha B, Tanuja M, Santhosh SR.

Introduction: According to Indian Air Force publication (IAP) 4303, presently individuals with Hb < 13 g/dL (males) are being placed in lower medical category which makes them unfit for flying. The aim of the present study was to examine the cardiovascular response to hypoxia and exercise in anemic and healthy controls in order to decide the suitability of flying activities. **Methods and materials:** 25 individuals with anemia and 15 healthy controls participated in the present study. The participants were subjected to Normobaric Hypoxia (NH) equivalent to an altitude of 15,000 feet. Different physiological parameters were measured during NH. Participants also performed Maximal Aerobic Capacity ($\dot{V}O_2$ max) and Maximal Anaerobic Capacity test in Bicycle Ergometer. **Results:** A significant difference in $\dot{V}O_2$ max between anemic (45 ml/min/kg) and healthy control (58.4 ml/min/kg) was observed. Anaerobic work capacity differed significantly between healthy (620 watt-min) and control (520 watt-min). Heart rate and SpO_2 were 73.4 bpm and 89.6 bpm and 98.6% and 98.6% in anemic and control. **Conclusion:** There is deterioration in exercise capacity and hypoxia tolerance in individuals with low hemoglobin levels. Adequate precaution should be exercised for permitting the aircrew to fly with low hemoglobin level.

A Case of Low G-tolerance in a Fighter U/T Aircrew: An Approach to Aeromedical Disposal

Kumari Pooja

Background: As is the case with other human physical characteristics, G tolerance varies among individuals. Distribution and ranges from +2.2Gz to +7.1Gz. NATO STANAG 3827 AMD states that aircrew who do not successfully complete a rapid-onset, +7Gz, 15-s centrifuge profile with anti-G suit and straining manoeuvre will be considered to have low G tolerance. Similarly, the Advisory Publication 61/26A by Air Standardization Coordinating Committee (ASCC), states that aircrew unable to pass a 7-G, 15-s rapid-onset run while wearing an anti-G suit and performing an AGSM should be considered to have low G tolerance. Aircrew with lower G tolerance are more likely to experience symptoms of G stress in flight than those with higher G tolerance and thus it poses significant aeromedical risk and concerns in relation to safety and effectiveness during flying a highly manoeuvrable aircraft.

Case Summary: A 21-year-old ab-initio pilot presented with 05 episodes of greyout/ blackout while flying syllabus sorties in the squadron with inability to pull more than 5G. However, the pilot gives a h/o being conscious in each of these episodes and having lost only peripheral vision to central vision with no features suggestive of G-LOC/A-LOC. His detailed clinical, haematological, neurological and cardiovascular evaluation at the boarding centre was within normal limits. Baseline HR, HUTT and HRV did not reveal any parasympathetic predominance. During his human centrifuge evaluation, he was unable to sustain acceleration 6 Gz 30s following which he was advised to undergo 12 weeks of physical conditioning program and review with an Executive report on flying only limited to 4Gz in order to maintain his flying currency. During his subsequent evaluation, he presented with a complementary executive report on flying. Although, there was a significant improvement in his physical conditioning recorded objectively as compared to previous evaluation, his human centrifuge evaluation revealed insignificant difference in the G-tolerance. Despite proper AGS fitment and adequate performance of AGSM the pilot experienced repeated episodes of blackouts and was unable to clear minimum standard of 7G for 15s. He was also thoroughly evaluated by Ophthalmologist and Aviation Psychologist which did not reveal any significant abnormalities apart from mild anxiety.

Discussion: Retaining low G tolerance aircrew in fighter stream will have significant aerospace safety and effectiveness concern while flying ASF class aircraft. Therefore, it seems reasonable at this point that, the demonstrated deficiency in G tolerance should be treated as a type of flying deficiency and thus the pilot was considered unfit for fighters for Low-G tolerance.

Adie's Tonic Pupil: Significance in Aviators and Aeromedical Disposal

B Juhi, Raju AVK, W Ritesh

Background: Adie's Tonic pupil is a benign, usually unilateral, pupillary syndrome in which a larger than normal pupil responds minimally, if at all, to light, but constricts slowly and tonically to a near stimulus (light-near dissociation) and has cholinergic super-sensitivity. It induces impaired near vision, glare, photophobia and difficulty with dark adaptation, which may not be conducive in flying environment. A Weapon System Operator of a fighter aircraft with isolated dilated pupil was assessed over approximately 3 years – right from the beginning till his condition became stable. His condition was not considered an absolute disabling condition for aviation and he was finally retained in flying in restricted medical category. The important aspects considered in the aeromedical assessment were – neurological assessment; ophthalmic issues like tolerance to glare, visual acuity; anisocoria and the executive report on flying with regards to visual response to bright sunlight, ability to read maps and MFDs and ability to identify ground features and spot another ac in bright light conditions.

Aeromedical Discussion: The aviator didn't have any neurological, traumatic or systemic condition/ Adie's syndrome. The tonic pupil stabilized at 4 mm and there was an anisocoria of 2 mm. Light-near dissociation persisted. His executive report was uncomplimentary with regards to spotting another aircraft in bright sunlight in the air-superiority fighter (which flies at a max speed 2120 kmph) as his eyes were getting shut by the glare. But he could read MFDs, maps and pick up ground features comfortably and satisfactorily. Hence, considering that Navigation in a transport ac was his parent branch (max speed 452 kmph), he was advised a trial on that ac to assess his capabilities in performing Flt Nav duties. If successful, the organisation could revert him back to his parent branch and original ac, thereby avoiding attrition of a valuable human resource. This case demonstrates that Adie's Tonic pupil is not always a disabling condition for military flying. Nevertheless, it has to be analysed on a case to case basis. **Learning Objective:** Aero medical disposal of a potentially disqualifying case, having no reference in the available aeromedical guidelines.

Session II: Free Papers

Work-life Balance and Burnout among IAF Women Officers: A Preliminary Study

Anand K, Mohapatra SS, Kunte R

Work-life balance relates to the amount of time devoted to one's life at work, relative to the time spent outside work. Effectively balancing work and

family is an important concern in present day society and for the last two decades, the issue of work-life balance has become a growing concern due to significant changes in the work force, such as the entry of an increasing number of women into the workplace. Women have been contributing to the Defence Forces for a long time now and in an attempt to examine the work-life balance and burnout among women officers of Indian Air Force, this preliminary study was taken up. A total of 90 women officers from the rank of Flying Officer to Group Captain across various branches from five commands participated in the study. Participation was voluntary and amid Covid-19, the test battery was mailed to them with detailed instructions and filled questionnaires were mailed back to the study team. Work-life balance was measured using Work-life Balance Scale and Burnout was measured using Maslach Burnout Inventory. Results revealed women officers reported moderate to low burnout and moderate to high personal accomplishment. They had moderate work-life balance. Overall Work-life balance came out to be significant predictor of Emotional Exhaustion domain of burnout wherein poor work-life balance increases emotional exhaustion, and good work-life balance increases Personal Accomplishment. Work-life balance is a significant predictor of burnout for women officers of Indian Air Force and the implications of good work-life balance and experience of burnout are discussed.

The Republic of Singapore Air Force Covid-19 Pandemic Response and Lessons Learnt

Benjamin ZQS

Introduction: To effectively limit the impact of SARS-CoV-2 on local and overseas flying operations, the Republic of Singapore Air Force's Medical Service was tasked to develop a framework to guide decision-making and safeguard force health throughout the pandemic. **Material and Methods:** Our response to the pandemic included the swift deployment of pandemic drawer plans, continuous medical intelligence gathering on SARS-CoV-2 characteristics, rapid conduct of disease testing and contact tracing, employment of risk assessments matrices for overseas personnel, enforcement of safe management measures and mask-wearing, and ensuring business continuity of critical medical functions. **Results:** Important lessons learnt included comprehensive threat assessment, robust pandemic preparedness, adoption of a tiered defense strategy, large-scale implementation of disease testing, contact tracing and isolation methods, value of effective communications, and envisaged new norms for post-pandemic recovery. **Conclusion:** SARS-CoV-2 has presented unique challenges to militaries around the world. Militaries with a rapid Observe-Orient-Decide-Act (OODA) loop and the ability to sense-make information quickly were more likely to mitigate the negative impact of a raging pandemic on operations.

Having a robust pandemic drawer plan in place, with immediate implementation at 2 the point of threat detection, had helped the RSAF ensure that the “first blow” of a pandemic on military operations was adequately buffered. This provided time to assess the situation and tailor appropriate responses based on evolving information and evidence.

Physical Activity and Sleep Quality among Military Aircrew during Covid-19: A Cross-sectional Pilot Survey

Chandra Sekara Guru S, Murtaza, Uma Mahajan

Introduction: Owing to lack of adequate research studies on level of Physical activity (PA) and sleep quality among military aircrew, this pilot study was aimed at assessing the PA and sleep quality among military aircrew during COVID-19 pandemic. **Methods:** After obtaining informed consent, a cross sectional anonymous pen-paper pilot survey was conducted among 59 aircrew of a training establishment. Responses for validated International Physical Activity Questionnaire (IPAQ), Pittsburgh Sleep Quality Index (PSQI) questionnaire and self-rating before pandemic along with demographic details were collected. Data analysis was done in Stata 12.1, expressed as inter-quartile range with statistical significance set ≤ 0.05 . **Results:** About 80% participants reported participating in games and PA regularly. Before pandemic, 68% aircrew did moderate-vigorous PA and >93% had average-good sleep quality. Total physical activity during pandemic was 1059 (594, 1074) MET-min/week with energy expenditure of 1226.48 (623.7, 2036.7) Kcal/week. Time spent sitting was 6 (5, 10) hours/day and more than 86% of aircrew reported good global PSQI score. The effect of pandemic was observed as significantly reduced energy expenditure i.e. 1001.25 (673.2, 1794) Kcal/week among aircrew who self-rated high level of PA before pandemic ($p=0.042$). Aircrew who regularly played games significantly engaged in more total physical activity of 1547 (827, 1911) MET-min/weeks ($p<0.0001$) with significantly higher energy expenditure of 1752.7 Kcal/ week ($p<0.0001$). **Conclusion:** Despite pandemic restrictions, aircrew who regularly involved in PA/ games were able to maintain a better physical activity level. Moreover, aircrew with better sleep quality were found significantly engaging in higher PA level and lesser sitting time.

The Role of Emotion Regulation in Mediating the Relationship Between Aggression and Aviation Safety Attitude in Pilots

Akansha Gautam, KS Sawhany

Background: Military Pilots' life is full of challenges and high-pressure performance. Pilots need certain capabilities and abilities to deal with these

challenges and high pressure demands. In absence of the ability to regulate one's emotions, individual may turn to impulsive and maladaptive methods of emotion regulation, including engaging in aggressive behaviour. **Objectives:** The current empirical research sought the relationships between emotion regulation, aggression and safety attitude in pilots. Study further examined, whether emotion regulation mediates the relationship between aggression and safety attitude in pilot or not. Two hypotheses were formulated to study the variables, first hypothesis examined that self-regulation and aggression will predict the safety attitude among pilots. Second hypothesis investigated that emotion regulation will mediate the relationship between aggression and safety attitude. **Methods:** 205 pilots from IAF with the age range of 28- 40 years (Male, M=33.54; SD= 3.76) were assessed on emotion regulation skill questionnaire, Aggression questionnaire, and Aviation safety attitude scale. **Results:** Data was analysed using correlation and path analysis to investigate the association and mediation effect of emotion regulation on the relationship of aggression and safety attitude. Findings of the study showed that emotion regulation has significant negative relationship with aggression and positive significant association with self-confidence and safety orientation (sub-scale of aviation safety attitude). Results also revealed that self-regulation has significant negative relationship with risk orientation (sub-scale of aviation safety attitude). **Implications:** The finding of the study suggested that a focus on emotion regulation skill considered as an important component for programs aimed at preventing and tolerating negative and impulsive emotion among pilots.

