



**64TH ANNUAL SCIENTIFIC CONFERENCE
OF
INDIAN SOCIETY OF AEROSPACE MEDICINE**

20 - 21 NOV 25



e-Souvenir



**INSTITUTE OF AEROSPACE MEDICINE
INDIAN AIR FORCE
BENGALURU, INDIA**

**64th Annual Scientific Conference
of
Indian Society of Aerospace Medicine**



**At
Institute of Aerospace Medicine
Bengaluru, India**

20 - 21 November 2025

Institute of Aerospace Medicine Indian Air Force



A WARM WELCOME TO ALL THE PARTICIPANTS

CONFERENCE LOGO



Conceptualised & Designed by

Gp Capt Deepak Kumar Khukhar

Wg Cdr G Harshavardhan

Dr. Harshitha

LOGO DESCRIPTION



The logo emblem of the 64th annual scientific conference of Indian Society of Aerospace Medicine (ISAM) has been conceptualised and designed to pictorially bring out the theme of the Conference— ‘नवाचारम् : अनन्त संभवः’.

The central motif of the infinity symbol reflects boundless exploration, continuous progress, and the limitless horizons of scientific discovery in Aerospace Medicine.

At its core, the emblem of the Indian Society of Aerospace Medicine signifies the society's enduring commitment to promoting excellence in aviation and space health sciences. The triad of indigenous aviation and space platforms: a turboprop aircraft, a soaring fighter aircraft, a human rated space launch vehicle represents the dynamic spectrum of our nation's aerospace operations — from the skies to outer space — where aerospace medicine continues to play a vital role in ensuring human performance, safety, and adaptation.

The human head silhouette, integrated with a neural network design, symbolizes the convergence of human physiology, neuroscience, and technological innovation — areas that define the future of aerospace medicine. The cosmic backdrop conveys the vastness of space and humankind's relentless quest for knowledge.

The Sanskrit inscription “नवाचारम् : अनन्त संभवः” (Navacharam: Anant Sambhavah) translates to “Innovation: Infinite Possibilities,” encapsulating the vision and spirit of the conference — to inspire innovation and collaboration in the ever-expanding frontier of aerospace medicine.



MESSAGES





MESSAGE

1. It gives me immense pleasure to extend my greetings to Indian Society of Aerospace Medicine (ISAM) on the occasion of the 64th Annual Conference at the Institute of Aerospace Medicine (IAM), Bengaluru.
2. Aerospace medicine specialty has made significant contributions to aircraft design and development, aerospace safety and the enhancement of operational efficiency in the Indian Air Force. The aeromedical support provided in the historical Axiom-4 mission and the ongoing Gaganyaan programme has been praiseworthy.
3. This year's conference theme - 'नवाचारमः अनंत संभवः Innovations in Aerospace Medicine: Infinite Possibilities' reflects the society's unwavering commitment to exploring novel solutions in the ever-evolving aerospace environment. As air and space domain converge, innovations and indigenisation become even more vital. I acknowledge the hard work and commitment of IAM and ISAM in their relentless pursuit of excellence, enhancing human performance and safety in aerospace domain.
4. I am confident that this conference will foster productive deliberations and inspire new ideas. I extend my best wishes to all participants and members of IAM and ISAM, for their future endeavours.

Jai Hind!

(AP Singh)
Air Chief Marshal
Chief of the Air Staff



वायु अफसर कमांडिंग-इन-चीफ
Air Officer Commanding-in-Chief

Telefax : (0) 080-23412821

AFNET : 4111-7200



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

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

Message

1. It is heartening to note that the Indian Society of Aerospace Medicine (ISAM) is conducting its 64th Annual Conference at Institute of Aerospace Medicine (IAM) in Bengaluru on 20-21 Nov 25.
2. The Institute of Aerospace Medicine has been the cornerstone in ensuring human performance optimization in the Indian Air Force. From pilot selection and training to research on life support systems, IAM's contribution has been fundamental to our operational readiness. The institute ensures our aircrew are able to operate effectively and safely across the vast and challenging operational landscapes, sustaining peak performance even in the most demanding circumstances. The theme – “Innovations in Aerospace Medicine: Infinite Possibilities” rightly acknowledges this legacy of excellence while looking ahead to new frontiers.
3. In the era of diversified aerial platforms and extended mission profiles, the role of aerospace medicine has never been more critical. Aerospace Medicine professionals' pioneering work in areas such as human factors, fatigue management and physiological training continues to enhance the effectiveness of our air warriors across all domains of aerial operations.
4. I commend IAM and ISAM for their consistent dedication to fostering excellence in research and academic advancement. I am confident that the valuable scientific discussions during the forthcoming two days conference will broaden our perspectives for pioneering research towards augmentation of aircrew performance and aerospace safety.

Jai Hind!

Place: Bangalore
Date: 17 Nov 25

(Tejinder Singh)
Air Mshl
Air Officer Commanding in Chief
HQTC IAF



सर्जन वाइस एडमिरल आरती सरिन, ए वी एम एम वी एम एम
महानिदेशक सशस्त्र सेना चिकित्सा सेवा

Surgeon Vice Admiral Arti Sarin, AVSM, VSM
Director General Armed Forces Medical Services

Tele : 011-24199801, 24199802
ASCON : 33080



MESSAGE

कार्यालय महानिदेशक
सशस्त्र सेना चिकित्सा सेवा
रक्षा मंत्रालय
रक्षा कार्यालय परिसर
'ए' ब्लॉक, (चौथी मंजिल)
अफ्रीका एवेन्यू, नई दिल्ली - 110023

Office of Director General
Armed Forces Medical Services
Ministry of Defence
Defence Offices Complex
'A' Block, (4th Floor)
Africa Avenue, New Delhi-110023

1. It gives me immense pleasure to convey my warm greetings and felicitations on the 64th Annual Conference of the Indian Society of Aerospace Medicine, being organized at the institute of Aerospace Medicine at Bengaiurud from 20-21 Nov 25.
2. Aerospace Medicine occupies a unique position at the confluence of medical science, technology and operational readiness. The theme 'Innovations in Aerospace Medicine: Infinite Possibilities' aptly reflects the pioneering spirit that has propelled this specialty to the forefront of Aviation and Space health. As flight envelopes expand and human presence in space grows, the discipline must continue to evolve through scientific ingenuity, innovations and collaborative research.
3. IAM has been a cornerstone of this evolution, contributing path-breaking research, technological innovation and academic excellence that continues to uphold the highest standards of Aircrew safety and mission performance. The ISAM conference provides an ideal platform for professionals to share experiences, deliberate on new ideas and chart the way forward for the future of Aerospace medicine.
4. I extend my best wishes to the organisers, delegates and participants for fruitful discussions and further success in the frontiers of Aerospace Medicine.

'Jai Hind'

Station: New Delhi

Dated : 14 Nov 2025


(Arti Sarin)
Surg Vice Admiral
DGAFMS



एयर मार्शल एस शिवाकुमार, वि से मे
प्रशासनिक प्रभारी वायु अफसर
Air Marshal S Sivakumar, VSM
Air Officer-in-Charge Administration

Telefax : 011-23012934 (O)
AFNET : 2111-5100
Mobile : +91-9652908840
E-mail : yog-dev@gov.in

वायु सेना मुख्यालय
वायु भवन, नई दिल्ली
Air Headquarters
Vayu Bhawan
New Delhi - 110106



MESSAGE

1. I am happy to note that the Indian Society of Aerospace Medicine (ISAM) is conducting its 64th Annual Conference on 20-21 Nov 25 at IAM, Bengaluru.
2. The theme of the conference – “Innovations in Aerospace Medicine: Infinite Possibilities” is aptly chosen contemplating the advancement in aviation and space operations which are challenging in nature and demand optimal performance of the man and the machine. This also requires human integration in advanced platforms to exploit their full potential without impinging upon aerospace safety.
3. Aerospace Medicine professionals have always used innovative approaches in translating their core aerospace medicine knowledge to devise practical solutions for the air warriors.
4. I am sure the deliberations at this scientific forum will widen the outlook of young professionals and will also give an opportunity to learn from the varied experiences of veterans. I wish to congratulate every member of this professional society who has worked tirelessly to stand by the ethos of the speciality and carve a unique stature at international level.
5. I wish the 64th Annual Conference of ISAM all success.

Jai Hind!



एयर मार्शल संदीप थरेजा एसएम वी एस एम एवं बार
महानिदेशक चिकित्सा सेवा (वायु)

Air Mshl Sandeep Thareja SM VSM & Bar
DIRECTOR GENERAL MEDICAL SERVICES (AIR)

Telefax : 011-26168098 (Off)
AFNET : 21125100

वायु सेना मुख्यालय
वेस्ट ब्लॉक-VI
आर के पुरम
नई दिल्ली - 110066
Air Headquarter
West Block-VI
RK Puram
New Delhi - 66
12 Nov 25



MESSAGE FROM DGMS (AIR)

1. It is with feeling of immense pride and privilege that we announce the 64th Annual Conference of Indian Society of Aerospace Medicine (ISAM) at the Institute of Aerospace Medicine (IAM) from 20-21 Nov 25.
2. This year's theme 'Innovations in Aerospace Medicine: Infinite Possibilities' is both a testament to our journey and vision for the future. As we stand at the crossroads of unprecedented advancements in aviation and a quest for space exploration, this theme resonates at very core of our mission; to innovate relentlessly to safeguard human performance and ensuring mission success in the most demanding environments.
3. IAM has been at the forefront of research and education, contributing immensely to operational excellence and the safety of aircrew in aviation and space domain. This conference is a dynamic platform for ISAM members and associated professionals to share knowledge, present novel findings and foster collaborations that will shape the future of the specialty in our country.
4. As the President of the Society, I extend a warm welcome to all invitees, delegates and veterans in the field of Aerospace Medicine and wish the conference a resounding success.

Jai Hind!

Place: New Delhi

Date: 12 Nov 25


(Sandeep Thareja)
Air Mshl
DGMS (Air)



एयर वाईस मार्शल रेणुका कुंटे
प्रधान चिकित्सा अधिकारी
Air Vice Marshal Renuka Kunte
Principal Medical Officer

Telefax : 080-23414061 (O)
AFNET : 4111-7550 (O)
Mobile : 9823712449
E-mail : renuka12kunte@gmail.com

प्रशिक्षण कमान मुख्यालय
भारतीय वायु सेना
जे सी नगर पोस्ट
बेंगलोर-560006

HQ Training Command
Indian Air Force
JC Nagar
Bangalore - 560006



MESSAGE

1. It is with immense pleasure that I extend my warmest greetings to all the members of the Aerospace Medicine community for the 64th Annual Conference of the Indian Society of Aerospace Medicine. The conference theme 'Innovations in Aerospace Medicine: Infinite Possibilities' 'नवाचारम् : अनंत संभवः', is not merely a title – it is a brilliant articulation of the boundless potential inherent in both scientific exploration and the extraordinary resilience of the human spirit in extreme environments.
2. The conference serves as a vital platform and offers an ideal opportunity to share breakthroughs, forge essential partnerships and generate innovative ideas necessary to address new physiological and operational challenges. Your work is fundamental to aerospace operators' optimal performance and in enhancing aerospace safety.
3. IAM has historically been a nucleus for pioneering work in this discipline. I am highly confident that the comprehensive deliberations over these two days will not only yield valuable insights but will also stimulate the next generations of research across military and civil aerospace domains.
4. As the conference's Chief Coordinator, my very best wishes to the organizers, presenters and participants for the grand success of ISAM Conference 2025. May your discussions propel the field into a future of infinite possibilities.

Best Wishes & Jai Hind!

Place : Bangalore

Date : 14 Nov 2025

(Renuka Kunte)
AVM
PMO, HQ TC, AF



एयर कमांडोर राजेश कुमार
समादेशक

Air Cndr Rajesh Kumar

Commandant

Tele Off : +91-80-2522-1781

Fax : +91-80-2522-4659

AFNET : +43137200

Mob : +91 9650752927

E-Mail : rajeshkkurl@yahoo.com



SOUVENIR MESSAGE

वांतरिक्ष औषधि संस्थान

भारतीय वायु सेना

विमानपुरा पोस्ट

बेंगलूरु - ५६००१७

Institute Of Aerospace Medicine IAF

Vimanapura Post

Bengaluru-560017

1. It is a matter of great pride and honour that we are organizing the 64th Annual Conference of the Society of Aerospace Medicine at the Institute of Aerospace Medicine. For over six decades, IAM has stood as the cradle of innovation, nurturing generations of aerospace medicine professionals who have safeguarded the health and performance of our aircrew.
2. This year's theme 'Innovations in Aerospace Medicine: Infinite Possibilities' – beautifully captures the spirit of curiosity and creativity that defines our field. From the roaring engines of fighter jets to the silent vastness of space, Aerospace Medicine continues to illuminate the pathway that connect human physiology with the ever-expanding frontiers of flight. The remarkable success of India's participation in Axiom-4 Mission, has marked a new chapter in our country's space endeavours, exemplifies how medical science, technology and human courage come together in perfect harmony.
3. The ISAM conference is more than an academic congregation; it is a celebration of ideas, experience and imagination. It is here that science meets service, data meets determination and dreams of tomorrow take their first scientific shape. Each paper presented, each debate initiated and each conversation during conference contributes to the collective evolution of Aerospace Medicine – an extraordinary specialty.
4. As Commandant of this illustrious institution, I take pride in the dedicated efforts of the organizing team and the unwavering support of our veterans, researchers and young minds who keep IAM's legacy alive. May this conference ignite new collaborations, inspire bold research and reaffirm our shared mission – to ensure that whenever humans dare to fly, Aerospace Medicine will always be there to safeguard them in their endeavours.

Jai Hind!

[Signature]
17 Nov 25



ORGANISING COMMITTEE



**64TH ANNUAL SCIENTIFIC CONFERENCE
OF
INDIAN SOCIETY OF AEROSPACE MEDICINE**

Conference Advisory Committee

President

Air Mshl Sandeep Thareja, SM, VSM & Bar

Secretary

Gp Capt NK Tripathy

Chief Coordinator

AVM Renuka Kunte

Executive Coordinator

Air Cmde Rajesh Kumar

Conference Organising Committee

Organising Secretary

Gp Capt Deepak Kumar Khukhar

Assistant Organising Secretaries

Wg Cdr BN Vasudev
Wg Cdr G Harshavardhan

Organising Secretariat

Maj Sunil Kumar
SqN Ldr Rahul Tiwari
SqN Ldr Ganesh S Dev
SqN Ldr Ketan Deshpande

Scientific Committee

Gp Capt YS Dahiya
Wg Cdr Devdeep Ghosh
Maj Jeya Karthik
SqN Ldr Ketan Deshpande
Surg Lt Cdr Alla Rakesh
Surg Lt Cdr Abhilash P T

Stage Committee & MC

Gp Capt YS Dahiya
SqN Ldr Gaurab Ghosh
SqN Ldr Rahul Dev

**Invitation, RSVP,
Seating & Ushering, Reception,
Registration**

Sqn Ldr Nikeeta Jha
Sqn Ldr Ketan Deshpande
Surg Lt Cdr Alla Rakesh
Surg Lt Cdr Manish Kharub
Dr Satyajeet Singh H Raulji

Delegate Kits & Mementoes

Gp Capt MB Suja
Wg Cdr Y Dinker
Wg Cdr Shikha Gianchand
Wg Cdr Namita Chowdhry
Sqn Ldr Salil Bhanoo
Maj Kishore
Dr. Gokul Harish
Dr. Sneha Kahalekar
Dr. Ajay Beniwal

**Slide Projection, Photography
& Technical Support**

Wg Cdr Avinash BK
Sqn Ldr Ganesh Dev

Sqn Ldr Rahul Dev
Surg Lt Cdr Alla Rakesh
Surg Lt Cdr Manish Kharub
Flt Lt Gurleen

Poster Presentation

Wg Cdr Devdeep Ghosh
Dr Sneha Kahalekar

Folders, Banners, Printing

Lt Col Srinivasa AB
Wg Cdr Avinash BK
Wg Cdr Devdeep Ghosh
Maj Manu Murali

E- Souvenir

Gp Capt YS Dahiya
Surg Lt Cdr Abhilash P T

Catering (All events)

Surg Capt Dev Kamal Kagti
Wg Cdr Arunabh Ghosh
Surg Lt Cdr Harsha MR
Maj Pradeep

Stage Preparation

Gp Capt YS Dahiya
Wg Cdr Avinash BK
Sqn Ldr Krishnaveni

PRO

Dr. B Sinha, Sc 'F'

	Dr. Sneha Kahalekar
Treasurer	Dr. Santhosh Sc 'F'
Ladies Event	Wg Cdr Nidhi Singh Sqn Ldr Meghna Dr. Sneha Kahalekar
Transport	Sqn Ldr Rahul Tiwari Maj Manu Murali Flt Lt Gurleen
Business Meetings	Maj Jeya Karthik Surg Lt Cdr Abhilash P T
TMS Coordination	Gp Capt YS Dahiya Gp Capt P Biswal Lt Col Srinivasa AB Maj Jeya Karthik
Accommodation	Wg Cdr KK Singh Wg Cdr Bharath Maj Venkatesh E Dr. Ajay Beniwal
Administrative Support	Gp Capt Sushmita Sekhon Sqn Ldr Anubhav Upadhyay
Medical Cover	Gp Capt Seema Gambir Sqn Ldr Vidya Rani
Officers Mess Support	PMC, Offrs Mess
Oration	Org Secretariat
Trophies & Awards	Gp Capt SS Mohapatra Wg Cdr Nidhi Singh Surg Lt Cdr Manish Kharub
ISAM News Letter & Video	Sqn Ldr Anubhav Upadhyay Sqn Ldr Gaurab Ghosh Sqn Ldr Rahul Dev Dr. Satyajeet Singh H Raulji
Draft Speeches and Messages	Gp Capt P Biswal Maj Sunil Kumar

Conference Dinner

Gp Capt P Biswal
Sqn Ldr Anubhav Upadhyay
Sqn Ldr Nikaeta Jha
Sqn Ldr Rahul Dev
Surg Lt Cdr Manish Kharub

Fellows Night

Gp Capt YS Dahiya
Gp Capt Deepak Kumar Khukhar
Gp Capt P Biswal
Surg Capt DK Kagti
Wg Cdr A Ghosh
Sqn Ldr Ketan Deshpande

KMC Coordination

Wg Cdr BN Vasudev
Maj Sunil Kumar





SCIENTIFIC PROGRAMME



Day 1(20 Nov 25, Thursday)

0800 Hr Onwards – Registration of Delegates

0845 Hr: All Delegates to be Seated

Time	Inaugural Session			
0900 – 0946 Hr	0900 Hr : Arrival of the Chief Guest at Srinagesh Auditorium 0901 – 0904 Hr: Audio-visual presentation on 64th Annual Conference of ISAM 0905 – 0912 Hr: Welcome address by Commandant, IAM 0913 – 0921 Hr: Presidential Address by DGMS (Air) 0922 – 0936 Hr: Inaugural Address by CAS 0937 – 0946 Hr: Award Ceremony, Unveiling of E-Souvenir			
0947 – 1040 Hr	Air Marshal Subroto Mukerjee Memorial Oration Orator: Mr Anchit Gupta Topic: Fortitude in Blue Chairperson: Surgeon Vice Admiral Arti Sarin, AVSM, VSM			
1043 – 1115 Hr Tea at 'The Court'				
1115-1200 Hr	Plenary Scientific Session: Lessons learnt from Axiom-4 Mission to International Space Station Chairperson: AVM Anupam Agarwal, VSM (Retd) Topics: Astronaut Perspective Orator: Gp Capt S Shukla Flight Surgeon Perspective Orator: Gp Capt P Biswal			
Srinagesh Auditorium		Engineer Auditorium		
1200 – 1300 Hr	Scientific Session 1		Scientific Session 2	
	Training Protocols for Aircrew Indoctrination – Need for a Relook		Operational Aerospace Medicine	
	Chairpersons: AVM Renuka Kunte, Air Cmde Prateek Kinra		Chairpersons: AVM Arijit Sen, Gp Capt Mona Dahiya	
	High G Training in Dynamic Flight Simulator: A New Approach	Gp Capt MS Nataraja	OBOGS for LCA: System Description & Flight Test Evaluation	Dr Ajaz Ahmed Bhat
	Effect of Ejection Procedure Simulator Training on Cardiovascular and Stress Parameters of the Flight Cadets	Wg Cdr Ajay Kumar	Acute Effects of Screen Exposure on Cognitive Fatigue and Sleep Quality	Sqn Ldr Anubhav Upadhyay
Heart Rate Analysis during Simulated Push-Pull Effect Maneuver	Wg Cdr Avinash BK	Retrospective Analysis of Performance of Trained pilots during Ejection Procedure Simulator Training	Sqn Ldr Ketan Deshpande	
Attitude vs Ground Level Simulation in Hypoxia Indoctrination	Wg Cdr G Harshavardhan	Digital Anthropometry: A Paradigm Shift in Aircrew Selection	Mr Sabyasachi Nayak	
1300 – 1400 Hr	Scientific Session 3		Scientific Session 4	
	Cutting Edge Research for Optimizing Aircrew Performance		Field Trials (CLOSED DOOR)	
	Chairpersons: AVM Kaushik Chatterjee, Gp Capt NK Tripathy		Chairpersons: Surg Capt SG Swamy (Retd), Gp Capt MS Nataraja	
	Assessment of Intermittent Normobaric Hypoxia Equivalent of Moderate Altitude as a Tool for Acclimatization of Hypobaric High Altitude	Gp Capt DK Khukhar	Neck Injury Risk During HMDS integration in Two Operational Fleet of IAF: IAM Experience	Surg Lt Cdr Harsha MR
	Objective Detection of Sleep Deprivation	Dr Santhosh SR Sc 'F'	DASH-V Integration in an Advance Combat Aircraft: IAM Experience Enroute Certification	Wg Cdr Devdeep Ghosh
	Physiological Parameters as Marker of Stress in Simulated Flying	Sqn Ldr Rahul Dev	Flight Trials of Indigenous Zeolite for OBOGS in a Combat Aircraft: Aeromedical Perspectives	Maj Jeya Karthik R
			Integration of Communication Ear Plug (CEP) in Gallet Helmet to Mitigate Cockpit Noise: Aeromedical Considerations	Wg Cdr Vasudev BN
	Poster Session 1 (Venue: The Lounge)			
	Noise-Induced Temporary Hearing Loss – From Exposure to Recovery Through Targeted Interventions			Lt Col Drona Sharma
	A Study of the Stability of Biochemical Analytes in Serum of Healthy Population and Its Aeromedical Significance			Gp Capt Ashwini Kumar
Lingering Symptoms Following Exposure to Simulated Hypobaric Hypoxia			Wg Cdr Deepan Rai	
Measurement of Peak Sound Levels at an Operational Airstrip: Aeromedical Concerns & Mitigation Strategies			Sqn Ldr Shruti B Chandran	
HBOT as Silver Lining in Era of Antibiotic Resistance			Surg Lt Cdr Divya Singh	
Comparative Analysis of Knowledge, Attitude and Practice Pretest and Posttest on Hyperbaric Oxygen Therapy Among Healthcare Professionals			Surg Lt Cdr Renny Justine	
1400-1500 Hr Lunch at 'The Court'				