Session III: Civil Aviation Medicine

Current Practice of Testing for Consumption of Psychoactive Substances amongst Civil Aviation Personnel: an Update from DGCA India

Yashvir Singh Dahiya

In view of the increasing prevalence of use of psychoactive substances in general population in India, there remains a high likelihood of use of these substances by those involved in Civil Aviation. ICAO Annex 1 also states that that 'Holders of licences shall not exercise the privileges of their licences and related ratings while under the influence of any psychoactive substance, which might render them unable to safely and properly exercise these privileges'. Therefore, there was a need for setting up a preventive mechanism and consequently a DGCA Civil Aviation Requirement (CAR) has been formulated that lays down the procedure for the identification of the aviation personnel indulging in use of the psychoactive substance and the deterrent action against such personnel. The paper will concisely highlight

the testing methodology, broad based requirements for selection of collection site, urine screening test kits & laboratory for confirmatory test, and responsibilities of Medical in Charge of the airline operator and Medical Review Officer (MRO).

Random Psychoactive Substance Testing for Aviation Personnel – Are We Ready?

Punita Masrani, Vipul Masrani, Pooshan Navathe

Introduction: Consumption of psychoactive substance has become common in most populations worldwide, and many regulators now consider random testing necessary for safety sensitive industries, including aviation. Each industry and national regulator sets their own drug testing program and subsequent return to work criteria and these are implementable at industry level and oversight maintained at regulatory level. **Methods:** The CAR on Procedure for examination of aviation personnel for consumption of Psychoactive Substances requires post-duty urine testing at a designated laboratory; and if the result is non-negative, confirmatory testing is required at a laboratory that meets requirements for such tests. Workplace drug testing procedures are different from clinical urine tests, standard qualitative or quantitative chromatography or biochemistry tests for drug panels and WADA drug testing. The intent of workplace testing is to determine safety and the process needs to be legally robust. This requires clear procedures, including method of collection, training of collectors, determining validity of the sample, selection of the testing material and laboratories, maintaining chain of custody and Medical Review Officer's interview of the employee who gets a positive report from the confirmatory test. Also, random selection of the required number of personnel to be tested pan India requires a program that can select without bias and spread through the calendar year. **Results:** Random drug testing can be carried out at point of collection (POCT) or at the laboratories. Methodology, logistics, QRs for selection of collection kits, laboratories and broad roles of each department to implement the process whether onsite or with vendors will be discussed. Interpretation of the results such as negative, non-negative, laboratory confirmed negative, laboratory confirmed positive, MRO verified negative and MRO verified positive will also be discussed. Legal frameworks, managing disclosure concerns, comprehensive assessment methods, access to substance abuse professionals, rehabilitation and return to duty policies will need to be in place for the aviation community to implement the program successfully. **Conclusion:** Historically, any new policy, either at national level or industry level has a "teething" period, while problems are assessed and solutions are accepted. Available expertise, data, and international better practice can aid in implementing this program for aviation personnel, thereby achieving the goals of the programme.

Coping Styles and Subjective Well-being of Indian Civil Aircrew in the Context of Covid-19

Chaturvedula S, Thattil A, TripathyNK

Introduction: The Corona virus (COVID-19) infection has emerged into a widespread pandemic that stalled the world. Humanitarian missions like Vande-Bharath, taken up by various Indian commercial airlines in COVID-19 wave 1 and increased passenger services during COVID-19 wave 2 were carried out extensively by the aircrew. Operating under such stressful conditions is likely to affect the well-being and psychological health of the aircrew. Hence, there arises a concern to understand the various experiences of civil aircrew during pandemic. In this context, the study aimed to explore the different coping strategies adopted by civil aircrew and to assess their subjective well-being. **Material and Methods:** This research is a descriptive study with a cross-sectional design. Indian civil and cabin crew (n=100) voluntarily participated in the study. Two standardized questionnaires and a demographic inventory were administered on the sample to identify the coping strategies (The Brief COPE) and assess subjective well-being (WHO-5). Qualitative analysis and parametric statistics were computed for the data obtained on study variables. To investigate if there was any difference in the coping strategies utilized by the aircrew in the 1st wave and 2nd wave of the pandemic t- test was carried out. **Results:** The mean age of the sample was 43.74 \pm 10.36 years and mean flying experience is 17.34 \pm 11.66 years. The mean values obtained on the coping strategies indicate that the sample's adaptive coping strategies were higher than the maladaptive coping styles. A significant negative correlation was obtained between maladaptive coping and well-being. There was no significant difference among the coping strategies used during the first and second wave of COVID-19. Qualitative analysis revealed that financial constraints were imposed on the aircrew like reduced salary and leave without pay. Participants also reported discomfort while flying with PPE Kit. The policies and regulations about the COVID protocols were reported to be frequently amended by airlines and regulatory authorities leading to ambiguity in the crew. **Conclusion:** The results of the present study demonstrate that the Indian civil aircrew utilize adaptive coping strategies frequently and maladaptive coping strategies sparingly. In the context of COVID-19, certain stressors may be unchangeable with specific coping strategies, but their application may nonetheless lead to positive feelings of autonomy or reduction in the experience of anxiety. Thus, airlines may initiate the trend of positive psychological interventions as a preventive

measure. Pilot training may also incorporate techniques for adopting healthy behavior using specific coping strategies.

Occupational Injuries to Flight Attendants in a Middle Eastern Airliner

BK Umesh Kumar

Introduction: Air travel is one of the safest modes of travel. However, injuries do occur in flight due to many factors such as air turbulence, spillage of hot beverages and fall of improperly stowed overhead baggage. Injuries occur not only to passengers but also to the Flight attendants who are handling the passengers throughout the flight. **Material and Methods:** A retrospective study of all records of crew safety Report by the captain of the aircraft for all the flights from 01 Mar 2015 to 31 Mar 2019 in a National Carrier of Middle Eastern country was analyzed. **Results:** There was one injury to Flight attendant every 1200 flights. Commonest aircraft involved was Boeing. Inflight phase had 82% of all injuries. 63% of accidents involved female Attendants. Commonest age group involved was from 25-30 years. Cart and container injuries were the commonest and accounted for nearly 62% of the total injuries followed by turbulence. Back injuries were the commonest injuries followed by Ankle, shoulder and Burns. Mean days of absence from work seen in shoulder injuries 40 days followed by injuries to back which accounted for 38 Days. **Conclusion:** Reduction in injuries to Flight attendants can be brought about by proper selection of crew, reduction in cart load. Proper maintenance of cart and container plays a major role in prevention of occupational accidents.

Session IV: Operational Aerospace Medicine

Ejection over High Altitude – An Aeromedical Perspective

Binu Sekhar M, Raghunandan V, Tripathy NK

Exiting altitude settings available in BTRU of present generation ejection seats would be inadequate for ejection and post ejection survival over very high altitude ground elevations such as regions of Himalayas. This issue implies an operational requirement for increasing the BTRU setting for man-seat separation to 7000m. Redefining BTRU settings to cater for high altitude elevations have several aeromedical implications due to physiological and physical factors peculiar to high altitude ejection, seat-man separation and survival. This includes higher parachute opening shock, hypoxia, hyperventilation, hypocapnoea and hypothermia. This paper deliberates on aeromedical implications and the possible solutions for increasing BTRU setting to cater high altitude ejection.

Upgradation of Musculoskeletal Injuries in the Operational Bases: Need for a Re-look

Dev R, Binu Sekhar M

Background: Musculoskeletal Injury (MSK-I) have been one of the most common contributors of disabilities amongst aircrew. Existing policy mandates all cases of MSK-I (including minor injuries like sprain of small joints, phalangeal fractures etc.) to be evaluated at IAM, majority of which do not warrant a complete Human Engineering (HE) assessment. Hence, a need was felt to decentralise evaluation and empower other boarding centres/ field units with Aerospace Medicine specialists to carry out evaluation. **Method:** A retrospective analysis of 930 cases of MSK-I amongst serving aircrew who reported to IAM between Jan 2016 – Oct 2020 was carried out. **Results:** Of the total cases, 27.68% cases were of lower limb injuries and 16.52% cases were of upper limb injuries. 36.77% cases of upper limb and 52.71% cases of lower limb injuries were treated surgically while 63.23% upper limb and 47.29% lower limb injuries were treated conservatively. Full functional recovery within 12 weeks was seen in significant number of conservatively treated distal upper and lower limb injuries. **Discussion:** HE assessment of MSK-I at IAM is comprehensive with facilities to simulate aeromedical stressors. However, certain disabilities don't require all such tests and facilities for evaluation. In such cases sending an aircrew from field units to IAM amounts to an administrative requirement that can be met by empowering other medical boarding centres and local stations with aerospace medicine specialists. Procedure to conduct and facilitate evaluation and medical board of aircrew in non-flying medical category with certain minor MSK-I at local station level is discussed.

Air Sickness Desensitization Therapy Using Barany's Chair and DISO Simulator: a Comparative Analysis

Omesh Nath, HMK Murthy

Motion sickness is more common among trainee (ab-initio) pilots as 30-40% of them become airsick during their first few sorties. Those who fail to adapt need to be subjected to Airsickness Desensitisation Therapy (ASDT). Aim of this paper is comparative analysis on outcome of Airsickness Desensitisation Therapy using Barany's Chair and DISO Simulator. Three years data each by using Barany's chair and Air Fox DISO simulator was compiled for this retrospective study. Suitable statistical analysis was carried out and it was seen that there were no statistically significant differences in success rates of ASDT by using Barany's Chair and SD Simulator. However, ASDT in barany's chair

involves head movements on rotating chair with 'eyes open' and 'eyes closed' sessions which simulates cross coupling sensations arising due visual, vestibular and proprioceptive stimulations. Over the past 3 yrs, 47% of the running time of DISO simulator has been utilized for ASDT runs. Barany's chair is better suited for management of ASDT cases without affecting the other training activities on SD simulator, Also it addresses the visual vestibular conflict arising due to cross coupling thereby making it ideal for ASDT cases.

A Comparative Study of Cardiovascular Changes on Exposure to +GZ Stress between Ab-initio and Experienced Fighter Aircrew of Indian Airforce

Sushree SK, Mishra S, MS Nataraja

Background: Exposure to high sustained +Gz is a part of routine for fighter pilots and with introduction of Air Superiority Fighter Jets, the aircrew are exposed up to 9Gs. There is certainly anecdotal evidence from the tactical fighter community which suggests that fighter pilots do experience a degree of adaptation arising from frequent exposure to high +Gz. However, the phenomenon has not been studied extensively. **Material and methodology:** The aircrew were divided into two groups i.e ab initio fighter aircrew with flying experience <350hrs and experienced fighter aircrew with experience of >350hrs. They were subjected to various runs GOR (Gradual onset rate), 4.5GTT (Target Tracking), 6G TT, 7GTT, 8G TT and 9G TT. Their basal heart rate (1 min before the run), peak heart rate during the run and post run heart rate (1 min after the run) were measured by 32 channel Medic. The relaxed GOR tolerance was also noted for ab initio and experienced fighter aircrew. **Results:** The relaxed GOR of the ab initio and experienced aircrew were found to be $4.39 \pm 0.64G$ and $4.58 \pm 0.75G$ respectively. One way ANOVA revealed statistical significant difference between Basal and peak HR with P value 0.029 and 0.001 However, post run HR was not statistically significant between ab initio and experienced fighter aircrew with P value of 0.1. **Discussion:** The basal and peak HR of ab initio pilots was higher than the experienced pilots and was statistically significant might be due to a better modulation of emotional response by the experienced aircrew during exposure of +Gz and less amount of circulatory Epinephrine than younger aircrew.

Session V: Space Medicine

Analysis of Electromyographic Changes in Gastrocnemius Muscle on Exposure to 24 hours of Dry Supine Immersion (DSI)

Manu N, Anupam Agarwal, Vineet Kumar Malhotra

Introduction: Under microgravity, changes are observed in both structure and content of the gravity dependent muscles. This may result in disuse atrophy and muscle weakening. However, changes have never been described in the ultra-short term of 24 hours. Examination of changes in electromyographic activity of the gastrocnemius muscle, on exposure to 24-h of simulated microgravity using Dry Supine Immersion (DSI), was used to study changes in the muscle.

Method: 10 healthy volunteers were exposed to 24 h of simulated microgravity using DSI. The force generated by maximal voluntary contraction of isometric plantar flexion of ankle was recorded. Electromyography of the gastrocnemius corresponding to more than 80% of maximal voluntary isometric contraction (labelled as submaximal contraction) was recorded pre and post exposure to 24-h of DSI.