1500-1600 Hr	Scientific Session 5	Medical Innovation Under Defence Excellence	Scientific Session 6	Challenges in High Altitude Operations
	Chairpersons: Air Mshl S Subramanian, Air Cmde Vipin Sharma (Retd)		Chairpersons: AVM SGS Datta, Surg Capt DK Kagti	
	iDEX Project: Proposal to Execution	Gp Capt Kanav Bhartendu	Aeromedical Evacuation with Critical Care Support: Outcomes and Challenges from High Altitude Areas	Gp Capt Ranjan Sarkar
	In-flight Physiological Monitoring	Gp Capt YS Dahiya	Rapid Acclimatization of Aircrew for High Altitude Operations	Lt Col Srinivasa AB
	Skin Spray Gun	Wg Cdr Tinku Antony	Ejection over High Altitude Area (HAA)	Sqn Ldr Anubhav Upadhyay
	An Automated and Cost-Effective FOD Detection System for All Weather and Visibility Conditions	Sqn Ldr VS Srikanth	Retrospective Study of Casualty Evacuations in High Altitude Areas of Ladakh and the Operational Challenges	Maj Suryakiran
	Poster Session 2 (Venue: The Lounge)			
	Prediction of Human Lung Parameters During Simulated Push Pull Maneuvers of Modern Aircraft How far will you venture within Heliosphere and beyond!			Dr Munna Khan
	Autonomous Diagnostics and Biosensing in Astronaut Health Monitoring: Innovations in Aerospace Medicine			Lt Col S Jhariya
	Ocular Injury in Aircrew due to Shuttle cock - A Case Report			Ms. Shreya Manjusha
AED with ECG Monitoring Onboard: Advancing In-flight Medical Response Readiness			Lt Col TS Rana	
Case Report: Atrial Septal Defect in a Prospective Pilot			Dr Shagufta Hasnain	
Aeromedical Deliberations in Re-fighting an Aircrew with Pulmonary Embolism			Sqn Ldr Nikeeta Jha	
			Flt Lt Aman Arya	
1930 Hr Conference Dinner at 'Sterling's Mac Hotel'				
Day 2 (21 Nov 25, Friday)				
0830 – 0930 Hr	Scientific Session 7	Panel Discussion: Future of Civil Aviation Medicine in India	Scientific Session 8	Aviation & Space – Mind Matters
	Chairpersons: Gp Capt YS Dahiya, Gp Capt Murtaza		Chairpersons: AVM Sachin Shouche, Dr CHN Sowgandhi Sc 'F'	
	The Changing Panorama of Civil Aviation Medicine in India	Air Cmde Vipin Sharma (Retd)	A Machine Learning Based Approach to Differentiate Fatigue/Drowsiness State from an Alert State in IAF Pilots Utilizing Physiological Sensor and Cognitive Battery Assessment	Dr Akansha Sc 'E' Mr Ajay Pratap Singh
	Global Perspectives guiding Vision 2025	Dr Rajib Ghosh	A Structured Aeromedical Evaluation of Three Space Analogue Missions: A Flight Surgeon's Perspective	Sqn Ldr Gaurab Ghosh
	Shaping the Future of Civil Aviation: A Research Perspective	Air Cmde Vipin Sharma (Retd)	Work Needs and Personality Profiles of Air Force Cadets and Commissioned Officers	Mr A Bagdai
	Aircrew Certification at a Civilian Facility in India: Experience, Insights & the Road Ahead	Wg Cdr SS Khatua (Retd)		
	Poster Session 3 (Venue: The Lounge)			
	HBOT in Sports Injuries			Gp Capt Pallavi Goswami
	A Rare Case of Congenital Right-sided External Auditory Canal Atresia – An Approach to Aeromedical Disposition			Surg Lt Cdr Manish Kharub
	Personality Assessment of Flight Cadets Undergoing Pilot Course using IPIP – Neo Personality Inventory			Sqn Ldr Meghna
Giant Cell Tumor in A Helicopter Pilot – Aeromedical Considerations for Flying			Lt Col Ashok Warthe	
Cases of Congenital Anomalies of Kidney and Urinary Tract (CAKUT) in Civil Aircrew Aspirants: Aeromedical Disposition			Maj Manu Murali V	
Astronaut Monitoring System (AMS) During Long-duration Human Space Flight Neuroscience Missions Focusing on Alerting, Orienting, and Executive Functioning of Astronauts using Pupillometry Based Neuroscience			Ms Iniya Pragati	
Rising Inflight Medical Events: Rethinking Onboard Medical Kits and the Need for a National Surveillance System			Lt Col Mithun Kumar (Retd)	
0930-1000 Hr Tea at 'The Court'				
1000-1100 Hr	AVM MM Srinagesh Memorial Oration Orator: AVM Deepak Gaur AVSM (Retd) Topic: Innovative Attitudes – Lessons from Living Legends Chairperson: Air Mshl Sandeep Thareja, SM, VSM & Bar			
1100-1200 Hr	JHF Manekshaw Panel Subject Matter Experts From Aerospace Industry Speaker 1: Mr. Awais Ahmed, Pixxel Aerospace Topic: Taking the Planet's Pulse- A Satellite View on Human Health Speaker 2: Capt Dhruv Rebagrada, Interglobe Aviation Topic: HFACS to HFIX Chairpersons: Maj Gen V V Joshi, VSM (Retd), Air Cmde Rajesh Kumar			

Scientific Session 9 Research By Young Mind		Scientific Session 10 Free Papers	
Chairpersons: Surg R Adm R Ravi (Retd), Col KK Sharma		Chairpersons: Dr Biswajit Sinha Sc 'F', Col Saurabh Bhardwaj	
Changes in Physiological and Cognitive Parameters with Continuous Wakefulness of 36 Hours	Maj Sunil Kumar	CT Coronary Angiography as an Alternative to Invasive Coronary Angiography in the Assessment of CAD in Aircrew	Brig Navreet Singh
Dynamic Radiographic Assessment of Lumbosacral Instability in IAF pilots: A Four-Case Series	Maj Sai Chandra	Development of a Predictive Model to Determine Biological Age Based on Lifestyle Behaviors in Healthy Pilots	Gp Capt SS Mohapatra
Does Contrast Sensitivity Improve at Night After Breathing Supplemental Oxygen?	Dr Bhavana KJ	Desert Skies and Combat Medicine: Aeromedical Lessons from A Joint Air Force Drill	Sqn Ldr Shruthi B Chandran
To Study Vestibular Adaptation Time with Varying Rate of Onset and Angular Velocity	Dr Harshitha T A	Medical Operations of Air Force: Global review with national perspective	Gp Capt GS Basra
Poster Session 4 (Venue: The Lounge)			
Incidental Hepatobiliary Abnormalities in Military Aviation Candidates: A Retrospective Study		Surg Lt Cdr Abhilash PT	
Brachial Neuritis (Parsonage-Turner Syndrome) in A Helicopter Pilot: A Rare Diagnostic Challenge with Occupational Consequences		Sqn Ldr SP Singh	
Psycho-Dermo Immunology in Aviation Medicine: Integrating Mind and Health		Maj Shivaprasad	
Neuropsychological Profiling and Fitness-to-Fly in Military Aviators with Multiple Sclerosis and Viral Encephalomyeloradiculopathy		Mr A Bagdai	
Cruising to Success: Leveraging Body Composition Analysis for Airmen		Dr Ketan Pakhale	
Heart Rate Optimization For Efficient High G Training: A Relook		Sqn Ldr Rahul Dev	
Transitioning Flight Decks: Aeromedical & Ergonomic Challenges of Transitioning Medically Unfit Rotary Wing Pilots to RPA Operations		Lt Col Srihari Iyer	
1300-1345 Hr Lunch at 'The Court'			
Scientific Session 11 Aeromedical Decision Making: Challenging Cases		Scientific Session 12 Human Factors in Aircraft Accident (CLOSED DOOR)	
Chairpersons: Air Cmde P Ghana, VSM, Surg Capt PD Ayengar		Chairpersons: Air Cmde Manas Saha, VSM, Gp Capt Ranjan Sarkar	
Management of Motion Sickness: Recent Advances	Wg Cdr Sneha Dinakar	Human Factors in Aircraft Accident	Gp Capt S Devesar
Basilar Top Syndrome in a Fighter Pilot: Early Intervention Matters!	Maj Pradeep	Prevention of Ejection Spinal Injury: Role of Ejection Procedure Simulator	Wg Cdr Polish S
Aeromedical Decision Making in Cases of Androgen Insensitivity Syndrome (AIS)	Sqn Ldr Krishnaveni	Aircraft Accident Investigation: LCA ejection	Sqn Ldr Suma Deepika
CNS Vasculitis in Civil Aircrew: A Case Report	Sqn Ldr Rahul Tiwari		
Poster Session 5 (Venue: The Lounge)			
Nutrition and Hydration Attitudes and Practices Among Aircrew: A Questionnaire-Based Study		Surg Lt Cdr Alla Rakesh	
Efficacy of Hyperbaric Oxygen Therapy in Osteoradionecrosis: A Retrospective Study		Maj Venkatesh E	
Anthropometric surveillance and Obesity Prevalence in Armed Forces Personnel: A Cross-Sectional Study		Sqn Ldr Mohin Sakre	
Factors influencing the Outcome of Airsickness Desensitization Therapy (ASDT) among flight cadets		Surg Lt Cdr Rajesh Reddy	
Psychometric tests used in Pilot Selection		Ms Kanya Bihari	
Scientific Session 13 Clinical Aerospace Medicine		Scientific Session 14 Physiology of Atmosphere & Beyond	
Chairpersons: Gp Capt SS Mohapatra, Col Rohit Kochhar (Retd)		Chairpersons: Gp Capt MPS Marwaha, Col Yogendra Vidhani	
Research and Development of a New Dental Restorative Material for Dental Clinics, Supersonics and Outer Space	Col Manu Krishnan	From Earth to Orbit: Simulated Microgravity Induced Biphasic Intraocular Pressure Response Over 24 Hours	Lt Col Manu N
Acoustic Neuroma in a Commercial Airline Pilot: Aeromedical Implications in Re-fighting	Wg Cdr Ashu Chandra	Effects of Simulated Microgravity on Central Retinal Artery (CRA) Dynamics	Dr Sneha K
Impact of Otorhinolaryngological Disorders on Flight Safety – An ENT Assessment	Wg Cdr Srujan Vallur	Effect of Simulated Microgravity on Sensory-Motor System Using Computerized Dynamic Posturography	Fit Lt Preethi R
Ocular Misalignment and Visual Fatigue in Attack Helicopter Aircrew: Case Series and Aeromedical Perspective	Wg Cdr Vikas Sharma	Evaluation of Fighter Index of Thermal Stress (FITS) Restrictions in Basic Trainer Aircraft and Ground Conditions Towards Prevention of Heat Stress in Aircrew	Lt Col Srinivasa AB
1545 – 1615 Hr Tea at 'The Court'			
1615 – 1730 Hr ISAM General Body Meeting (Venue: Srinagesh Auditorium)			
1915 Hr ISAM Fellows' Meet (ISAM Fellows only) at Vayu Vihar Officers' Mess, Challaghatta			