Result: Time domain analysis of the surface EMG of Gastrocnemius during submaximal contraction revealed a significant increase in mean Integrated EMG (iEMG) amplitude (effect size=0.73, $p=0.031$) following 24-h DSI. Power spectral analysis showed a significant decrease in mean frequency (MNF) ($p=0.043$) and median frequency (MDF) ($p=0.024$) following 24-h DSI. No significant changes were observed in total power, mean power and maximal voluntary contraction. A very strong negative correlation was noted between iEMG, MNF and MDF for the duration of submaximal voluntary contraction ($R = -0.827$ & -0.810 , $p=0.003$, 0.004 respectively); whereas, a very strong positive correlation was noted between iEMG and mean power ($R = 0.911$, $p=0.002$).

Conclusion: The findings of the study point towards muscle weakening seen by an early onset of muscle fatigue in anti-gravity muscles as early as 24-h of exposure to microgravity. The same may be borne in mind even during very short duration human space missions.

A Study to Examine Intraocular Pressure Changes during 24h Dry Supine Immersion and its Correlation with Cardiac Output and Leg Girth

Sinha B, Mishra S, Manu N

Introduction: In a microgravity environment, the absence of 'g' force causes a redistribution of body fluid from lower limbs to the cephalad region. Manifestations of the fluid shift are characterized by 'Puffy Face' and 'Chicken Legs.' This ultimately leads to an increase in Intraocular Pressure (IOP). Indications of the impact of the microgravity environment on visual function were reported as early as during the Mercury mission when astronauts reported changes in optical eyesight. 20-25% of the increase in IOP was also reported during the Spacelab experiments. Space Shuttle Mission also confirmed an increase in IOP. Simulated microgravity experiments on the earth have also

demonstrated an increase in IOP during acute exposure. A significant proportion of the astronauts who participated in long-duration space missions experienced noticeable and persistent ophthalmic changes. **Aim:** The present study was undertaken to examine the IOP changes during exposure to 24 h Dry Supine Immersion (DSI) and find the correlation with cardiac output. **Material and Methods:** Four healthy male volunteers participated in the study and were immersed in a thermoneutral DSI facility. Their IOP was measured by applanation tonometry at baseline supine condition before exposure to DSI and every 6 hours after that until 24 hours. In addition, the cardiac output of the participants was measured from finger arterial pulse wave by arterial tonometry. **Results:** Mean IOP in the left eye at baseline was 18.1 mmHg, then it decreased to 16.2 and 15.2 mmHg respectively after 6 and 12 hours of DSI and in the right eye, the IOP fell from the baseline value of 17.3 to 15.3 and 14.6 mmHg. IOP increased significantly in both eyes at the 18th hour of DSI. However, IOP fell below the baseline value after 24 hours of DSI. Cardiac Output (CO) was recorded lowest at the 18th hour after a fall from the baseline value of 4.6 L/min. The correlation between IOP and CO revealed that the baseline CO is negatively related to IOP at the 18th hour of DSI ($r=-0.954$; $P=0.046$). Leg girth and IOP were negatively correlated. **Conclusion:** IOP after an initial fall from baseline till 12 h of DSI increased at 18 h, which then returned to pre-DSI baseline at 24 h. CO was not correlated with IOP. However, leg girth was negatively associated with IOP.

Cardiopulmonary Responses to Centrifuge Simulated Parabolic Flight

HS Harshith, MS Nataraja, Sneha Dinakar

Introduction: Parabolic flights, by producing short periods of weightlessness, closely simulate microgravity. However, they are still expensive, incur a significant logistics support, and occurrence of any adverse events during such simulation is undesirable. The present study was formulated to explore the feasibility of using a human centrifuge for simulation of parabolic flight to study the cardiopulmonary parameters as an alternative ground-based model. **Material & Methods:** 12 healthy male volunteers were subjected to simulated parabolic flight, the profile of which involved exposure to 20 repetitions of hypogravity periods (+0.5 Gz), each interposed between periods of hypergravity phases (+2 Gz), using High Performance Human Centrifuge. Heart rate (HR), respiratory rate (RR) and arterial oxygen saturation (SpO₂) were studied during such a simulation and analyzed using one-way repeated measures ANOVA. Motion Sickness Assessment Questionnaire (MSAQ) was administered to the participants after the run. They were also asked to rate their subjective feeling of

weightlessness experienced during the run. **Results:** Comparison of HR revealed a significant difference ($F=22.167$, $p<0.001$) across 20 loops of different gravity phases. Post-hoc analysis revealed that the mean HR of hypergravity phases was significantly higher compared with Pre-run 1 G values and that of hypogravity phases. Similarly, HR showed a significant difference across Pre-run 1 G, 10th and 20th loops of hypogravity phases ($F=5.672$, $p=0.01$). Post-hoc analysis, however, revealed that the reduction in HR at 20th loop was significant than both Pre-run 1 G ($p=0.023$) and 10th loop ($p=0.042$) values. No significant differences were observed in both RR ($F=1.789$, $p=0.148$) and SpO2 ($F=1.708$, $p=0.199$) across different gravity phases. The mean Overall Motion Sickness Score was found to be 23.6%. Participants rated their subjective feeling of weightlessness between 4 and 6 (Mode=5) on a scale of 1 to 10. **Conclusion:** It can be concluded from the results that HR increased during hypergravity conditions and reduced during hypogravity conditions, an expected outcome during parabolic flight. The significant reduction in HR during the 20th loop of hypogravity phase compared to 10th loop and Pre-run 1 G conditions indicate a possible association with duration of exposure. The centrifuge simulated parabolic flight profile designed in our study was able to emanate physiological changes similar to those experienced in actual parabolic flight for HR, RR and SpO2.

Snow Survival Training of Astronauts: Through the Eyes of a Flight Surgeon

Sannigrahi P, Mishra S, Renjhen P

Manned space flight missions always harbour within itself the possibility of an off-nominal re-entry and landing. The crew has to be prepared to deal with such an eventuality. Hence, survival training post landing forms an integral part of pre-flight preparation of an Astronaut. The survival training is aimed at enhancing the ability of the crew to take effective decisions and rational & decisive actions in extreme situations after emergency escape from a spacecraft, till the search and rescue team evacuates. The training enables the crew to acquire the skills required in the event of an off-nominal landing (or splashdown). This paper deals with the Snow survival training for Astronaut candidates conducted by a foreign Astronaut Training Centre. The Snow Survival Training program consists of theoretical lectures, practical demonstrations in the field and 48 hours of snow survival experience in real environmental conditions. With the advent of Human Spaceflight Programme, the lessons learnt in the Snow Survival training would be helpful in conducting extreme weather training of

Indian Astronauts as well as serve as a welcome addition to the existing training pattern of Jungle & Snow Survival course for aircrew in India.

Session VI: Aircraft and Aircrew Equipment Assembly-Trials and Evaluations

Integration of FRILJ with EED: An Aeromedical Appreciation

Ranjan Sarkar

Background: The transport and helicopter fleet of the IAF are required to perform flying operations over large expanses of water in support of maritime operations and island territories. An inflatable life jacket with an emergency egress device is used as a survival aid for an aircrew while ditching. Towards this, the IAF intends to integrate indigenously developed Fire Resistant Integrated Life Jacket (FRILJ) to an off the shelf Emergency Egress Device (used for underwater breathing). This required an on ground human engineering and functional evaluation of the EED and its integration with ILJ prior to flight clearance.**Methodology:** The FRILJ with EED was tested for its ergonomics along with human engineering evaluation on ground on ALH MK-1, Chetok and Mi-17 V5Hptr. It was performed on 3 aircrew and 3 non aircrew subjects of lowest and highest sitting height. In addition, a vibration stress test was carried out using the multi axial vibration simulator at IAM with exposure to upper body resonance frequencies. A functional evaluation on performance, endurance, efficacy and ease of breathing underwater of ILJ with EED was performed at the WSTF (Indian Naval Water Survival Training Facility) as per functional evaluation protocol suggested by IAM. This involved (after 15 mins of physical exertion) operating, breathing and escaping from 16 ft of underwater depth.**Results:** The ergonomics and HE evaluation was satisfactory, with adequate fitment of FRILJ with EED. The vibration stress test in Gz axis revealed no induction of resonance in the upper body. The WSTF tests carried out were found to be satisfactory with 3 minutes and 10 seconds of underwater oxygen supply for a total of 30 breaths. The high-altitude simulation test was limited to 20000ft exposure for 60 minutes. There was no change in weight of the cylinder post exposure.**Conclusion and Recommendations:** The overall HE and functional assessment of the EED for suitability of Hptr operations was found to be satisfactory. Work of Breathing (WOB) of the EED as per the tech specs of the OEM (< 4KpA) was adequate. The system is recommended for helicopter flight trials. HE evaluation recommends repositioning of Velcro straps. Functional evaluation mandated compulsory leak test for each and every EED system individually. An unmanned

Rapid decompression test from 7000 to 40000ft needs to be performed prior to transport flight trials, in the EDC chamber at IAM.

Retro-fitment of an Oxygen System in a Transport Aircraft of IAF: Decompression Chamber Trials

Raju AVK, Sarkar R, Tripathy NK

The aeromedical concerns of sudden onset hypoxia and rapid decompression are an omnipresent threat to flight safety when flying over 10000 ft. The issues of hypoxia are mitigated in transport aircraft with cabin pressurization. However, the requirement of oxygen system in these aircraft is considered essential as an emergency in case of cabin failure of cabin pressurization or rapid decompression. With this background, a requirement for retro-fitment of a functional oxygen system of a small transport aircraft of Indo-German origin into a pressurized medium lift cargo aircraft of British Origin was envisaged. Towards this, ground based simulator trials were conducted on the oxygen system to assess its functionality before undertaking flight trials in the aircraft. The assessment consisted of ground trial of the test oxygen system in the Explosive Decompression Chamber (EDC) with three experiment protocols. The experimentation involved exposure to simulated altitude of 15,000 ft for 25 min and rapid decompression from 7,000 to 15,000 ft. Physiological parameters, endurance, and flow of oxygen in the system were evaluated. The trial results indicated that the physiological parameters (heart rate, respiratory rate, oxygen saturation (SpO₂), and end tidal carbon dioxide (EtCO₂) were within normal limits during the entire duration of exposure to 15,000 ft and decompression from 7,000 ft to 15,000 ft. In addition, the physiological parameters were also within normal limits during exposure to 1 min of simulated hyperventilation. Neither any subjective or objective symptoms of hypoxia were observed nor any appreciation of increased breathing resistance reported by the subjects. The endurance of the system in terms of delivering continuous oxygen flow at 15,000 ft was assessed to be 73 min. From the trials, it was inferred that the oxygen system in a single crew configuration could be used satisfactorily up to operational ceiling altitude specified for the subject aircraft.

Study of Performance Characteristics of ANVIS Gen III NVG and its Comparison with Existing NVGs in the IAF

V Raghunandan, Binu Sekhar M, Rahul Dev

Introduction: NVGs are widely used in military aviation. Performance of an NVG in providing high resolution and target acquisition is critical for flight safety and operational capability. The M/s Elbit Mk-III Gen III NVG has been considered

superior to other NVGs presently in use. The objective of this study was to evaluate the performance characteristics of this NVG in terms of visual acuity, contrast sensitivity and field of view in a laboratory setting and compare with performance characteristics of existing NVGs in the IAF. **Material and Methods:** M/s Elbit Mk-III Gen III NVG was studied for its performance in terms of visual acuity, contrast sensitivity and field of view. 06 subjects familiar with NV use participated in the study. Visual acuity was measured using tribar and Silderman's chart while contrast sensitivity was measured using Pelli-Robson chart under full-moon, half-moon, quarter moon and starlight conditions. The field of view was measured using cross bar chart. **Results:** The mean visual acuity of Gen III NVG was found to be 20/29, 20/31, 20/34 and 20/39 under of full-moon, half-moon, quarter-moon and starlight illumination conditions respectively. The mean contrast sensitivity was 0.9, 0.75, 0.6 and 0.53 log CS units respectively with mean field of view of 40°. The results were compared with performance characteristics of existing NVGs. **Conclusion:** The M/s Elbit Mk-III Gen III NVG was evaluated for its performance characteristics and was found have better performance in terms of visual acuity and contrast sensitivity than the existing NVGs in the IAF. In addition Gen III NVGs demonstrated consistent performance in star light conditions.

Inadvertent Operation of Ejection Seat Firing Handle: Aero-Medical Aspects

Murtaza

Introduction: Inadvertent firing of ejection seat handle is a flight safety hazard and may lead to accidental ejection on ground or in air. An incident of unintended firing of ejection handle due to fouling of flying clothing with ejection handle on ground in a trainer aircraft was reported which led to a study from aero-medical point of view which looked into various aspects like anthropometric issues, generation of force by body movement, seat design, harness fouling with ejection handle etc. **Methodology:** 10 aircrew subjects were selected based on various anthropometric parameters and divided into groups like short, tall, thin, overweight etc. Trial and assessment was conducted in two stages – first in ejection seat bay in a simulated environment and second stage in actual cockpit in parked aircraft. Various aero-medical aspects like probability of specific anthropometric parameter causing fouling, seat and harness design, procedure of strapping, impact of seat modification etc were studied. **Results and Discussion:** Findings revealed that design of negative G strap stiffener combined with lack of vigilance while strapping has the potential to cause entanglement of stiffener with ejection handle which may lead to inadvertent operation of firing handle. No specific anthropometric parameter was found relevant to increase the risk. Earlier modification of seat did not appear to

influence this possibility of fouling. **Conclusion:** In this fighter trainer cockpit, the flexibility of ejection handle and sliding aspect of negative G strap stiffener creates the dynamic link which when combined with strapping procedure can lead to fouling of handle with flying clothing. This can cause inadvertent firing of ejection handle. Design modification of negative G assembly stiffener along with modification of Pilot Orders has been suggested to preclude inadvertent fouling with ejection firing handle.

Session VII: Innovations & Recent Advances

Gender Based Difference in Computerized Dynamic Visual Acuity: A Pilot Study

Anitha T, Mishra S and A Kumar

A fighter jet pilot is often exposed to various visual stimuli. An efficient visual integration and processing is required to accommodate an environment consisting of complex control panels and external visual stimuli throughout the high speed flying duration. Dynamic visual acuity (DVA) gives a functional measure of visual stabilization which occurs due to the vestibule ocular reflex (VOR) along with processes like catch-up saccade and visual motion processing. DVA with transitional motion helps in finding the measure of otolith contribution rather than canals. Induction of women into the fighter stream of IAF has commenced, difference in the dynamic visual acuity of women pilots from men pilots is being assessed in this study. This study aims at finding out the difference in DVA between male and female volunteers (N=50) by measuring their DVA with Neuroequilibrium™ equipment available in Neurovestibular lab at IAM. The results revealed that there is no statistically significant difference in the DVA amongst the gender groups. But doing it on a larger population may help in establishing the difference in DVA if any present.

Development of a Simple and Specific Method for Estimation of Cyanide in Post Mortem Blood: Implications as an Aid to Air Crash Investigations

Neha Gupta, Dr Santhosh S R

Introduction: Analysis of combustion gases such as Hydrogen cyanide (HCN) and Carbon monoxide (CO) is an important part of toxicological investigation in any fatal air crashes; it provides clues towards the events that happened just before, during or after the mishap especially in air crashes associated with fire.

Analysis of both HCN and CO is important since it gives useful information in differentiating in-flight as opposed to post crash fire. Presence of hydrogen cyanide in post mortem blood samples of the deceased aircrew provides vital information during aircraft accident investigation. Even mildly elevated, non lethal levels of this poisonous gas in blood causes subtle effects on central nervous system, adequate to impair the performance of air crew. It is also a useful tool to differentiate between antemortem and postmortem burns since presence of this gas in blood of victims suggests inhalation of smoke before death. In this study we attempted to develop a simple and reliable method for quantitative estimation of cyanide in blood using spectrophotometry with the broad aim to improve the technique of toxicological analysis of blood gases during fatal air craft accident investigation at this laboratory. **Material and Methods:** The method selected for the present study involved extraction of HCN from blood samples by microdiffusion using Conway microdiffusion cells and the quantitation of the extracted cyanide using the UV- Vis spectrophotometer. Limit of detection and limit of quantitation were calculated using serial dilutions of standards. This method was validated by assessing the sensitivity, linearity, accuracy and precision by using blood samples spiked with known concentrations of cyanide. **Results:** The spectrophotometric method developed in this study demonstrated a sensitivity of 99.7% and a range of linearity between 0.0625 and 4 µg/ml. The limit of detection and limit of quantitation were found to be at values 0.0625 and 0.125 µg/ml. The working range of this method was 0.125-4 µg/ml. Precision was measured by Intraday Coefficient of variation (CV) which was 4.27% and inter day CV being 9.04%. The accuracy when standard concentrations were analyzed as samples was found to be 85.92%. **Conclusion:** A simple and specific method has been developed and validated for determination of cyanide in blood using UV-vis spectrophotometer and microdiffusion cells. The method is found to be accurate and sensitive for the detection of sub lethal blood cyanide levels which are more commonly encountered in Aircraft accident investigation due to inhalation of smoke. Analysis of both HCN and CO during fatal aircraft accident investigation will not only help to understand the sequence of events which happened before, during and after the crash, but also aids in differentiating In-flight and post crash fires.

Localization of Centre of Gravity of Helmet Systems in Human Anatomical Coordinate Frame using 3D Scanners

Sabyasachi Nayak

An accurate assessment of the Centre of Gravity (CoG) and mass properties of aircrew helmets, including Helmet Mounted Devices (HMDs), are required to determine the neck injury potential under ejection forces, as well as

neck muscle fatigue during long duration flights. For this, the two most important parameters are the head supported mass and the Centre of Gravity in the Anatomical Coordinate Frame, which is defined using the Frankfurt, Mid-Sagittal and Coronal planes. In this study we outline a new procedure for a more precise determination of the CoG of the helmet as well as the combined head and helmet system. This is accomplished by measuring the helmet mass and CoG properties using a Trifilar pendulum and the geometrical properties of the helmet and head using a 3D scanner. The required coordinate transformations from the Lab Frame to the Anatomical Coordinate Frame are carried out by using a 3D scanner as a coordinate digitizer. The head model is chosen as an ADAM head or equivalent, and of an appropriate size that fits the helmet. This enables the consistent measurement of the CoG in the Anatomical Coordinate Frame and hence the comparison of different helmet systems along with their respective HMDs, as well as the evaluation of their respective ejection safety criteria.

Application of Piezoelectric Sensor to Record Orthostatic Changes in Carotid and Dorsalis Pedis Artery on Tilt Table

Munna Khan, Kashif IK Sherwani, SK Sharma, Ashok Kumar Salhan

Background: Piezoelectric sensors are versatile tools and have various applications. Carotid arteries find an important place in many clinical conditions as well as in studying phenomena like +G_z induced loss of consciousness (G-LOC) in high performance fighter pilots. Dorsalis pedis artery also needs proper blood flow for mobility of foot during high-G maneuvers. An effort has been made to record gravity induced orthostatic changes in the carotid artery and dorsalis pedis artery during different postures of +1G_z.

Method: Volunteers were 6 healthy male and female subjects having ages 20-35 years. The carotid artery running by lateral side of throat was palpated and the piezoelectric (PZT) sensor was placed over using medical adhesive tape. The Dorsalis pedis artery on the dorsal aspect of foot was similarly palpated and other piezo sensor was placed over and taped like first PZT. The pulse signals were acquired by Arduino board and connected to a laptop via USB port. The output of both PZT sensors were recorded and displayed on the laptop screen with the help of a software oscilloscope simultaneously. The recording was done while the subjects lay supine and moved to a vertical position and then back to supine again using tilt-table. The recorded data file was saved and analyzed offline. **Results:** Average Carotid values (\pm SD) for peak-to-peak voltage for Supine, Vertical and Recovery states were 1.900 ± 0.794 , 1.133 ± 0.615 and 2.402 ± 0.788 volts respectively. The corresponding values for Dorsalis pedis artery noted as above were 0.651 ± 0.482 , 1.086 ± 0.978 and 0.532 ± 0.347 volts

respectively. The value of area under the curve of PZT waveform for Carotid artery, in Supine, Vertical and Recovery positions along with the standard deviation is 8.087 ± 3.457 , 3.329 ± 2.207 and 9.017 ± 3.798 respectively. Corresponding values for dorsalis pedis artery are 4.842 ± 2.720 , 6.321 ± 3.144 and 3.912 ± 2.339 respectively. **Discussion:** The data on passively moving from supine to vertical position shows a significant decrease in Carotid blood flow, signifying the gravity based flow of blood volume towards lower limbs. The fact is corroborated by a corresponding increase in the blood flow of Dorsalis pedis artery. On passively moving from vertical to supine position again a predictable recovery to previous blood flow is recorded. Interestingly the behavior of Dorsalis pedis was in the other direction and values of both peak-to-peak volts and AUC were less in recovery state than initial supine position. **Conclusion:** A very simple and inexpensive system has been devised to study a physiologically important phenomenon of blood flow changes in the Carotid artery and dorsalis pedis artery. Piezoelectric sensors are very sensitive to record and analyze the blood flow data non-invasively with minimal interference with subject's physiology.



ABSTRACTS: POSTER PRESENTATIONS



25 Nov 21: Pre-Lunch Poster Session

Diagnosing Inflight G-LOC: Dilemma in Aeromedical Decision Making

Ajay Kumar

Background: The differential diagnosis for inflight loss of consciousness in a fighter pilot is G-LOC as it is physiological and 10-20% of fighter pilots may experience it during their career. However, it's very difficult to establish the diagnosis in many cases. Three cases of in-flight episodes of Loss of Consciousness have been discussed in the paper highlighting how to investigate such cases to establish the diagnosis of G-LOC.

Case Reports: Three cases have been discussed in the paper where, two cases were considered as a case of G-LOC based on the circumstantial evidence and data from the flight data recorder. However, one case was diagnosed to be of Loss of Consciousness (Inv). One case did not benefit from the high-G training as he repeatedly experienced 'G-LOC' at very low G levels while wearing Anti-G Suit and performing AGSM. He was recommended unfit for fighter flying. Another aircrew was experiencing G-LOC due to incorrect technique of AGSM as he had not undergone 'high-G training'. After correction of technique, he could successfully meet the qualifying requirements of 9G for high G training. The third case was considered as a case of inflight Loss of Consciousness not due to G exposure. Subsequently, he was diagnosed to have Focal Cortical Dysplasia.

Discussion: The paper describes the approach and aeromedical disposition of inflight Loss of Consciousness among fighter aircrew. The paper also discusses the need for 'G tolerance standard' at entry and high G training for fighter aircrew. The first case highlights that not all case of in-flight loss of consciousness among aircrew is G-LOC, even if it occurs in conjunction with high-G exposure. Ruling out presence of any potential cause for inflight loss of consciousness is extremely important before labeling a recurrent case of inflight LOC as G-LOC. The second case re-iterates the fact that there are set of people who will not be able to endure high G exposures due to inherent individual characteristics. These people need to be identified and screened at initial entry into fighter flying itself. The cause for the recurrent episodes of inflight G-LOC in third case was identified as improper AGSM. The problem could be identified and corrected in the Dynamic Flight Simulator. This highlights the significance of high-G training using High Performance Human Centrifuge before commencement of operational flying and high-G sorties and also establishes it as a diagnostic tool for such cases. **Conclusion:** Inflight LOC in a fighter pilot poses a challenge in diagnosis and differentiation from G-LOC. The paper discusses approach to such a case in detail.