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 1930s, 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 defense services, it grudgingly began the process of 'Indianization' 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 Indianization, 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 aircrafts. 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 and 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 defense 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
1972-2025**

Ser No	Year	Orator	Topic
1.	1972	Maj Gen Inder Singh	Rehabilitation of Cases of Ischemic Heart Disease in The Armed Forces
2.	1973	Dr Rustom Jal Vakil	Electro-Cardiographic Abnormalities in Normal and Apparently Normal Individuals
3.	1974	Gp Capt Peter Howard	Current Research in Aviation Medicine in The Royal Airforce
4.	1975	AVM MM Srinagesh	The Values of Aviation Medicine in The Changing World
5.	1976	Dr PN Chuttani	Alcohol: The First Drug of Addiction
6.	1977	Lt Gen RS Hoon (Retd)	Incidence of Cardiovascular Problems Among Flying Personnel and Their Evaluation
7.	1978	Dr Raja Rammanna	Aviation and Radiation Hazards
8.	1981	Dr 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
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 Future1
20.	2002	Prof Dougla 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
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 – For the Future of Our planet
38.	2020	Dr Scott Shappell	Developing Novel Intervention Strategies Using Human Factors Intervention Matrix (HFIX)
39.	2021	Dr Quay Snyder	Pilot Physician's Evolution to Human Intervention Motivational Study (HIMS)
40.	2022	Dr Gary Kay	Analysis and Evaluation of the Cognitive Demands of Flying
41.	2023	Padmashri Dr Syed Mujtaba Hussain Kirmani	Playing International Sports for Two Decades – What it takes!
42.	2024	Dr. VR Lalithaambika	The Next Giant Leap: My Reflections on India's Human Spaceflight Programme
43.	2025	Mr Anchit Gupta	Fortitude in Blue

Air Mshl Subroto Mukerjee Memorial Oration Biodata of the Speaker



Mr Anchit Gupta

Mr Anchit Gupta is the Managing Director at Samara Capital and the founder of IAFHistory.in. At Samara Capital, which is an India-focused private-equity firm, he leads investments in consumer, healthcare, and technology and partners with management teams on strategy and value creation.

The son of an Indian Air Force fighter pilot, he grew up with the sound of jet engines and a lifelong respect for the men and women in blue. In 2012, a chance discovery of his father's profile on Bharat-Rakshak led him to collaborate with IAF historian Jagan Pillarisetti and begin a decade-long effort to assemble one of the richest open databases on IAF people, units, aircraft, awards, accidents, and operations. Known across the community as the 'Data Shikari', Anchit has manually collated millions of data points from gazettes, logbooks, interviews, and archives, and has written extensively, appearing in national dailies and creating over 100 Twitter threads with more than 10 million views.

In 2022, he met the Chief of the Air Staff, Air Chief Marshal V. R. Chaudhari, who encouraged the Inspire History Project, under which Anchit delivers guest lectures across IAF establishments. For his contributions to preserving and popularising IAF history, he received the Chief of the Air Staff Commendation (2024) and the AOC-in-C Commendation (2025). Based in Gurgaon, Anchit balances his investment work with his historical endeavours and is always eager to document veterans' anecdotes for posterity.

Air Mshl Subroto Mukerjee Memorial Oration Abstract

'Fortitude in Blue'

Mr Anchit Gupta

This talk invites Air Warriors to internalise the qualities that built the Indian Air Force and the people within it. Anchored on the twin pillars of Courage and Fortitude, it unpacks a practical 'DNA of Fortitude', the clear, actionable strands illustrated with real cases from past IAF officers. By the end, attendees leave with a simple mental template, a checklist they can apply in daily decisions, missions, and career choices to cultivate the same enduring qualities.



Air Vice Marshal MM Srinagesh Memorial Oration



Air Vice Marshal MM Srinagesh OBE

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

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

2007-2025

Ser 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
14.	2021	Steve Roberts	Head & Neck Protection – the Evolving Science
15.	2022	Dr James Vanderploeg	Private Human Space Flight: Opening Space for All
16.	2023	Air Marshal Pawan Kapoor, AVSM, VSM and Bar (Retd)	Patient Safety: Drawing Lessons from Aviation Safety
17.	2024	Wg Cdr (Dr) Kartik Kalyanram (Retd)	Effective Healthcare Strategies for Low Resource Settings Learnings from IAF
18.	2025	AVM Deepak Gaur, AVSM (Retd)	Innovative Attitudes in Aerospace Medicine: Lessons from Living Legends

Air Vice Mshl MM Srinagesh Memorial Oration Biodata of the Speaker



Air Vice Mshl Deepak Gaur, AVSM (Retd)

Air Vice Marshal Deepak Gaur, AVSM (Retd) is a graduate of AFMC, Pune and was commissioned in December 1983. He did his MD (Aviation Medicine) from IAM, Bangalore in 1991. He is also an alumnus of Defence Services Staff College, Wellington.

A Fellow of the Indian Society of Aerospace Medicine (ISAM), AVM Gaur has several scientific publications and presentations to his credit, both national and international. He is a recipient of the Chief of the Naval Staff award for best published scientific paper in Medicine and Allied specialties in 2007. He has contributed chapters in two textbooks including the API Textbook of Medicine. The Officer has been awarded commendations by Chief of the Air Staff twice, in 2007 and 2013. In recognition of his meritorious service, he was awarded Ati Vishisht Seva Medal on 26 Jan 2017 by Honourable President of India.

A Professor and Examiner of Aerospace Medicine, Rajiv Gandhi University of Health Sciences, Karnataka, he was appointed as the first ever Consultant in Aerospace Medicine in March 2014. He has served as Commandant of the Institute of Aerospace Medicine, IAF, Bangalore, PDMS (Specialist) and as Commandant Command Hospital Air Force Bangalore. He retired on 31 August 2021 after almost 38 years of service. Now at Dehradun, he conducts medical exams for pilots and pilot aspirants in Civil Aviation. He has recently published his memoirs 'White Coats, Blue Skies' that has inspiring true stories of his days in the Air Force.

He is married to Mrs Namrata Gaur, who is now a full-time homemaker. They are blessed with two children who are well settled.

Air Vice Mshl MM Srinagesh Memorial Oration Abstract

Innovative Attitudes in Aerospace Medicine: Lessons from Living Legends

Air Vice Mshl Deepak Gaur, AVSM (Retd)

Over three decades of practice in Aerospace Medicine, largely in the Indian Air Force and Civil Aviation Sectors, the speaker has been privileged to have learnt many lessons in innovation and bringing change to improve flight safety and aircrew health. The talk covers a range of such ideas and efforts as well as their successful and not-so-successful implementation from early 1990s till date. These include innovations to modify fighter aircraft aircrew equipment assemblies and ejection seats as also innovation in procedures and policy. All examples are with the speaker's personal involvement at various stages, but all are also documented and verifiable.

Success or failure in achieving innovative change always remains a part of the story. To strive to bring about change is crucial, results can go either way. Such innovation can rarely, if ever, be done alone. Aerospace Medicine in India has seen many stalwarts who displayed courage and conviction to encourage change and innovation. This talk is a tribute to some of these living legends who were instrumental - sometimes in helping to conceive, some other times to follow through, but always to fearlessly stand up and encourage the effort. All of them never shying away from taking the bull by its horns. The speaker is convinced that this tribe is only set to increase in future.

Air Vice Marshal JHF Manekshaw Panel



Air Vice Marshal JHF Manekshaw

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

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

In the field of Aerospace Medicine, JHF Manekshaw achieved heights no lesser than his brother, whom the nation reveres. In the memory of this exceptional professional in the speciality of Aerospace Medicine, the Indian Society of Aerospace Medicine, in its 57th Annual Conference has decided to start a Panel on Emerging Trends in Aerospace Medicine dedicated to the memory of JHF Manekshaw. In the Panel of 57th ISAM Conference in 2019, Dr Girish S Deodhare, Director CA & ADA delivered a talk on Challenges in Development of Modern Fighter Aircraft and Dr Unnikrishnan Nair, Director HSFC delivered a talk on *Human Space Programme*.

Air Vice Marshal JHF Manekshaw Panel Orations
2018-2025

Ser no.	Year	Orator	Topic
1.	2018	Dr S Somnath	Human Space Programme
		Dr Kotesch 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
4.	2021	DR. AK Ghosh	Human Interface in 5+ Generation Fighter Aircraft
		Dr Pratima Murthy	Mind Matters in Modernity
5.	2022	Mr Maneesh Kumar	Risk Based Approach to Management of Safety in India
		Ms. Nandini Harinath	Glimpses of ISROs inspiring missions
6.	2023	AVM Deepak Gaur, AVSM (Retd)	OPTRAM – The Evolution of a Revolution
		Dr. Srikanth Kondapalli, Ph.D.	Psychological Warfare of China
7.	2024	Dr. SL Vaya	Behavioural Forensic Clues: Way Forward to Connect the Dots
		Dr Hanamantray Baluragi	Collaborative Research: Opportunities & Challenges
8.	2025	Mr Awais Ahmed	Taking the Planet's Pulse – A Satellite View on Human Health
		Capt Dhruv Rebbapragada	HFACS to HFIX

Air Vice Marshal JHF Manekshaw Panel Orations Biodata of the Speaker



Mr. Awais Ahmed

Awais Ahmed is the Founder and CEO of Pixxel, a space data company and spacecraft manufacturer redefining Earth observation with hyperspectral imaging. He founded Pixxel alongside Kshitij Khandelwal in 2019 while completing his undergraduate degree at BITS Pilani. Their goal: to bring the benefits of space down to Earth through a hyperspectral imaging constellation that could monitor the planet's health in unprecedented detail.

At Pixxel, Awais leads the company's long-term strategy, product vision, and global partnerships. Under his leadership, Pixxel has successfully launched six commercial hyperspectral satellites—Fireflies—delivering imagery at 5-meter resolution and 135+ spectral bands. This makes Pixxel's data 50x richer than traditional Earth observation systems, enabling earlier risk detection and more intelligent decision-making across industries.

Once fully deployed, Pixxel's upcoming constellation of 18-24 satellites will capture imagery across up to 250 bands in both VNIR and SWIR ranges, with a 40 km swath and daily global revisit capability.

**Air Vice Marshal JHF Manekshaw Panel Orations
Abstract**

Taking the Planet's Pulse – A Satellite View on Human Health

Mr Awais Ahmed

Satellites are no longer just eyes in the sky tracking weather and terrain - they are rapidly becoming stethoscopes for the planet. This talk will explore how next generation Earth observation, particularly hyperspectral imaging, can detect subtle changes in air, water, vegetation and the built environment that are early indicators of risks to human health. From mapping crop stress before famine, to monitoring air quality and urban heat islands, to tracking pollution and vector borne disease habitats, satellite data can help governments and healthcare systems move from reactive response to preventive action. Drawing on real examples from Pixxel's missions and global partners, the lecture will outline what is already possible today, the scientific and technical challenges that remain, and how India can build a planetary scale "health monitor" from space. The session will be of interest to clinicians, public health professionals, policymakers and technologists working at the intersection of space, environment and human wellbeing



**Air Vice Marshal JHF Manekshaw Panel Orations
Biodata of the Speaker**



Capt Dhruv Rebbapragada

Capt Dhruv is currently the Chief of Flight Safety & Safety Manager for Indigo. He has been an active pilot for the last 39 years, instructor and an examiner on the A320 family aircraft, Lead auditor, Accident & Incident investigator, CRM trainer. Dhruv was also the Regional Safety Director- South Asia for Airbus.