Cerebral Venous Thrombosis in Civil Aircrew: Aeromedical Disposal

Raju AVK

Background: A 28 year old civil aircrew developed pin prick headache after three days of loose motions which did not respond to conventional analgesics. Neurological

evaluation, including neuroimaging diagnosed the case to be Right Transverse and Sigmoid Sinus Thrombosis (Cerebral Venous Thrombosis). She demonstrated normal Coagulation Factors work up. She was managed conservatively with anticoagulants. Her symptoms improved dramatically without recurrence. She was continued on prophylactic Ecospirin (150 mg) OD which was stopped after about eight months of use since onset. The aircrew is presently asymptomatic living a normal active life. **Current Evaluation:** Neurologic evaluation was normal. Recent MR Venography with contrast shows complete resolution of Cerebral Venous Thrombosis (CVT). Repeat Coagulation Factors work up to evaluate hypercoagulable state was normal. **Aeromedical Discussion:** The major concerns with CVT are recurrence, seizures, neurological deficits and headache. Federal Air Surgeon's Medical Bulletin (FAA) states that 40% of CVT patients develop seizures during first two weeks of onset and treatment of CVT is with anticoagulants. This aircrew never had seizures, was observed for more than a year without recurrence, she has been successfully managed with anticoagulants and is off any medication since last six months. Recent neuroimaging shows resolution of CVT. For prognosis, CVT cases can be subjected to Methylenetetrahydrofolate Reductase (MTHFR) gene polymorphism studies and Homocysteine estimation. Evidence of MTHFR gene mutation, with abnormal Homocysteine, points towards recurrence. It was decided to award her P2 status (Fit to fly as Co-Pilot) in order to observe her for some more time. She was advised to report with EEG, MTHFR gene mutation study Homocysteine and Vit B12 estimation during her next review. If the tests come normal, plan would be to upgrade her to PIC with QEP. She can be considered for upgradation to P1 status during her subsequent review, if she demonstrates a minimum period of 2 years of normal clinical status however requiring regular follow up with Homocysteine and Vit B12 estimation. **Conclusion:** Cerebral Venous Thrombosis can compromise flight safety. It requires thorough neurological and haematological evaluation before considering aircrew fit for flying duties.

Adopting Covid-19 Times in Ophthalmological Examination of Candidates

Atul Kumar Singh, Vikas Sharma

As the second wave of SARS-COV-2 has hit India very hard, as an Ophthalmologist, our responsibility is to prevent viral transmission that will help us to combat the grave situation by preventing further transmission. Other than routine eye patients for recategorization, emergency etc, we have a clientele of service candidates as well as civil aircrew, who report regularly for medical examination. We would like to share our experience and innovation in the eye department has done during the covid-19 pandemic. In the ophthalmology department apart from social distancing guidelines. We have two distinct zones for ocular examination, Zone A for candidates reporting for medical examination, Zone B for patients reported for Eye Issues. To prevent mixing of the two, we assigned separate Ophthalmologist, Staff and equipment for the two

different zones. We keep separate entry and exit points for the two zones and ensured one-way flow of the candidates and patients. Gates of the rooms are open with only a fan on. Use of Air conditioner is strictly prohibited. Staff members are equipped with PPE kits. All candidates are briefed well in advance regarding ophthalmological pattern of examination before entering in the consultant chambers. The room door remained open with one candidate waiting outside the door area so that he can also see what is supposed to do after entering the chamber. Hand rest is moved down to minimise contact with the refraction chair. Distant visual acuity is done self by candidate. Two trial frames and two refraction set is laid in examination area. Two kidney tray are put, one with 1% sodium hypochlorite solution and other with normal saline. After each refraction, trial frame and trial lenses was soaked in the sodium hypochlorite solution followed by normal saline wash and other trial frames and a refraction set was used for next candidate. Dilating drop is instilled self by candidates. In slit lamp examination it is very difficult to follow social distancing norms; hence we have given two barriers in slit lamp, one at the viewing arm and one at the patient examination arm instead of one. Lower half of breath shield is made by face shield clipped on either side of slit lamp. During Indirect Ophthalmoscopy, double mask to be worn by candidates as well as examiner. Intra ocular pressure (IOP) recordings were done only in suspected cases of glaucoma or other diseases. We prefer a Non-contact tonometer with safe distance as a primary instrument in well-ventilated room with sufficient air exchange. On OPD day, all patients were asked about history via telecom by optometrist and token were given. Patients were called in the OPD one by one. All red eye patients had a separate designated area for waiting. A separate slit lamp is installed in another room to see these patients. We had started video consultation for our clientele. A designated WhatsApp no is displayed on prominent areas. Awareness about black fungus has led to anxiety among COVID recovered patients. We also encountered many patients with post-COVID eye fatigue and strain. Routine fundoscopy is done with a fundus camera. Lastly, waste disposal at this time cannot be undermined. Department has given lectures to aware health care workers and optometrist regarding proper waste disposal.

25 Nov 21: Post-Lunch Poster Session

Ejection during Spin Recovery: Injury Pattern Analysis and Lessons Learnt

Chandra A, Biswal P

Background: Assisted escape from an uncontrolled aircraft is a life saving measure adopted by the aircrew in the face of imminent danger. The injuries associated during whole of the ejection procedure may range from minor abrasions to being fatal depending upon multiple aircraft, aircrew and environmental factors. Mostly, the injuries sustained are peculiar to the various phases of ejection sequence indicating the sequelae in a particular case. The site and extent of these injuries have direct

connotation in relation to the time required by the ejectee for complete or partial recovery and the duration for which a trained pilot will not be available to the organisation for operational roles. **Case Summary:** A young female flight cadet of fighter stream was carrying out her first solo spin sortie during stage-II of flying training in a Kiran Mk-1 jet trainer aircraft. During the profile the aircraft entered into spiral and she was unable to recover it even after repeated attempts. She initiated the ejection sequence by pulling the seat pan ejection handle and had a through canopy ejection while the aircraft was in a nose down descending attitude. She landed about 80 kms away from the base on a hard metalled road. She was initially attended by the local civil population followed by the IAF airborne SAR aircraft including the medical team. She sustained multiple injuries including fractures of spine and extremities. After her latest aeromedical evaluation, she has been made permanently unfit for ejection seat aircrafts. **Discussion:** The injuries sustained by the trainee pilot have been studied and the pattern has been analysed in relation to the different phases of ejection sequence. This older generation ejection seat imparts relatively higher ejection forces compared to the present generation seats, causing more adverse impact on the occupant. Additional factors present in this case, enhancing the injury potential such as unusual aircraft attitude, incorrect pilot posture, ejection through canopy and unfavorable landing conditions have been discussed. Certain deviations from the laid down guidelines during and after ejection by the trainee have also been addressed. **Lesson Learnt:** The importance of repeated lectures and practical demonstrations of ejection, injury pattern, during and post landing actions throughout the flying career is reemphasised. Reinforcement of training with knowledge of ejection seats' capabilities and limitations on current aircraft type is brought out

Outcome of Motion Sickness Desensitisation Therapy: A Comparison of Two Different Approaches

Bhowmick B, Sushree SK, Sannigrahi P, Dinakar S

Introduction: The Motion Sickness Desensitisation Therapy (MSDT) includes exposure to gradually incremental provocative stimulation/ Coriolis illusion from 5RPM to 25 RPM in Airfox-DISO simulator. Once the cadet/aircrew becomes symptomatic/vomits during the desensitisation therapy at a particular RPM, the exposure to provocative stimuli is stopped for the day, then either the run is given at same RPM on the next day with medication (Status-quo) or the RPM is reduced by 2.5RPM on the next day (Step-down). On the subsequent day motion stimuli is given at the same RPM with medication. However, there is no literature available regarding the comparison of effectiveness of these two different approaches (Status-quo and Step-down). **Aim:** The aim of the study was to find out the effectiveness of the Status-quo and Step-down approach followed during MSDT and comparison of their outcome. **Material and method:** A retrospective study was carried out based on the data available on MSDT

during the period of Jan 10 to Sep 21. A total of 54 Cadet/aircrew reported for MSDT. However, 51 cadets/aircrew were subjected to MSDT at IAM. Some underwent the protocol as per status quo approach and some underwent the protocol as per step down approach. 04 of the aircrew were found to have psychological element/Vestibular Pathology and their data was excluded from the study. 08 cadets/aircrew who successfully completed without any interruption in the protocol was also excluded from the study as there was no requirement of status quo/step down approach. **Results:** Total Step-down approach was followed 35 times and Status-quo approach was followed 20 times. The success rate for Status-quo and Step-down approach is found to be 40% and 80% respectively. **Discussion:** Dealing with motion sickness is based on the use of desensitising vestibular training, together with concomitant confidence-building psychological counselling. Once the person vomits, reducing the motion stimuli and addition of medication at the same stimuli helps in confidence building. From the result, it can be concluded that the Step-down approach has been effective than Status-quo approach, with more number of successful outcomes.

Heterotopic Ossification (HO): A Case Report

Billa Nanda Kishore

Heterotopic ossification is a condition where bone grows in the muscle, tendons or other soft tissues around joints in the body. **Etiology:** Heterotopic ossification occurs most commonly after trauma, burns, neurologic injuries and major orthopaedic surgeries. **Pathology:** The conversion of progenitor cells to osteogenic precursor cells as a result of cell-mediated interactions with the local tissue environment. **Investigations:** Plain radiographs are commonly the first imaging study, technetium-99 bone scan is gold standard. **Management:** Radiation and surgical excision can improve patient outcomes. Aero-medical disposal: Depends on case to case basis. Dependent on aetiology, type of muscle or joint involved, size of bone, site of formation. **Aero-medical concern:** The major concerns with aviators with HO are: distracting pain and joint limitations (Decreased ROM of concerned joint) that may interfere with normal flight duties and with emergency egress activities.

A Field Experience on Casevac of a Patient with Burst Fracture of Spine using Stretcher based PTU with Spinal Column Stabilizer

Sri Hari E, Agarwal A

A young SF personnel has sustained burst fracture of spine while doing training exercise of powered ascending in the unit. The individual had fallen from a height of approx 6 mts and had sustained burst fracture of D12 spine with loss of touch sensation in B/L (left > right) lower limb. The patient had to be air evacuated for definitive surgical intervention to CHCC Lucknow. This paper discusses the experience gained while transferring the patient using the locally fabricated Stretcher based PTU with spinal

column stabilizer under the guidance from PMO CAC challenges. It also lays out the challenges faced in ensuring the prevention of secondary spinal injury during the CASEVAC. This paper also brings out the experience gained during the transfer of two other patients (CVA with capsuloganglionic bleed, electrocution 40 % burns). It lays out the design and local fabrication procedure followed in designing of the PTU and the integration of spinal column stabilizer with straps onto the stretcher with all the lifesaving equipment's (portable transport ventilator, defibrillator with multi para monitoring, carbon composite oxygen cylinders and suction apparatus) with battery backup of approximately upto 3.5 to 4 hours.

26 Nov 21: Pre-Lunch Poster Session – I

Neurovestibular Laboratory: Potential Research Application in Aerospace Medicine

S Dinakar, B Bhowmick, SS Khatua

Vestibular physiology is an elusive topic for both the Physiologist and the Vestibular Neurologists. Understanding the anatomy and the neural pathways of the vestibular system is a task. The clinician is concerned with the diagnosis of vestibular pathology whereas the Aerospace Med Spl is concerned with the behaviour of the normal vestibular system in air and microgravity. The aerospace environment accentuates the difference between the two sets of vestibular system. Acceleration affects the vestibular system and may lead to spatial disorientation. There is thus a need to study the normal vestibular physiology, their variation in aerospace environment. With the availability of objective assessment of vestibular system, it has become possible to attempt to assess all aspects of vestibular system. Currently the Department of Acceleration Physiology and Spatial Orientation has a state-of-the-art Neurovestibular Laboratory that can functionally assess vestibular system and give objective scores for certain parameters. The laboratory has immense potential for research like developing a normative data for the Indian population. This can be used to screen-out candidates during medicals, in diagnosing cases of unexplained dizziness and monitoring the level of fatigue – to list a few. With the human space program in the horizon, training in 'vestibular adaptation time', has led to a practical usage. This concept paper brings out some of the research potential that the laboratory holds in the near future.

Android Phone Based Audiometry for Screening of Hearing Loss

Anshuman Dutta

Introduction: Hearing loss has severe effects on the individual. Early detection is essential for maximum benefit. However, most hearing-impaired adults delay obtaining

treatment. Diagnostic hearing testing at an appropriate facility is difficult. New methods for screening aim to provide easy access for patients and optimum outcomes on rehabilitation. **Aim:** The purpose of this study was to examine the rationale of android application-based hearing audiometry in normal population. **Methodology:** The available literature on android based hearing audiometry was evaluated in terms of sensitivity and specificity when compared against gold standards such as Pure Tone Audiometry (PTA). The studies were also evaluated in terms of their reproducibility and ease of use. **Results:** Android based hearing audiometry is considered a feasible option for screening of hearing where pure tone audiometry is not available. **Conclusions:** The application may be used as a screening tool for hearing loss in service population and their families.

Relationship of Physical Parameters and Flying Experience with Incidence of G-LOC in Centrifuge Training: A Retrospective Study

Sanjay P, Mishra S, A Kumar, Dinakar S

Introduction: G-LOC has been one of the major causes of incapacitation in fighter flying since aircraft capable of sustaining high G came into existence. There have been numerous studies analysing physical parameters and their effect on G tolerance, however, they remain inconclusive. This study looked at the effects of Age, Height, Weight and BMI on the incidence of G-LOC in male fighter pilots undergoing centrifuge training. The effect of Flying hours on G-LOC was also analysed. **Materials and methods:** Retrospective data of 330 pilots, from two years (2018 and 2019), was retrieved from the High Performance Human Centrifuge (HPHC) database. The sample was split into two groups, those who had gone into G-LOC (n=79) and those who had not (n=251) and the means of the parameters were compared between the two groups. **Results:** Analysis showed a significant difference in Age, Height, BMI and Flying hours between the two groups. The G-LOC group had a lower mean age, BMI and flying hours compared to the Non-GLOC group and this was proven to be statistically significant ($p < 0.05$). The GLOC group had a higher mean height and this was also statistically significant. However, the actual magnitude of the difference which was assessed by calculating the effect size ranged between small and medium for all the parameters with Age and BMI having the highest effect sizes of 0.388 and 0.396 respectively. **Conclusion:** This study concludes that no single factor has a major role in incidence of G-LOC and ability to sustain G forces depends more on the pilot's confidence in handling high G situations and good quality AGSM.

Low G Tolerance in an Ab Initio Aircrew: A Squadron Level Preparedness

Isha Sah, Mona Dahiya

Low G tolerance has been defined as inability to sustain +7Gz applied at the rate of 1G/sec or greater and sustained for 15 sec, for subjects seated in upright seat (13

deg back angle), wearing a functioning Anti G suit and performing AGSM (NATO STANAG 3827). A 21 y old ab-initio aircrew presented to SMC 5Wg with history of blurring of vision followed by grey out and loss of consciousness during MRT of syllabus flying in Hawk Mk 132 aircraft. He was thoroughly evaluated at IAM and finally diagnosed as a case of Low G tolerance. Although he was finally declared unfit for fighter fleet, station and sqn's effort in physical conditioning helped in improving +gz tolerance of the individual significantly. Therefore, it is recommended that each and every case of grey out or low G tolerance should be brought to the notice of AMA, as soon as possible, by Flt Cdr or CO of the Sqn so that their training can be focused on physical conditioning and improvement of +Gz tolerance.

26 Nov 21: Pre-Lunch Poster Session – II

A Study on Stress among Commercial Airline Pilots

Swathy Kuppala

Introduction: Stress is experienced when the environmental demands exceeds a person's adaptive capacity and is associated with health and diseases such as depression and cardiovascular diseases. Aviation workers are particularly vulnerable to increased sleepiness, chronic fatigue, and decreased performance, which can adversely impact productivity and safety in domestic flight operations. **Objectives:** To study the prevalence of Perceived stress among the workers of aviation industry using perceived stress scale (Cohen). **Methodology:** This study was a cross sectional study done among the 90 workers of aviation industry using convenient sampling. After explaining the procedure and obtaining the consent, Percieved stress scale-10 was administered to the willing participants. **Results:** In the Study population 20 (22.2%) were not engaged in any recreational activities. In the Study population 32 (35.6%) were having financial problems. In the Study population 23 (25.6%) were having family problems. The mean perceived stress score of the study population is 11.43 with standard deviation of 7.19, the median is 10 and mode being 4. The minimum and maximum perceived stress score of study population is 1 and 36 respectively. The stress level was Low in 66, (73.3%), Moderate in 19 (21.1%) and Severe in 5 (5.6%). **Conclusion:** The stress levels and its predictors are least studied among the aviation workers. In this study, we found that the stress levels are comparable to other groups or populations. Interventions aimed at reducing the stress levels and addressing its predictors will help in alleviating their stress and improve their work capacity and health.

Social Media Engagement and Well-being among Military Aviators

Iyer Srihari, Manu N, Chaturvedula S

Introduction: Military aviators operating in field areas heavily rely on Internet for communication and recreation purposes. Social Media like Facebook, WhatsApp, Twitter etc are used for this purpose. These platforms are rapidly permeating into the daily lives of this population and becoming a major influence on their well-being. Social media engagement measures the public shares, likes and comments for an online business' social media efforts. Engagement has historically been a common metric for evaluating social media performance. User engagement consists of a portion of user experience, a psychological state and user behaviour. Social media users feel glad to receive positive reinforcement for their updates in the form of “likes” and “comments,” which motivates them to engage and update more in social networking sites. This keeps them eagerly waiting for the responses from their network. Social media can thus, contribute to increase in overall smart phone use, which has been associated with negative outcomes such as impaired social interactions, social isolation, as well as both somatic and mental health problems, including anxiety, depression and stress. Therefore, this study tries to understand the effect of social media engagement on military aviators' well-being. **Material and Methods:** The study is of a descriptive nature, with a cross-sectional design. Two standardized questionnaires were used- Social Media Engagement Questionnaire (SMEQ) and WHO-5 Well-being Index, on military aviators (n=60). The SMEQ measures the extent to which people's key daily activities tend to involve social media. It consists of five items on a scale with response choices ranging from “Never” to “Seven” per week. The WHO-5 is a widely used questionnaire assessing subjective psychological well-being consisting of 5 simple and non-invasive questions, which tap into the subjective well-being of the respondents. To understand the effect of social media engagement and well-being among military aviators, descriptive statistics and ANOVA was used. **Results:** The questionnaire was sent to ten army aviation units across the country and a total of 57 responses were obtained electronically. The mean age of the participants was 31.6yrs \pm 4.63(SD) with flying experience ranging between 21-4,500hrs. All the participants were males. Pearson Correlation showed a moderate significant negative correlation between Social Media Engagement and Psychological Well Being ($r = -0.424$, $p=0.01$). 17% of variability Psychological Well Being can be accounted for Social Media Engagement. There is a linear relationship between the variables. The regression model statistically significant predicts the outcome variable of Psychological Well Being and is a good fit. The coefficient of Social Media Engagement (-.263) is statistically significant as its p value of 0.002 is less than 0.05. **Conclusion:** The result of the present study demonstrates that reduced social media engagement leads to more psychological well-being. The key is to create a well-balanced social media engagement and satisfaction which will enhance the psychological well-being and improve flight safety.

Critical Thinking Training Module for the Indian Air Force

Gurpreet Kaur, Subh Priya Pal, Soumi Awasthy

The professionals working in the aviation sector cannot afford to make mistakes as it may lead to serious consequences. They work under highly stressful environments wherein demands are overwhelming at times. There have been varied training programs designed not only to deal with the stressors and improve the well-being but also to enhance the mental capacities of the soldier. Armed Forces are always on a lookout for new and effective training strategies that can be incorporated for operational effectiveness. Critical thinking skills to understand and evaluate the battlefield become crucial under these circumstances. Good critical thinking promotes diverse thinking skills, and is very important in the fast-changing warfare scenarios. Critical thinking has been defined in different ways by different theorists, consisting of different components. Some say it includes questioning/reflective thinking (Siegel, 1988), others say, critical thinking is reflective thinking (Perkins, 1993), many theorists believe that critical thinking is the ability to use logic and reasoning (Baker & Anderson, 1987). Bloom's taxonomy was one of the first frameworks to characterize thinking as a group of lower-order and higher-order thinking processes consistent with many modern conceptualizations of critical thinking (Reeves, 1990). Higher order thinking skills which includes critical thinking skills (Bloom, 1956), are dependent upon memory, which is core of lower order thinking skills. Taking this into consideration, two tier training module was developed for Indian Army. At the base level, there are basic activities that focuses on lower order thinking skills and at the second stage activities focusing on higher order thinking skills have been included. It was found that there was enhancement of critical thinking as well as on activities related to memory, attention and reasoning. The said module can be customized for Indian Air Force.

Situation Awareness and its Enhancement in the Indian Airforce

Subh Priya Pal, Gurpreet Kaur

Situation awareness is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future (Endsley, 1995). In a highly stressful aviation environment, establishing and maintaining situation awareness is pertinent as well as challenging for air warriors. In recent years, there has been growing interest in the concept of mindfulness and its links with situation awareness. Surprisingly, there is a notable lack of empirical research which considers mindfulness to enhance the human factors (abilities or skills of personnel) to acquire and maintain situation awareness. Hence, the objective of the current research is to propose a theoretical conceptualization of the training module to enhance situation awareness using mindfulness, as conceptualized by E. J. Langer (1989). According to Langer (1989), mindfulness is a simple process of

noticing new things and while noticing new things, one becomes sensitive to the context in the present moment. It helps in taking perspectives and engages the person in the process. The current research paper depicts the role of mindfulness in enhancing cognitive readiness and subsequently situation awareness. Although there are alternative methods to enhance situation awareness, they are limited to characteristics of the task or factors related to human-computer interaction. And, in the modern warfare scenario, just knowledge, task-specific skills and abilities are not sufficient but other cognitive and non-cognitive factors are also equally important for acquiring optimum levels of situation awareness and successively efficient decision-making and performance.

26 Nov 21: Post-Lunch Poster Session

Simultaneous Bilateral Shaft Femur Fracture: Case Report on Post Aircraft Accident Injury

Pankaj Rai, Santosh Kumar, Prashant Padhi

Introduction: Simultaneous bilateral shaft femur fractures are unusual injuries commonly occurring due to high energy mechanisms such as motor vehicle accidents (MVA) and account for just 2% of all femoral fractures. These injuries are generally associated with other life threatening injuries. Patients with these fractures are prone to develop pulmonary complications with increased morbidity and mortality. These injuries are higher risk of developing infections and long term sequela in the form of limb shortening, deformity, restricted range of motion and abnormal gait which are detrimental for aircrew to back to active flying. **Case Report:** Authors report a case of 31 year old male patient who is brought to the emergency with history of aircraft accident during air show with comminuted fractures of bilateral femur simultaneous bilateral fracture femur post ejection. There was swelling and deformity both thighs without any neurovascular compromise, swelling and foreign body over right eye lid and superficial abrasions over face. **Management:** On arrival primary survey was carried out as per ATLS guidelines to rule out any life threatening condition. Initial resuscitation was carried out and all routine x rays and CT scans and lab investigations were done. After optimizing the medical condition, his fractures were internally fixed using locking intra medullary rods under general anaesthesia on the same day. The fractures were fixed using a fracture table and an image intensifier. All the fractures were fixed in the same sitting. He was allowed weight bearing with the aid of a walking frame and at 03 months patient started walking without support. At six months follow-up, the both femoral fractures were healing with maturing callus and at one year it shows united fractures with implant in situ. At approx 18 months post injury individual was placed in LMC A3G3 (T-12) and he could resume flying duties with restrictions. During subsequent review he was upgraded to LMC A2G2 (P) after HE evaluation and could resume solo fighter

flying. **Conclusion:** Bilateral femur fractures are fairly uncommon then unilateral fracture. These fractures are associated with a higher overall injury severity and a higher incidence of morbidity and mortality. In the scenario of aviation it poses significant risk for the comeback of aviator to active flying. Careful decision should be made between Damage control Orthopedics and Early total care in patient with other life threatening injuries. Adequate resuscitation followed by single-stage stable fixation of multiple fractures is advisable in case of stable patients. Advancement in field of orthopedic surgery, availability of better implant with prompt diagnosis and meticulous emergency care and surgery are promising game changers

Four Cases of Multisystem Inflammatory Syndrome in Adults Associated with Sars-Cov-2 Infection – an Overview of Clinical Features, Diagnosis and Treatment

G Varadaraj, AJ Swamy, B Sangeetha, S Sandhu, KS Shruthi

The varied spectrum of presentation of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is intriguing. Multisystem inflammatory syndrome in children (MIS-C) is a well described and documented condition that is associated with the active or recent COVID-19 infection. A similar presentation in adults is termed as Multisystem inflammatory syndrome in Adults (MIS-A). With only very limited cases reported from the west, MIS-A is considered a rare and serious complication of COVID-19. However, it is not as uncommon as we think. Many cases go undiagnosed for lack of COVID -19 like symptoms and unawareness among treating clinicians about this newer clinical entity. Further, antibody testing and inflammatory markers are not easily available in many of the Indian hospitals especially in rural India where the second wave had been intense, thereby making it difficult for the diagnosis of MIS-A. Also, there is no clear treatment guideline for MIS-A unlike MIS-C where the treatment protocol is well laid out. Awareness about MIS-A among treating clinicians can thus help in further evaluation and increased identification of the syndrome at the early stages thereby helping in the early institution of treatment. Our tertiary COVID care hospital in South India which has handled about 5200 cases of COVID-19 is been able to identify 04 cases of MIS-A proving that this clinical entity is not as rare as it is thought but lacks reporting and prompt identification. Here we describe 04 cases of MIS-A and strive to bring in the various aspects of it, including the clinical presentation, laboratory markers, diagnostic criteria and treatment considerations in this post second wave of the COVID-19 pandemic in India.