**Air Vice Marshal JHF Manekshaw Panel Orations
Abstract**

HFACS to HFIX

Capt Dhruv Rebbapragada

The HFIX is a structure framework designed to translate human factors analysis into actionable safety interventions. It complements the HFACS model by providing a systematic way to address the root causes identified during investigation.



**Plenary Scientific Session:
Lessons Learnt During Axiom 4 Mission to ISS
Biodata of Speaker**



Gp Capt Shubhanshu Shukla

Group Captain Shubhanshu Shukla, is a distinguished astronaut with the Indian Space Research Organisation (ISRO) and a decorated test pilot in Indian Air Force. Shukla graduated from National Defence Academy (NDA) with a Bachelor of Science degree in Computer Science in 2005. He is a qualified test pilot and a combat leader, boasting over 2,000 hours of flying experience across a diverse range of aircraft, including the Su-30 MKI, MiG-21, MiG-29, and Jaguar. He also holds a Master of Engineering degree in Aerospace Engineering from the Indian Institute of Science (IISc), Bangalore. In 2019, he was selected as one of the four astronaut-designates (Gaganyatris) for India's maiden human spaceflight mission, Gaganyaan. Shukla made history as the mission pilot on Axiom Mission 4 (Ax-4) to the International Space Station (ISS) in June 2025. This achievement made him the first Indian national to visit the ISS and the second Indian to travel to space, after Rakesh Sharma in 1984. He returned to Earth after 20 days and 3 hours in space, conducting various microgravity studies.

Plenary Scientific Session: Lessons Learnt During Axiom 4 Mission to ISS

Astronaut Perspective

Gp Capt Shubanshu Shukla

As the Mission Pilot of Axiom Mission 4 (Ax-4), I had the opportunity to participate in a landmark commercial human spaceflight mission to the International Space Station. Along with operational and piloting responsibilities, I conducted Indian scientific experiments focusing on biomedical, physiological, and material science research in microgravity. This experience offered unique insights into human adaptation, performance, and health maintenance in space. In this talk, I will share key observations on crew readiness, onboard medical monitoring, and recovery challenges, and discuss how collaborative medical frameworks supported mission success. I will also highlight the significance of these experiments in expanding India's presence in orbital research and their implications for future human spaceflight and aerospace medicine initiatives.

**Plenary Scientific Session:
Lessons Learnt During Axiom 4 Mission to ISS
Biodata of Speaker**



Gp Capt Punyashlok Biswal

Gp Capt Punyashlok Biswal is Head of Department of Space Medicine at the Institute of Aerospace Medicine, Bangalore. He is one of the pioneers spearheading the medical aspects of Human in Space Programme (Gaganyaan) in collaboration with ISRO. He was part of the team that selected the four Gaganyaan astronauts in 2019 and has been the Flight Surgeon to Gp Capt Shubhanshu Shukla during the Axiom 4 Mission in 2025.

An alumnus of the prestigious Armed Forces Medical College, did his MD in Aerospace Medicine from Institute of Aerospace Medicine, Bangalore. He has served as the Flight Surgeon of operational Army Aviation Squadrons and has been the SMO at 4 Wg, Agra before coming back to IAM as a post graduate teacher. At IAM he has headed the Dept of Human Engineering and now heads the Dept of Space Medicine. An avid researcher, he has around 27 scientific publications under his belt. He holds a patent for an equipment to measure the Centre of Gravity of Aircrew Helmets. He is also the Principal Worker in development of the indigenous Psychological Test Battery called pSuMEDhA. His academic interests are in the field of Human Engineering and Human Factors, Ergonomics and Anthropometry, Biostatistics and Machine Learning and of course Space Medicine. Presently, he is deeply involved in providing operational space medicine support to ISRO for the Indian Human Spaceflight Programme.

Plenary Scientific Session: Lessons Learnt During Axiom 4 Mission to ISS

Flight Surgeon's Perspective

Gp Capt Punyashlok Biswal

The Axiom 4 (Ax-4) private astronaut mission to the International Space Station (ISS) served as a crucial milestone, providing invaluable medical data and operational experience for India's forthcoming Gaganyaan program. This oration presents a comprehensive medical report from the perspective of Indian Air Force flight surgeons who were part of the ground support team, outlining key physiological observations, operational challenges, and their direct implications for developing robust medical protocols for Gaganyaan.

Medical support and monitoring spanned the entire mission timeline. The pre-launch phase involved a 14-day Health Stabilization Program, including quarantine, a low-residue diet, and managed circadian rhythm adjustments. During the orbital phase, astronaut health was meticulously tracked through regular confidential Private Medical Conferences (PMCs) and psychological support sessions (PPCs). The post-landing phase encompassed immediate medical assessment upon splashdown, followed by a structured, intensive rehabilitation program.

In-flight, the astronaut successfully adapted to microgravity; mild Space Motion Sickness (SMS) resolved within 48 hours, while other anticipated physiological effects like cephalad fluid shift and spinal unloading-induced back pain were effectively managed. Post-flight, the astronaut exhibited predictable neurovestibular unsteadiness but maintained good orthostatic tolerance. A key finding was an approximate 5 kg loss in body weight, primarily from muscle mass. The personalised rehabilitation program, focusing on vestibular and proprioceptive retraining, proved highly effective, leading to full medical clearance for operational duties within six days.

The Ax-4 experience yields critical, actionable recommendations for the Gaganyaan program. Key recommendations include establishing a dedicated, quarantine facility at the Sriharikota launch site, mandating the integration of flight surgeons throughout all mission phases to build rapport and ensure oversight, and developing non-pharmacological SMS countermeasures leveraging national expertise in yoga and biofeedback. Furthermore, the findings underscore the need for culturally appropriate nutritional support and a robust, data-informed post-flight rehabilitation protocol. By adopting these lessons, Gaganyaan can significantly enhance astronaut safety, well-being, and performance, ensuring mission success.



ABSTRACTS PODIUM PRESENTATION



DAY 1: 20 NOV 25 (THURSDAY)

Scientific Session – I Training Protocols for Aircrew Indoctrination- Need for a Relook

Chairpersons: AVM Renuka Kunte, Air Cmde Prateek Kinra

High G Training in Dynamic Flight Simulator: A New Approach

Nataraja MS

The Indian Air Force is a formidable force with an inventory of exceptional air superiority fighter aircraft. These aircrafts are built with highly sophisticated technology and possess many advanced features. However, the aircrew is still the weakest link in man machine interface as the aviation stressors challenge the capabilities of the pilot. There are many countermeasures to optimize the performance of a fighter pilot. High G training aimed at enhancing the tolerance of aircrew to high sustained G is undoubtedly the most important force multiplier. High G training for fighter pilots in IAF dates to 1991 and has evolved with time into newer modalities. The breakthrough was procurement of High-Performance Human Centrifuge (HPHC) in 2008 which enabled transition from mostly pre-programmed open loop profiles to closed loop profiles with pilot in control. With further upgradation in 2019, the HPHC now called Dynamic Flight Simulator has acquired the capabilities to simulate realistic scenarios namely 1v1 combat and missile ditching while experiencing high G. This paper discusses the experience of IAM in implementing the capabilities of DFS into the High G training of IAF fighter pilots, thereby attempting to infuse confidence of combating G among fighter aircrew along with ensuring practical indoctrination of G tolerance skills.

Effect of Ejection Procedure Simulator Training on Cardiovascular and Stress Parameters of the Flight Cadets

Ajay Kumar

All Flight Cadets of flying branch undergo Ejection Procedure Simulator Training (EPS) twice during their stay at the Air Force Academy. The EPS training is as per the approved syllabus by the Medical Directorate. The EPS training prepare all the Flt Cadets to adopt correct posture whenever ejection is initiated in the actual flying. It is expected that the EPS training shall stay with the Flt Cadets for at least next three years when it is repeated for them to maintain the currency of this training. To generate long term memory, the EPS training should be able to generate adequate stress which may be reflected in the psycho-physiological parameters post training. At present, there is no study to ascertain the stress induced by such a training on the subjects. This study was conducted with the aim to assess if there was any difference in the stress scale and cardiovascular parameters recorded before and after the EPS training. All the Flt Cadets of Stage-1 flying training from Jul 2025 to Nov 2025 giving consent participated in the study. The result will be discussed with its possible implications on the effectiveness of EPS training for generating long term memory.

Heart Rate Analysis During Simulated Push-Pull Effect Maneuver

Avinash BK, Nataraja MS, Rahul Dev

Introduction. Push-pull effect is considered as an important contributing factor in G-induced loss of consciousness (G-LOC) related aircraft accidents. Pathophysiology of push-pull effect is attributed to the delay in Autonomic Nervous System (ANS) response manifested as delayed Heart Rate (HR) and Blood Pressure (BP) recovery, which in turn resulted in decreased +Gz tolerance. As the HR is an important factor depicting ANS response, this study was conducted to analyze the HR response during a simulated push-pull effect maneuver.

Methods. The profile for assessing G tolerance at gradual onset rates (GOR) involves Gz build up from baseline of 1.4Gz at a rate of 0.1G/s. The level of +Gz at which peripheral light loss (PLL) was reported during GOR is considered as level of G tolerance. The profile for PPE involves exposure to -2Gz from baseline of +1.4Gz. After 10 secs at -2Gz, the centrifugal force builds up at the rate of 1.5G/s up to baseline. This is followed by gradual build-up of +Gz at the rate of 0.1G/s. The level of +Gz at which PLL was reported is calculated as G tolerance post PPE. Minimal baseline HR pre run, max HR during the run and baseline HR post run in GOR was compared with similar variables of PPE run. Also time taken to achieve max HR (Tmax) during GOR was compared with time taken to achieve max HR post negative G exposure.

Results. Data of 53 aircrew were analyzed retrospectively, The Mean G tolerance with R-GOR was 4.66 ± 0.07 . Mean G tolerance after PPE at -2G for 10 seconds was 4.52 ± 0.56 . mean HR pre, max and Post during GOR were $105.9 (\pm 16.3)$, $180.8 (\pm 27.9)$ and $116.2 (\pm 22.2)$ respectively. Similar variables of PPE run were $107.9 (\pm 15.7)$, $177 (\pm 24.5)$ and $123 (\pm 18.2)$ respectively. There was no statistical significance between HR values of GOR and PPE. Tmax GOR (17.58 ± 1.4) and Tmax PPE (38.1 ± 5.77) showed significant difference to the value of $p = 0.002$.

Discussion. In accordance with existing literature, this study showed that the peak HR achieved during +Gz phase of Push-pull effect is similar to GOR. However, there was a significant delay, after -Gz exposure, to attain the similar HR level on subsequent +Gz runs, probably because of delay in the autonomic nervous system response. This could be attributed to persistence of delayed vasomotor response due to preceding -Gz exposure. If the peripheral vasomotor delay persists even after the subsequent +Gz exposure of 15 sec, it may decrease the tolerance to subsequent +Gz exposures if they occur during that impaired period which the pilot may not be aware of. Exposure to simulated push pull maneuver in Dynamic Flight Simulator during Operational Training in Aerospace Medicine (OPTRAM) to demonstrate the deleterious effects of PPE is thus essential.