Aeromedical Evaluation of Aircrew Post Ejection at Field Level

Sri Hari E, Pipraiya R

“In the midst of every **CRISIS**, lies **GREAT** opportunity”

Introduction: Two aircrew from fighter stream have ejected from a trainer aircraft due to a technical snag causing engine flame out. They were managed conservatively for the same and their initial evaluation was carried out at IAM, IAF. The aircrew were due for their next review at IAM Bengaluru, However due to the COVID 19 pandemic related travel restrictions the aircrew could not be reviewed at IAM which in turn is affecting the upgradation of the aircrew. **Methods:** In view of the prolonged delay in routing the aircrew to IAM due to successive lockdowns, the case was taken up with the higher authorities for carrying out the Aeromedical evaluation of these aircrew at SMC. The clinical and functional evaluation of both the aircrew had been carried out at the unit using the resources available at the station level. The aircrew were also assessed for in-flight performance and tolerance to aeromedical stressors through a special sortie in the current type aircraft. **Results & Discussion:** This paper lays out the step by step procedure followed in the aeromedical evaluation of the aircrew. By optimal utilization of the resources available at the station level the aircrew were put back to cockpit with unrestricted flying. The aircrew were also followed up for the duration of one year post upgradation. This paper also lays emphasis on bringing out a common protocol for evaluation of aircrew for certain disabilities at field level without compromising on the critical aerospace safety aspect and makes them available for operational commitments at this need of the hour.

Lattice Degeneration – Clinical Entity with Variable Criterion for Civil vs Military Aviation

Anjali Maheshwari

Aim & Objective: 1. To assess the effect of lattice degeneration on visual profile of Aircrew and its complications. 2. To compare the prevalence of lattice degeneration among candidates for civil vs military aviation **Material & methods:** A descriptive observational study where the data was collected from multiple centres to assess the effect of lattice degeneration on the visual parameters of Aircrew. Two groups were formed with Group A consisting of all civil Aircrew and Group B consisting of the individuals applying for military aviation. Individuals with lattice degeneration were traced for presence or absence of symptoms, status of visual parameters and the effect of the visual sequelae in treated Individuals. **Study population:** 500 Aircrew attending initial and review medical at medical evaluation centres divided equally between Group A and Group B. **Results:** It was observed that Group A of the civil aircrew which was treated with laser did not show any decline in the visual parameters at 3 month follow up. Group B individuals did not undergo any treatment. **Conclusion:** Prognosis and effects of treatment of lattice degeneration showed stable visual acuity. Thus the stringent criteria's for military aviation needs to be reassessed with a larger data to prevent attrition of otherwise abled workforce.

27 Nov 21: Pre-Lunch Poster Session

Innovation: Multifeed Manifold for Oxygen Supply to Multiple Patients

Bhaskar Das, P Biswal, N Taneja VSM, S Bhargava

Introduction: Today our country is gripped with severe second wave of COVID-19 infection and this time we are experiencing oxygen crisis which has stretched the civil health infrastructure well beyond its limit. The Armed Forces Medical Services are always in readiness to augment the civil resources when called upon to do so. As we prepare to counter a potential surge in Covid-19, one of the important steps is adequate provisioning of oxygen to all those patients requiring oxygen support. In case of overflow of patients and anticipated insufficiency of oxygen cylinders/ oxygen pipelines we can use this multi feed manifold system from where we can split the oxygen lines supplying from 7000 Lt jumbo or 1246 Lt cylinder to 3 patients. The system of Multifeed Manifold was tried at our Covid-19 ICU to administer oxygen to multiple patients who were dependent on oxygen.

Discussion: This system of multi feed oxygen manifold will be useful in this Covid scenario/ crisis situation when we need to establish emergency crisis expansion ward where piped oxygen supply is not available or permanent lay out is not possible as well as to reduce the number of oxygen cylinders to be used inside the ward to increase the safety protocol. Also, this system will make wards more organized and will help in supply of oxygen to multiple patients with less no of cylinder. The system will also be more beneficial in SMC as well as in MI room. In case of mass casualty scenario, there may be a need for transporting multiple casualties from periphery to higher centres and most of them require oxygen. This system can be used with air worthy oxygen cylinders for supply of oxygen to multiple patients. Our medical services are being deployed to multiple field locations whenever they are called for emergency situations mainly disaster scenario. The respective wards set up at field can have such multi feed manifold which can be used for supplying oxygen to patients which require different flow rate.

Conclusion: Multi feed Manifold has been designed in such a way that it is effective, irrespective of the location, types or circumstances of establishment of crisis ward or in field setup or can be used for casualty air evacuation.

To Study the Pattern of Meal Timings Amongst Employees Related to Aviation

Aniket Kulkarni, AS Prasad, GS Basra

Background: Frequent variation in meal timings exist due to occupational requirement for the employees related to aviation who work in various shifts round the clock. Irregular meal timing is one of the known risk factors for lifestyle diseases such as obesity, hypertension etc. This study was carried out to assess the pattern of meal timings amongst employees related to aviation.

Methods: A cross sectional study was

carried out by using a structured questionnaire which was pretested and validated. 401 individuals who were involved in various duties related to aviation were interviewed. Data was compiled and analysed by using appropriate statistical methods. **Results:** Considerable proportion of individuals was found to be having irregular / delayed meal timings. Working hours / shift duties was the common reason for having delayed meals. Significant association was found between working hours and irregular meal timings. **Conclusion:** All efforts at individual, community and organization level are required to be taken to regularize the meal pattern without affecting the operational requirement of the organization for the employees involved in duties related to aviation.

Analysis of Psychological Stress in Aviators: a Multi-centric Study

Ghosh D, Mohapatra SS

Background and Introduction: Stress is a well-known detrimental factor on human performance. Any de-synchronization of Man-Machine-Mission interface due to stress or related fatigue may lead to hazardous consequences. Stress on and off the job may interfere with pilot's performance as well as job satisfaction. This multicentric study aims to determine the prevalence and factors associated with susceptibility to stress amongst aircrew across various fleets of Indian Air Force to address common modifiable factors. Emphasis has been given on coping strategies as well. **Material and Methods:** 69 healthy aircrew including 26 instructor aircrew and 43 regular aircrew from all stream viz. fixed wing, rotary wing and fighters participated in the study. This multi-centric study was conducted in four operational airbases from different geographical region. Stress scoring was done using modified ISMA (International Stress Management Association) questionnaire. Stress coping strategies were analyzed using Brief COPE questionnaire. Data were analyzed using descriptive statistics and fleet wise comparative analysis was done using chi-square test. **Results:** Likelihood of stress was found significantly high in unmarried aircrew as well as regular aircrew when compared to instructor aircrew. Amongst three categories of aircrew it is significantly high in transport and helicopter aircrew group when compared to fighter aircrew. This correlates to higher 'Approach' coping score in fighter aircrew when compared with non-fighter aircrew. However, there is no statistically significant difference in likelihood of stress depending on smoking and alcohol consumption status. **Conclusion:** Approach Coping is associated with more helpful responses to adversity, including adaptive practical adjustment, better physical health outcomes and more stable emotional responding. Re-emphasizing importance of 'optimal stress for optimal output' (Maximum adaptability model) and reviewing associated human factors for healthy 'Approach' coping strategy are of enormous importance at station level.

AEROMEDICAL SUPPORT TO HUMAN SPACEFLIGHT PROGRAMME

Gaganyaan: A 360 Degree Approach to Aeromedical Challenges

P Biswal

The Indian Human Space Programme has a sporadic history of periods of hectic activity followed by years of lull. Since the 1980s, when the first Indian went to space, IAM has been associated with each of these phases. In May 2019, the Indian Air Force and the Indian Space Research Organization signed a Memorandum of Understanding (MOU) to launch an Indian into space from Indian soil using an Indian rocket. The Institute of Aerospace Medicine has been at the forefront of all human aspects of this ambitious mission. IAM has led the medical efforts for this mission from crew selection to health maintenance to aeromedical training of the crew. Along with this, IAM provides critical aeromedical consultancy service to ISRO regarding various human use products and other aeromedical aspects of this mission. This presentation discusses the Gaganyaan mission from an aeromedical standpoint. The presentation divides these aeromedical aspects broadly into three phases: mission preparation, launch and orbital phase, and post-splashdown recovery and actions. It provides Medical Officers with an understanding of the complexities of human spaceflight. More importantly, it highlights the complexities involved in translating textbook-based theoretical knowledge into an actual mission to send a human into space. In conclusion, this presentation answers the question of what the big deal is about sending a human to space when India has a decades-old space programme and other countries have already sent people to space 60 years ago.

Crew Health Monitoring and Maintenance of Physical Fitness

Polash Sannigrahi

The astronauts are exposed to a magnitude of stressors in the dynamic environment of space-flight. It requires them to live and work in an extreme environment that includes microgravity, radiation exposure, circadian dysrhythmia, reduced daily physical activity and closed air-water systems. Therefore, it is imperative to maintain the crew health at optimum conditions at all times. To ensure this, periodic medical evaluations (PME) of Gaganauts are carried out at IAM every 06 months. Exposure to microgravity induces several physiological changes which includes cardiovascular and musculo-skeletal deconditioning. Considering these changes and the demanding physical workload, a comprehensive physical fitness programme comprising of Physical exercises, Swimming and Yoga is formulated to produce a measurable training effect. This paper highlights the details of the PME and the physical fitness programme for Gaganauts

Mental Well-being and Mental Health Monitoring

Dr Ch N Sowgandhi

The World Health Organisation defines Mental health as 'a state of well-being in which the individual realises his/her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to his or her community'. Mental health affects how we think, feel and act. It determines how people handle stress, relate to others and make healthy choices. For the first ever Indian Human Space Program, after the psychological selection, the psychological support and monitoring has gained prominence. A comprehensive system has been put in place so that the full potential of the crew is being realised. IAM and ISRO have made efforts to provide an environment to ensure not only physical health but also their psychological health and continued capacity for higher order cognitive abilities as well as those human qualities such as inquisitiveness, determination upon which the successful exploration of space depends. Alongside the mission specific training, we have evolved a robust mechanism for maintaining high level of mental health. This paper highlights development of certain strategies and specific mechanisms for stress management training, management of harmonious and productive team. Further, social skills training was designed to enable the 'astronaut-designates' to identify when to approach other crew members or support team to address individual or team decrements in performance and when to avoid such interactions. Evidence- Based Training Programs are also incorporated to promote and reinforce adaptive behaviours to maintain temporal consistency.

Gaganaut Aeromedical Training

Gaurab Ghosh

Aeromedical training is a key component of any spaceflight program. Although flight surgeons are always available on ground to communicate with the astronauts on-board, it is primarily to guide them through acute aeromedical issues in space. The astronauts, therefore, need to undergo a paramedic-level training to qualify and become familiar with common aeromedical problems in spaceflight. Aeromedical indoctrination has been an integral part of cosmonaut training at the Gagarin Cosmonaut Training Centre, Russia since the time human space mission was inception. Every year, new candidates are added to their cosmonaut pool. They undergo two years of basic astronaut training, followed by advance training which emphasizes more on systems integration and practical sessions on simulators. In both the modules, however, medical training occupies significant hours where cosmonauts learn and get hands-on training on basic aeromedical care. India, being on the verge of its maiden Human Space flight Programme, also lays importance to aeromedical training of Gaganauts. The training module proposed for Gaganyaan Mission is based in light of its operational requirements and justified after several scientific deliberations. This paper attempts to

summarize the key aspects of Gaganaut aeromedical training in India. The major differences between the Indian and Russian aeromedical training modules are also highlighted.