Altitude vs Ground Level Simulation in Hypoxia Indoctrination

G Harshavardhan, DK Khukhar

Acute Hypoxia exposure results in the appearance of a variety of symptoms, which may vary from individual to individual in terms of their severity, order of appearance and speed. However, there is considerable consistency in the symptom complex experienced by a particular individual on repetitive exposure to acute hypoxia which is described as "Hypoxia Signature". The principal element of hypoxia indoctrination is the intentional eliciting of hypoxia

symptomatology during Hypoxia indoctrination within a safe and controlled environment to enable aircrew to recognize the adverse effects of in-flight hypoxia. Hypobaric Chamber Training has traditionally been the mainstay for hypoxia awareness training. However, various other modalities like Reduced Oxygen Breathing Device (ROBD), Normobaric Chambers and Combined Altitude and Oxygen Depleted (CADO) paradigm are also being used to impart Hypoxia Awareness Training. In this article, a need for such Hypoxia Awareness Training, rationale behind such training along with various methods being employed currently world over are discussed. The department of High-Altitude Physiology and Hyperbaric Medicine is also providing expert advice for development of indigenous Hypoxicator by Indian MSME through Innovations for Defence Excellence (iDEX) platform. The progress of the project will also be discussed.

Scientific Session – II Operational Aerospace Medicine

Chairpersons: AVM Arijit Sen, Gp Capt Mona Dahiya

On-Board Oxygen Generating System for Light Combat Aircraft: System Description and Flight Test Evaluation

Ajaz A Bhat

The majority of high-performance combat aircraft currently operated by the Indian Air Force employ conventional oxygen systems, wherein a replenishable store of oxygen, commonly liquid oxygen (LOX), is carried on board. The gas flow to each crew member is controlled by a pressure-demand regulator that mixes oxygen with cabin air. However, with the advent of in-flight refuelling, present-generation fighter aircraft can undertake sorties lasting 6–8 hours, making the oxygen supply a limiting factor. Conventional gaseous oxygen (GASOX) and LOX systems are costly and logistically demanding, whereas the On-Board Oxygen Generating System (OBOGS) offers a more sustainable alternative. OBOGS utilizes molecular sieves and the pressure swing adsorption (PSA) technique to selectively remove nitrogen from engine bleed air, thereby supplying oxygen-enriched breathing gas to the aircrew. This paper provides a brief description of the OBOGS architecture and the Flight Test Instrumentation (FTI) integrated into the aircraft to monitor critical parameters, including breathing oxygen concentration, temperature, pressure, and flow rate. Sensors were strategically placed to evaluate system performance under operational conditions. Flight trials were conducted at altitudes up to 50,000 ft across 21 sorties. Key evaluations included OBOGS concentration variation with altitude, deceleration, Anti-G valve functionality, spiral descent, and negative-G conditions, with manoeuvres ranging from –2G to +6G. Results demonstrated that OBOGS, the breathing regulator, and the Anti-G valve performed satisfactorily under all tested conditions. Oxygen concentration levels consistently remained within physiologically acceptable limits, and system response during acceleration manoeuvres was found to be reliable. The successful evaluation validates OBOGS as a critical enabler for extended-duration missions, improving operational flexibility while reducing logistical costs associated with oxygen storage and replenishment.

Acute Effects of Screen Exposure on Cognitive Fatigue & Sleep Quality

Anubhav Upadhyay, SS Mohapatra, Stuti Mishra

Introduction. Digital devices are integral to daily life, but their use before bedtime may impair sleep and performance. Extended wakefulness with continuous screen exposure is particularly concerning for individuals in safety-critical roles e.g. aviation. This study investigated the immediate effects of screen time on sleep quality, mental fatigue, and cognitive function in healthy adults.

Materials & Methods. Thirty healthy adults (20–40 years, average screen use >5 h/day) underwent three conditions: baseline sleep (BL, 8 h sleep), extended wakefulness with screen time (SDST, 20 h wake + 4 h sleep), and extended wakefulness without screen time (NOST, same sleep protocol). Sleep quality was assessed using the Groningen Sleep Quality Scale (GSQS) and actigraphy; fatigue with the Chalder Fatigue Scale (CFS); and cognition with the Macworth Clock Test (MCT) and Dual Task Test (DTT) from the PSUMEDHA battery. Repeated measures ANOVA and Friedman's test were applied as appropriate.

Results. Sleep efficiency declined significantly in SDST compared to NOST and BL ($p < 0.01$). Subjective sleep quality worsened in both deprivation conditions, with no significant difference between SDST and NOST. Fatigue scores were highest in SDST, significantly exceeding both BL and NOST. Cognitive testing showed slower response times and increased lag errors in SDST, indicating impaired vigilance and psychomotor coordination.

Discussion. Continuous screen exposure during extended wakefulness exacerbates fatigue and impairs cognitive performance beyond the effects of sleep restriction alone. Mechanisms may include melatonin suppression, increased cognitive workload, and visual strain. These effects have critical implications for aviation and other safety sensitive professions.

Conclusion. Screen use prior to sleep (extended wakefulness) reduces sleep efficiency, increases fatigue, and worsens cognitive performance. Limiting screen exposure prior to sleep and promoting good sleep hygiene are essential for preserving performance and safety.

Changes in Anthropometric Parameters After Exposure to 12 hours of Simulated Microgravity in Dry Supine Immersion

B Vinod, Vipin Sharma, Binu Sekhar

Introduction. Studying of Anthropometric parameters, range of movements at lumbar and cervical spine is helpful for development of flying clothing, design of workstations in space missions. The changes are attributed to fluid shifts, gravity withdrawal induced swelling of discs and new posture.

Methods. 20 volunteers were exposed to 12 hrs of microgravity, simulated by dry supine immersion. Institute of Aerospace Medicine anthropometric platform was used to measure 26 body parameters before and after exposure to simulated microgravity. Results were analyzed using Paired t-test, Wilcoxon sign rank test, Pearson's correlation Coefficient.

Results. A significant increase in the Standing Height, Sitting Height, Sitting Eye Level Height, Acromion Height, Lip Width, Bizygomatic Width, decrease in Chest Circumference, Thigh Circumference, Calf Circumference, Waist circumference was noted. No correlation was found between differences in acromion height and chest circumference.

Interpretation and Conclusion. 12 hrs of exposure to Dry supine immersion caused an upward shift of body fluids due to lack of support, gravitation pull. The fluid imbibed into the intervertebral disc spaces and prevention of loading of spine led to an increase in the size of inter vertebral discs. This led to increase in 06 longitudinal parameters as early as 12 hrs. The cephalic fluid shift led to decrease in 04 circumferential parameters in lower body and swelling of soft tissues of face within 12 hrs.

Retrospective Analysis of Performance of Trained Pilots During Ejection Procedure Simulator Training

Ketan Deshpande

Introduction. Ejection procedure simulator provides a safe and controlled environment for pilots to practice emergency ejection procedure by assuming the right posture. No. 2 AMTC trains fighter pilots, cadets and QFIs as a part of one day course, primarily focussing on technique of correct ejection posture. Didactic lectures are conducted on anatomy of spine, potential injuries on spine, ejection sequence and psychology of decision making during an emergency. Ejection scenarios are carried out at 4G and 6G profiles, aircrew are evaluated for any injuries and debrief sessions are held to reinforce the correct ejection posture to be maintained during event of ejection.

Aim. To conduct a retrospective analysis of the performance of trained pilots during Ejection procedure simulator training at No. 2 AMTC.

Objective. To assess the frequency and types of errors conducted by trained fighter pilots, QFIs during the period of 2022-24. Compare the performance of the trained pilots against flight cadets.

Material and Methods. The records of trained fighter pilots and QFIs who underwent training at No 2 AMTC from 2022-24 were studied. A professional statistical analysis software was used. Appropriate study methods were employed to compare the performances of trained pilots, QFIs and flight cadets.

Results. A total of 156 fighter pilots and 84 QFIs completed the EPS training course during the study period. There was statistically significant difference in errors committed by trained pilots, QFIs and cadets.

Discussion. There was a significant difference among the performance of trained pilots and QFIs against that of flight cadets. This is largely due to the experience in operational flying gained by trained pilots against minimal experience of flight cadets. There was significant improvement in performance from first trial to second trial, highlighting the importance of ejection posture which was reinforced after the failure in first trial. This improvement was uniformly distributed across various fleets (fighters, transport, helicopter pilots).

Conclusion. The one-day EPS training course is effective in imparting the knowledge of correct posture to the pilots. It helps in building muscle memory and generalisation of behaviour during emergency scenarios.

Digital Anthropometry: A Paradigm Shift in Aircrew Selection

Sabyasachi Nayak, DK Kagti, S Venkatesh, YS Dahiya

Introduction. Anthropometry is of critical importance in military aviation for fitting the man to the machine and ensuring a proper match to the strict standards of cockpit fitment and compatibility with ejection systems. One of the principal uses of anthropometry at IAM is for aircrew selection by measuring the critical anthropometric parameters - Standing Height, Sitting Height, Buttock-Knee Length (Thigh Length) and Buttock-Heel Length (Leg Length). Based on the measurement values of these parameters for aircrew, they are qualified or disqualified for various aircraft, which have their respective thresholds of anthropometric limits. These measurements are carried out using the process of manual anthropometry, which is a time intensive process, requiring the utilization of manpower trained specifically to conduct such measurements. We propose the automation of this process by using the automatically measured parameters from a single scan in the standard posture, using a Laser 3D Scanner to determine the corresponding thresholds for analogous parameters.

Materials and Methods. We use the Vitus 3D Whole Body Scanner to generate the 3D scans in the standard posture for aircrew and candidates undergoing manual anthropometry and extract their automatically measured anthropometric parameters into a database. The corresponding manually measured values of the four critical anthropometric parameters for the subjects are also tabulated and added to the database. Analogous parameters are identified which lead to the best possible prediction and lowest difference from the corresponding manual measurements. Linear regression analysis is performed in order to find the corresponding thresholds for the 3D scanner parameters. ROC (Receiver Operating Characteristic) Curves are plotted between analogous 3D Scanner and manual anthropometric parameters to identify the 3D Scanner parameter thresholds which minimize the false positive and false negative rates in order to identify ranges of scanner analogous parameter values for which further manual measurements may be required.

Result and Observation. Using the relevant set of automatic parameters measured by the Laser 3D Scanner, threshold value ranges could be identified for various analogous scanner parameters which could screen candidates with high accuracy while minimizing false positives and false negatives. These threshold ranges were consistent with the 95% confidence intervals determined using linear regression analysis between the critical anthropometric parameters measured manually and their corresponding analogous scanner parameters.

Conclusion. By using the analogous automatic parameters as input, we can predict which individuals will be selected, rejected and the borderline cases for checking with manual measurement. This may lead to reduced workloads for manual anthropometry as well as remove the subjectivity of manual anthropometry, thus leading to more accurate results. Further improvements can be gained by standardization of the scanning posture which may lead to tighter thresholds on the scanner parameters, thereby reducing type 1 and type 2 error as well as the number of borderline cases requiring manual rechecking.

Scientific Session – III
Cutting Edge Research for Optimizing Aircrew Performance
Chairpersons: AVM Kaushik Chatterjee, Gp Capt NK Tripathy

Assessment of Intermittent Normobaric Hypoxia Equivalent of a Moderate Altitude as a Tool for Acclimation for Hypobaric High Altitude

*DK Khukhar, Harshavardhan G, R Sarkar, SS Mohapatra, Harsha MR,
G Garg, Anu, Shraddha*

Introduction. Rapid deployment of military personnel to High-Altitude Areas (HAA) predisposes them to myriads of high-altitude related maladies ranging from mild effects like Acute Mountain Sickness (AMS) to severe effects like High Altitude Cerebral Oedema (HACO) associated with various degrees of physical and mental performance decrement. Acclimatisation protocols that are traditionally followed are time consuming and hence Intermittent Normobaric Hypoxia (INH) exposure is being studied as an acclimation method for pre acclimatisation.

Material and Methods. 53 healthy low-lander males (mean age 26.98 ± 7.5 years) have participated and completed the study protocol. They were randomly assigned to either Chamber Normobaric Hypoxia (CNH, $n=26$) and Oxygen-hood Normobaric Hypoxia (ONH, $n=27$) groups. Physiological and haematological parameters of subjects were checked on Day0 in the Hypobaric Chamber after 30 minutes exposure to simulated pressure altitude of 15000 feet amsl as baseline, prior to commencing exposure to INH. Subsequently participants of both groups underwent eight hours a day exposure to INH equivalent to 7000 ft amsl for a consecutive period of 14 days. The same physiological and haematological parameters of subjects which were checked on Day 0 in the Hypobaric Chamber were repeatedly checked after 30 minutes exposure to simulated pressure altitude of 15000 feet amsl on Day 4, 7, 10 and 14 after completing the INH exposure of that day. The assessment tests included SpO₂, Pulse Rate (PR), End Tidal CO₂ (ETCO₂), Respiratory Rate (RR), Blood Pressure (BP), Minute Ventilation (VE), VO₂ Max, Red Blood Cell Count (RBCC), Haemoglobin concentration (Hb), and Packed Cell Volume (PCV).

Results and Discussion. No significant difference was observed between CNH and ONH groups, hence within-group results were used for analysis and interpretation. Haematological parameters changed significantly across the time points. Increase in Hb, RBC, PCV are suggestive of possible early haemoconcentration and subsequent erythropoietic augmentation. A significant change was observed in ETCO₂, VE and VO₂ Max. Results indicate towards partial restoration of ventilatory state and aerobic capacity. Other parameters did not show statistically significant differences on pairwise comparison.

Conclusion. The findings of this study suggest that 14 days exposure to Intermittent Normobaric Hypoxia equivalent to altitude of 7000 ft may be beneficial to acclimate a low lander person to high altitude.

Trend and Change Analysis through a Non-Parametric Statistical Approach for Biomarkers Identification in 40-hour Continuous Wakefulness Study

Santhosh SR, Kamlesh Kumar Singh, Vijayashree Rao R, Sandhya S,
Taslimariff Sayad, YS Dahiya

Introduction. Self-inflicted sleep loss is a global health disorder which has become prevalent amongst the Aviators of the Indian Air Force due to the rampant use of social media and access to multiple streaming platforms. At present no reliable objective assessment for sleep deprivation is available which could screen sleep deprived pilots before they commence a sortie. Sleep deprivation poses serious risks to cognitive and operational performance, making rapid, non-invasive detection of fatigue a priority for the Indian Air Force (IAF).

Materials & Methods. In this study, 25 healthy subjects underwent a 40-hour continuous wakefulness protocol, with serial urine and saliva collections across three days. Fifteen analytes were quantified. Preliminary analysis conducted using unpaired t-tests, while subsequent analysis was carried out using non-parametric methods—including data cleaning, median-based plotting, Jonckheere–Terpstra trend analysis, and Friedman’s test with post-hoc comparisons—to account for non-normal distributions and inter-subject variability.

Results & Discussion. The change analysis revealed three functional biomarker categories: Screening markers (e.g., Urinary Formate, 3-Indoxyl Sulphate), altered under stress; Recovery markers (e.g., Citrate, Taurine), returning to baseline with rest; Late responders (e.g., salivary IL-6, TNF- α), significant only after recovery. Trend analysis showed consistent decreases in most analytes. These findings provide a framework for selecting biomarkers relevant to a point-of-care device for rapid fatigue screening. The study also highlights the need for improved salivary platforms, early-morning sampling, and extended acclimatization/recovery in future protocols. Together, these insights refine biomarker discovery and advance translational application for operational readiness.

Physiological Markers of Acute Stress During Simulator Flying – An Application to Improve Flying Training

Rahul Dev

A fighter pilot during a training sortie would experience aeromedical stressors (acceleration, thermal, hypoxia, vibration etc.) and psychological stress due to degree of difficulty in a sortie, maintaining spatial orientation, perceived un-favorable sortie outcomes, pressure from Instructor. A flying trainee is under observation and knows that his/ her performance is being judged by the QFI. It has been well established QFI monitored simulator sortie with proper hot debrief can be an important tool to improve the subsequent inflight performance. But this approach is limited by lack of objective data regarding the physiological stress the trainee undergoes to achieve the visible performance. The present study is planned to evaluate physiological changes during simulator flying in trainees and generate data to identify markers for in-flight stress. The outcome of the simulator sortie should have implications on performance rating by the QFI so that there is a degree of stress towards improving performance. Number of syllabus sorties to be flown by the trainee aircrew is defined. The trainee graduates to fly the aircraft only once he/ she has cleared the mandatory simulator sorties. The flying instructor during the simulator sortie notes the errors and stressful moments.

In the simulator, portable physiological recording devices with data logger facility will be worn by the trainee aircrew. At the end of the simulator sortie the QFI notes and hands over the exact time of error/ stressful moments in the sortie to the Investigator who milks the data from the physiological data logger and corroborate the physiological parameters against the errors/ stressful moments given by the QFI. The physiological data recorded during the sorties are to be interpreted in line with the resting baseline and the data during a successful simulation sortie. Serial data collected from multiple sorties from 50 cadets is likely to generate possible patterns of physiological parameters of two types: First: Optimum stress related to successful simulator sortie and Second: Dysregulated stress response related to errors leading unsuccessful simulator sortie. Once identified these parameters could guide flying trainees to optimally manage psychological stress during flying and possibly improve flying training.

CLOSED DOOR SESSION

Scientific Session – IV

Field Trials

Chairpersons: Surg Capt SG Swamy (Retd), Gp Capt MS Nataraja

Neck Injury Risk during HMDS Integration in Two Operational Fleet of IAF: IAM Experience

-

Harsha MR

DASH-V Integration in an Advance Combat Aircraft: IAM Experience Enroute Certification

-

Devdeep Ghosh

Flight Trials of Indigenous Zeolite for OBOGS in a Combat Aircraft: Aeromedical Perspectives

-

Jeya Karthik R

Integration of Communication Ear Plus (CEP) in Gallet helmet to mitigate cockpit noise: Aeromedical consideration

-

Vasudev BN

Scientific Session – V

Medical Innovation under Defence Excellence

Chairpersons: Air Mshl Shankar Subramanian, Air Cmde Vipin Sharma (Retd)

iDEX Project: Proposal to Execution

Kanav Bhartendu

The presentation on the iDEX framework aims to familiarise the august gathering with the key avenues offered under this Government of India initiative. It will cover the broad structure through which the framework is implemented at the Ministry of Defence, followed by an overview of how it is operationalised within the IAF. The presentation will focus on the key advantages the framework provides in engaging with Start-ups, MSMEs, and individual

innovators. The innovative projects currently being taken up—especially by the Medical Branch—will be highlighted, along with the central and anchoring role of the Project Officer in guiding and supporting the design and development of these projects.

In-flight Physiological Monitoring

YS Dahiya

Military aircrew members who operate advanced high-performance aircraft are regularly subjected to physiological extremes that elevate the likelihood of in-flight physiological episodes that can impact flying performance and may even cause incapacitation. Therefore, reliable, real-time physiological monitoring is essential. However, effective monitoring is challenged by issues related to sensor reliability and their suitability for flight environments. This paper details the iterative design, technical integration and validation of a highly miniaturized, multi-modal vital sign monitoring chest patch and earlobe system developed for continuous aircrew health assessment. The project has been assigned under iDEX programme of MoD. At present, through extensive hardware development cycles, a repeatable and reliable signal acquisition chain has been achieved, resulting in a prototype. The integrated system simultaneously measures five essential bio-signals: Electrocardiogram (ECG), Heart Rate (HR), Respiration Rate (RR) derived from Impedance Pneumography (IP), Skin Temperature (TMP), and Oxygen Saturation (SpO₂) via Photoplethysmography (PPG). Validation process included rigorous testing in relevant simulator environments, specifically climate chambers, vibration simulators and human centrifuge up to 8G. Major achievements include the device remaining stable and operational across all test conditions, with high Signal-to-Noise Ratio (SNR) in ECG and PPG-Infrared signals. However, testing revealed susceptibility of the IP signal to motion artifacts and issues with patch adhesion during high humidity/sweating conditions (40°C, 70%+ humidity). These findings underscore the challenge of acquiring noise-sensitive data like respiration in dynamic environments.

Skin Spray Gun

Tinku Antony

The management of large wounds remains a significant clinical challenge, particularly in resource-limited settings where donor skin availability is constrained. Traditional split-thickness skin grafting (STSG), although widely practiced, becomes suboptimal when wound areas are extensive or when multiple surgical sittings are not feasible. The Spray Gun Technique offers a promising alternative by using skin micrograft, allowing substantial expansion of limited donor skin and promoting epithelialization.

An Automated and Cost-Effective FOD Detection System for All Weather and Visibility Conditions

VS Srikanth

Introduction. Foreign Object Debris (FOD) on runways can cause catastrophic aircraft engine damage, leading to life-threatening accidents and heavy maintenance costs. The HAWKEYE

system has been developed to address this critical need by enabling automated, accurate, and real-time detection of FOD under all weather and visibility conditions.

Challenges with Conventional Detection Methods. Traditional FOD detection and removal methods face several limitations: Manual Inspection: Prone to human error due to visibility, accuracy, and motivation issues. Mechanical Runway Sweepers (MRS): Slow (5–10 km/hr), limited area coverage, and inability to detect dislodged debris. These methods result in delayed FOD retrieval and compromised runway safety.

Aim. To develop an Automated and Cost-Effective FOD Detection System capable of functioning effectively in all weather and visibility conditions while minimizing manpower and operational time.

System Overview. The HAWKEYE system integrates Computer vision & Millimetre-Wave Radar for hybrid detection. Radar: Operates in the 76–81 GHz band, providing multiple-object detection and eliminating blind spots. Cameras: Developed a high frame rate and wide FOV camera for running AI algorithm and classification & for visual confirmation. Vehicle Speed: Up to 30 km/hr, scanning a 3 km runway in under 6minutes. Data Processing: Advanced AI algorithms (YOLO v9) enable fast and accurate FOD identification, supported by deep learning models for adaptive intelligence.

Operational Features. Personnel required: Only two — a driver and a pickup operator. Real-Time Monitoring: The operator views live camera feeds inside the vehicle and can zoom/pan to locate FOD. Retrieval: Once detected, the FOD is cleared manually by co driver. All-Weather Functionality: Works effectively during day, night & fog. Testing and Validation: The system underwent extensive testing across diverse environments: Mounted on vehicles equipped with RGB, SWIR, MWIR, and LWIR cameras. Field trials conducted during day and night conditions, including extreme weather testing at Leh. Multiple camera types evaluated for performance in FOD detection under varied spectral conditions. Millimetre-Wave Radar demonstrated reliable detection even for coin-sized objects up to 40 meters away.

Final Prototype. The final prototype integrates radar and Computer vision modules mounted on a vehicle platform. The setup allows continuous, full-width runway scanning with automated FOD detection and instant alerting for removal.