Aeromedical Consultancy: Our Contribution

Stuti Mishra

Institute of Aerospace Medicine is providing consultancy to ISRO as member of Design Review Team for various Human use products and other aeromedical aspects of the mission. As consultants in this review our role is aeromedical assessment as per the given QA/QC requirements and establish that the human centric system is operationally safe and effective. It is the first step for the review team to closely observe the hardware and software design. This presentation brings out the concepts behind design standards of the Human use products to be used for the Mission. It also brings forth the various DRTs IAM is providing consultancy. It will explain how concepts of safety, redundancy and reliability for Human use products need separate and specific considerations. In conclusion, this presentation answers how critical is the design review prior to acceptance and certification of a human centric system.

AIRCRAFT ACCIDENT INVESTIGATION

Overview of IAP 4305 & Recent Changes

Pratu Rastogi

IAP 4305 "Medical aspects in aircraft accidents: Prevention Management and investigation" is the primary reference guide for Medical officers in IAF for preparing themselves for handling aircraft accidents/ incidents and to serve as medical members in court of inquiries & Aircraft investigation Boards. The first edition of the IAP was published on Oct 1978 and the current second edition in 1994. Owing to advances in the field of Aerospace safety and Accident investigation IAP has been revised in Jun 2021. The 3rd edition of IAP 4305 has evolved significantly since its first edition in 1978. The current edition encompasses all critical inputs and stipulates various actions that are required to be undertaken by the medical personnel towards effective prevention, efficient management and investigation of Aircraft Accidents. The new version has undergone a major revamp in terms of layout of the sections and chapters while retaining its basic essence. The inputs from institute of Aerospace Medicine, DG Air Ops and DG I & S have been taken and incorporated in the present document. All the latest AFOs, policies, guidelines on the subject have been incorporated into the document and references have been provided for the ease of medical officers. The talk is designed to sensitize medical officers of the major changes that have been introduced in the new edition of the IAP 4305.

Role of MO as First Responder in an Aircraft Accident

Parul Goel

The role of a Medical Officer is of vital importance both in prevention and investigation of an accident. It is envisaged that all Airforce Medical officers should be able to discharge this duty with adequate sincerity, objectivity and concern, when called upon to do so, hence, they need to be well versed in all aspects of planning prior to do an aviation accident, be it the preparation and regular practice of pre-accidental plan, rescue and treatment of survivors, keeping an aircraft accident investigation kit ready at all times or being well aware of various investigation techniques. Adequate knowledge and technical skill of the MO is vital to his / her performance as an effective member of the investigation team. The primary role of a medical officer in response to an aircraft accident is to ensure safe triage, treatment, movement and evacuation of casualties from the site. Thus, the emphasis is to preserve life and prevent further harm. All this can be achieved through a meticulous medical preparedness, to handle such a unique scenario. In addition to the care of the crash/ accident survivors, the MOs are also responsible for gathering and preserving perishable evidence from the crash site, providing assistance during post mortem examination in case of fatal accident and preserving and dispatching requisite samples to the institute of Aerospace Medicine (IAM), Bengaluru. In addition, the MO often first respondent to crash site is a key witness for the "Accident Investigation Teams" both AAIB and Court of Inquiry. The talk is meant to give a glimpse to the medical officers, on their role in crash response & accident investigation thus enabling them to be prepared in a more proficient manner and handle critical situation in an efficient manner.

A Representative Case Discussion

YS Dahiya

This presentation contains the details of the investigation carried out by the Investigation Team constituted by the AAIB, Ministry of Civil Aviation, and Government of India. The Investigating Team determined the probable cause(s) as well as contributory factor(s) leading to the accident of Air India Express Boeing 737-800 aircraft, registration VT-AXH, on 07 August 2020 at Kozhikode airfield. The period of this investigation was amidst the peak of Covid-19 pandemic worldwide, which influenced the timelines for almost every activity of the team which included travel, availability of witnesses, and finalisation of test reports. The purpose of this aircraft accident investigation was not to apportion blame or liability. The sole objective of this investigation is the prevention of such accidents or incidents in future. The report has valuable inputs from the Accredited Representative appointed by the National Transport Safety Board of the United States of America. Air-India Express Limited B737-800 aircraft VT-AXH was operating a quick return flight on sector Kozhikode-Dubai-

Kozhikode under 'Vande Bharat Mission' to repatriate passengers who were stranded overseas due to closure of airspace and flight operations owing to the Covid-19 pandemic. The aircraft departed from Kozhikode for Dubai at 10:19 IST (04:49 UTC) on 07 August 2020 and landed at Dubai at 08:11 UTC. The flight was uneventful. The aircraft departed from Dubai for Kozhikode at 10:00 UTC as flight AXB 1344 carrying 184 passengers and six crew members. AXB 1344 made two approaches for landing at Kozhikode. The aircraft carried out a missed approach on the first attempt while coming into land on runway 28. The second approach was on runway 10 and the aircraft landed at 14:10:25 UTC. The aircraft touched down approximately at 4,438 ft on 8,858 ft long runway, in light rain with tailwind component of 15 knots and a groundspeed of 165 knots. The aircraft could not be stopped on the runway and this ended in runway overrun. The aircraft exited the runway 10 end at a groundspeed of 84 knots and then overshot the RESA, before plummeting down the tabletop runway approximately 110 ft below the runway elevation and impacted the perimeter road. There was no post-crash fire. Nineteen passengers were fatally injured and Seventy Five passengers suffered serious injuries in the accident while Ninety passengers suffered minor or no injuries. Both Pilots suffered fatal injuries while one cabin crew was seriously injured and three cabin crew received minor injuries.

Scoring, Coding and Assigning Severity to Aircraft Accident Injury Using Abbreviated Injury Scale (AIS)

Dev R

Background: Aircraft accidents (fatal/ non-fatal) often result in loss of trained manpower due to varied spectrum of injuries/ disabilities. The current practice in Indian Air Force (IAF) is to document the injuries/ autopsy findings in a descriptive manner which varies from individual to individual. Further, these reports are confidential in nature as they are a part of Court of Inquiry (Col) and stored at Directorate of Aerospace Safety (DAS). Thus, a need was felt to collate, classify and code the available injury data to form a database of injuries/ autopsy findings which can be easily accessible by authorised members of Col during future evaluations/ investigations. **Abbreviated Injury Scale (AIS):** It is anatomically based, consensus derived, global severity scoring system that provides standardized terminology to describe and classify an individual injury by body region according to its relative severity on a 6-point scale. The tool is widely used by health care workers associated in trauma care, accident investigators and researchers involved in epidemiological studies and systems development. **Discussion:** Introduction of AIS (ver. 2015) would help in uniform classification of injury by members of the Col thereby making the available injury data easier to compare and analyse. Based on the data problem areas resulting in specific type of injuries may be detected early so that appropriate changes may be brought out to improve overall aerospace safety.

AEROMEDICAL EVALUATION

Revised IAP 4303 (5th edition): Major Changes and Fresh Additions in Section VI

Ghosh G, Tripathy NK

Military discipline has distinct physical requirements to deliver combat readiness and functional efficiency for the service. The personnel are responsible for maintaining a high standard of physical and mental fitness. For those who develop disease or disability, there is a need to provide suitable employability within the service and to upgrade their medical category, whenever possible. Therefore, the personnel are examined periodically in the form of annual medical examination and medical board to ensure regular assessment of their physical and mental states. Indian Air Publications 4303 (IAP) is a policy released by medical authorities of Indian Air Force which guides medical examiners and specialist to ascertain an individual's medical condition based on employability in service and determine service liability. The publication undergoes revisions time and again in light of operational requirements and enhanced knowledge of medical conditions with respect to military scenario. The latest IAP 4303 5th Edition, which came into force with effect from 01 Nov 20, underwent major revisions and incorporated new chapters to facilitate better medical categorization of disabilities. This paper aims to highlight the key revisions and additions in Section VI of IAP 4303 (5th Edition) and evaluate the scientific rationale that went into revising the chapters as compared to its previous edition. Various diseases mentioned in Section VI including Obesity, Hypertension, Cardiac conduction defects, COPD and Bronchial Asthma, High Altitude Pulmonary Edema, Interstitial Lung Disease, Gastroesophageal Reflux Disease, Hepatosteatorrhea, Renal Calculus Disease, Benign Prostatic Hypertrophy, Minor Surgical Conditions, Prolapsed Intervertebral Disc, Pseudophakia, Malignancies, and Drug compatibility with flying have been discussed in lines of physiological rationale behind the changes in latest IAP edition. The comparisons drawn from its older edition have also been brought out.

Aeromedical Evaluation and Disposal of Hearing Loss: A Paradigm Shift

Sushree SK

Hearing loss is very common in Aviation environment affecting not only the aircrew, but the ground crew including Flight controllers, ATCOs, Technical personnel involved. The higher intensity of aircraft noise than that of other sound sources leads to the development of noise-induced hearing loss. However, good hearing is one of the prerequisites for safe flying. Frequent hearing examination helps not only in early detection of hearing loss but helps in treatment and disposal also. The hearing test included Free Field Hearing (FFH) in IAP 4303 4th edition and the disposal is also based on FFH. Although free field hearing test is a very good clinical method for assessment of hearing loss but it is a subjective method. Audiometry is objective and allows in

identifying and quantifying hearing disorders. It seems to be obvious that the clear identification of the nature and severity of the hearing disorder cannot be done with one single functional test. IAP 4303 5th edition, the assessment of hearing loss is more objective and practical in pre-detection of hearing loss and disposal of cases.

Field Disposals: Temporary Restrictions, Local and Field Upgradations

S Dinakar

Upgrading aircrew with certain disabilities at field is an important step towards empowering the local Aviation Med specialist. Specified disabilities like tonsillectomy, minor dental procedure, a hydrocoele surgery, etc, that involves uncomplicated recovery can be considered to full flying category by a field Aerosp Med specialist. In the past, aircrew who were placed in low med category for minor muscular disabilities, uncomplicated cataract surgery amongst others, were being evaluated at boarding centres. This had two implications, adding load at the boarding centres and delaying the appointments in the event. It was clear that the aircrew could be upgraded at field with the opinion of the concerned specialist and the field Aerosp Med Spl taking prudent call based on the disability, aircraft flown, executive report where necessary and the opinion of the clinical spl. It was concurred by the zonal advisor and finally approving authority lay with Gp Capt (MB) office. This eased the load off the boarding centres, shortened the time off flying, empowered the Aerosp Med Spl and saved the exchequer from expenses.

Incidental Findings during Aircrew Evaluation at IAM and its Impact on Aeromedical Disposal

Manu N

Medical inspection, examination and investigations are required to ensure the medical fitness and confirm medical category so as to determine an individual's physical and mental capacity to undertake duties of the branch or trade. The set of investigations conducted by annual medical examination at SMCs and investigations done at boarding centre are different. As the investigations conducted at boarding centre are more elaborate it is possible that few disabilities may be incidentally detected due to these investigations done at boarding centres. This retrospective study was conducted to study the impact and implication of the additional mandatory laboratory investigations/ evaluations conducted at boarding centres. A total of 1019 AME and medical board documents for a period of 09 years held at IAM were examined. A total of 1304 primary disabilities were evaluated in 1019 Aircrew out of whom 422 fresh disabilities were incidentally detected in boarding centre. 249 (60%) of the disabilities were attributed to the special investigations conducted in boarding centres. Incidence of deranged Lipid profile (86) was the highest disability detected, followed by Fatty liver disease (64) and Renal calculi / malformations (18) which were detected by USG abdomen. Deranged

Blood sugar was noted in 39 individuals. 66%(2/3rd) of these disabilities led to award of low medical category, amongst which all the disabilities detected by PTA and IOP were downgraded. There were no cases of abnormal Serum Creatinine. 165 disabilities (66%) among all the incidental findings by the additional investigations conducted at boarding centres necessitated lowering of medical category. This data raises question as to whether USG abdomen, Lipid profile and blood sugar should be done more regularly at SMCs during AME of aircrew. Based on the review of literature it is recommended that Blood Sugar and Lipid profile may be added as an investigation to be done during AME at SMCs. USG abdomen, LFT and IOP may be tested during AME for all aircrew on a five yearly basis (at ages of 35, 40, 45, 50 and 55 years) for early detection of the disabilities. Serum creatinine may be discontinued as a routine mandatory investigation in boarding centres and be done only in case of clinical suspicion, monitor complication of any disease or as a follow-up to detected nephrological abnormality.





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