Recommendations for Implementation. The integration of this onboard FOD detection system on ATC SAR Zebra vehicles is strongly recommended, providing the following advantages; High Speed and Accuracy: Rapid scanning with precise detection, Full Runway Coverage: Wide-angle sensors cover 150 ft in a single view, Efficient Operations: Capable of detecting multiple FODs within <15 minutes, Reduced Manpower: Only two personnel required without compromising accuracy, Night and All-Weather Capability: Operates efficiently even in low light condition, Minimal Operational Disruptions: Regular FOD checks can be scheduled without affecting flight operations, Enhanced Safety Monitoring: Frequent FOD detection enables faster tracing of debris sources, Scalable Deployment: Can be installed on all authorized runway and taxiway vehicles, Digital Reporting: Centralized compilation and transmission of FOD data to command and Air HQ for trend analysis and safety audits.

Conclusion. HAWKEYE offers a reliable, fast, and intelligent FOD detection solution designed to enhance runway safety, minimize human error, and optimize operational efficiency. Its AI-powered, all-weather capability ensures effective surveillance and timely debris management — paving the way for safer and smarter airfield operations.

Scientific Session – VI Challenges in High Altitude Operation

Chairpersons: AVM SGS Datta, Surg Capt DK Kagti

Aeromedical Evacuation with Critical Care Support: Outcomes and Challenges from High Altitude Areas

Ranjan Sarkar

Introduction. Aeromedical evacuation (AE) with ongoing critical care is essential for effective trauma and medical retrieval from remote, high-altitude regions.

Methods. This retrospective study analysed data of 200 AE cases from 2020 to 2025 at SMC 12 Wg and Command Hospital (WC), focusing on demographic, diagnostic, and outcome effectiveness in high-altitude evacuations. However meaningful data of only 128 could be retrieved. The incomplete data related mostly to civilian evacuations as follow up beyond 12Wg was not possible.

Results. The analysis revealed a mean patient age of 34.4 years with 86.7% Army personnel. Neurological emergencies dominated (40.6%), followed by medical (17.2%) and surgical cases (14.8%). Overall mortality was 33.6%. Notable improvements occurred from August 2024 onwards: mortality decreased from 35.1% to 20.0% (15.1 percentage point reduction), while survival/transfer rates improved from 55.0% to 80.0%. Cerebral venous thrombosis (CVT) cases were prevalent, reflecting high-altitude exposure risks.

Conclusion. Critical care-supported AE significantly enhances survival in high-altitude medical emergencies, with improvements in outcomes. The AN-32 was the principal transport platform, closely followed by the C-17, with Leh, Thoise, and Srinagar as primary evacuation locations. These patterns are consistent with the geography and operational focus of Indian Armed Forces medical evacuation infrastructure in the region. The experience, decision-making, and technical expertise of the onboard team are central to successful transfers, as consistently demonstrated in literature and in our data. The introduction of PALS (Portable Advanced Life Support System) since Aug 24 has had a positive impact on transfers and has improved the odds of positive outcomes even in gravely ill patients. The predominance of neurological cases, particularly CVT, highlights the unique challenges of high-altitude medical evacuations. Improved protocols in the pre hospital phase and systematic approaches to post-evacuation care are vital for optimizing AE effectiveness from challenging environments.

Rapid Acclimatization of Aircrew for High Altitude Operation

Srinivasa AB

Background. The Indian Army follows an Acclimatization Schedule that allows ascending soldiers 6 days at 9000-12000ft (Stage I HA), 4 days at 12000-15000ft (Stage II Acclimatization) and 4 days at 15000-18000ft altitude (Stage III Acclimatization), before further ascent. This study was aimed at considering the feasibility of induction of large bodies of battle worthy soldiers to Stage II HAA, with four days Stage I Acclimatization and 3 days for Stage II Acclimatization, with the use of drug prophylaxis.

Methodology. A total of one thousand five hundred and sixty-three (1563) soldiers of five units ascending to Stage II HA with troops deployed at or higher than Stage II HA were studied. Four units inducted in 33 Corps Zone, on the Jawaharlal Nehru Memorial Road Axis, with altitude of deployment 13060ft-13,800ft and higher, and one in 04 Corps Zone on the Tenga-Khirmu Axis, with the altitude of deployment at 12300ft and higher. One thousand three hundred and forty-five (1345) of these soldiers completed Stage II Acclimatization. Two hundred and fifty-five (255) of these new arrivals, ascending to altitudes >14,100ft were also studied at Stage III Acclimatization locations. The study subjects were divided into three groups of roughly equal size, Group 1 on drug prophylaxis with Tablet Dexamethasone 4gm BD and Cap lopar (Acetazolamide) 250mg Sustained Release OD, Group 2 with only Cap lopar 250mg SR OD and Group 3 with Cap Placebo (for lopar). Group 3 ascended by the conventional acclimatization schedule (as per AO 110/80) while Groups 1 and 2 ascended faster acclimatizing for 4 days at Stage I and 3 days at Stage II HA. The incidence of AMS, adverse effects and pulse rate, systemic blood pressure and Hb. O₂ saturation by pulse oximetry were studied serially in all subjects. Exercise performance and minute ventilation were studied in a nested cohort of seventy-five subjects (25 from each group) per Bn. Data was analysed to seek differences across duration of acclimatization and between groups at the end of acclimatization.

Results. Groups 1 and 2 finished Stage II acclimatization (Accl) on the seventh day at HA and proceeded to undergo Stage III Accl and deploy to forward posts three days before Group 3. The incidence of AMS and adverse effects requiring stoppage of prophylactic drug administration was, low and not significantly different between the three Groups. The incidence of AMS was very low at all Stages, never exceeding 5%, in any Group. Vital parameters were matched at the end of Stage II Accl, in all groups, as was minute ventilation. Physical exercise capacity was statistically significantly better in Group 3 than Groups 2 on the last day of Stage II Accl, but this did not affect the ability of the intervention Groups to ascend further or perform operational tasks.

Conclusion. Rapid induction on drug prophylaxis with 4 days Accl at Stage I HA and 3 days Accl at Stage II HA is feasible. A validation study in twenty-five thousand (25,000) soldiers, ascending to Stage II HA, on drug prophylaxis with Cap lopar (Acetazolamide) 250mg Sustained Release preparation once a day in the morning, with Accl of four days at Stage I and three days at Stage II HA, is recommended.

Ejection over High Altitude Area (HAA)

Anubhav Upadhyay

Ejection from aircraft at high altitudes presents significant aeromedical concerns due to the unique physiological challenges posed by rapid decompression, hypoxia, and the extreme environmental conditions encountered during ejection. The ejection sequence subjects the aircrew to high G-forces, which can result in injuries like spinal compression, cervical trauma, and cardiovascular strain, as well as barotrauma due to rapid changes in pressure. In high-altitude ejections, where oxygen levels are markedly reduced, hypoxia further complicates the individual's ability to function effectively, impacting cognition and physical response. The proper configuration and function of BTRU settings are vital to improving survivability and mitigating injuries in high-altitude ejection scenarios, along with other survival principles such as rapid parachute deployment & descent followed by survival actions undertaken by the

aircrew as well as a well-coordinated and timely SAR effort by the ground team. This presentation will cover the key aspects, essential for optimizing safety and recovery outcomes for aircrew during high-altitude ejections.

Retrospective Study of Casualty Evacuations in High Altitude Areas of Ladakh and The Operational Challenges

Suryakiran, Deepak Khukkar, Rahul Manral

Introduction. High Altitude Helicopter flying operations are of strategic and tactical importance, mainly for casualty evacuations, reconnaissance and observation operations, logistical support, rapid troop deployment etc. Helicopter flying in high altitude area has its unique challenges in varied fronts, like, unpredictable harsh weather, limited & sparsely maintained helipads, reduced engine performance due to low density of atmosphere, increased workload, pilot fatigue etc.

Methodology. Retrospective analysis of CASEVAC data from Apr 2023 till date was done to further understand the prevalence of high-altitude illnesses and the challenges faced during evacuation of variety of cases.

Results. A total of 697 cases has been evacuated from different parts of Ladakh starting from Apr 2023 till date. Further the paper discusses the prevalence of various high-altitude illnesses at different stages of high altitude. Further the operational challenges in high altitude including the environmental factors, physiological & psychological challenges, adversities faced by the medical teams in the forward echelons while evacuating the patients etc are also elaborated in this paper.

Conclusion. Casualty evacuations in high altitude is a life saving measure while testing the limits of the aircraft and that of the pilots. Meticulous planning of chain of evacuations from forward most medical echelons to the tertiary care medical centre is vital in saving life and limb in this unforgiving terrain. Overall, following acclimatization protocols, specialized training of aviators, technological advancements, better infrastructure, meticulous planning are essential for safe and effective helicopter operations in high altitude.

DAY 2: 21 NOV 25 (FRIDAY)

Scientific Session – VII

Future of Civil Aviation Medicine in India

Chairpersons: Gp Capt YS Dahiya, Gp Capt Murtaza

The Changing Panorama of Civil Aviation Medicine in India

Vipin Sharma

Introduction. The practice of Civil Aviation Medicine in India is as old as the Civil Aviation itself. With the School of Aviation Medicine, later the Institute of Aviation Medicine and the now

the Institute of Aerospace Medicine being the only Institute imparting knowledge on Aerospace in India and the IAF Medical Examination & Boarding Centres actively working in support of military aviation medicine, the nation logically approached IAF to look after this role for civil aviation as well. This arrangement has worked for decades with modifications and changes.

The Imminent Future. With the growth in Civil Aviation in India and the projections, it is only essential that a optimally staffed, optimally trained and efficient system of regulatory framework be established to manage the important aspects of civil aviation medicine and its allied applications within the regulatory framework provided by the DGCA in compliance with international guidelines laid down by the ICAO.

Possibilities for the Future. With the IAF expressing its reservations towards continuing to support the DGCA in its roles, there is a felt need to set up an alternate system which would appreciate the tasks at hand, match up with the regulatory requirements and also have the capacity to scale up to meet the future challenges of the practice of Civil Aviation Medicine in India. These possibilities and its possible implementation in a phased manner would be discussed.

Global Perspectives Guiding Vision 2025

Rajib Ghosh

As part of conceptualizing Vision 2025- Civil Aviation and Space Medicine, the author, as part of our Team, has leveraged on his experience in Civil Aerospace Medicine, and used benchmarking strategies to develop the blueprint for the future. As one presentation in this integrated panel, this author will highlight ten relevant experiences. He will relate each of these experiences as building blocks in the visualization of the future. He will discuss these experiences: (1) Aviation Medicine at British Airways; (2) Aviation Medicine at CAA, UK; (3) Aviation Medicine at CAMI, FAA, USA; (4) Teaching Human Performance and Limitations to Singapore Airlines pilots; (5) Navigating the world of Medical Examiner accredited to CAANZ, CASA, CAAS and FAA and lessons learnt; (6) Conducting research in Fatigue Risk Management System for Singapore Airlines A345 ULR flights and then applying that knowledge to other workplaces in Singapore; (7) Working at Senior Medical Officer at CAA New Zealand; (8) Efforts to pursue academic enrichment in Public Health, Occupational and Environmental Medicine, Management and Human Factors Engineering and how these related to and enrich the practice of Aviation Medicine; (9) Faculty in University in Singapore and enabling the next generation; and (10) Medical Expert in Court as Independent Aerospace Physician. Each of these themes merit individual presentations but this presentation is about briefly demonstrating how each of these experiences have contributed to our Vision 2025- our aspiration to be the world leader in Civil Aviation and Space Medicine.

Shaping the Future of Civil Aviation: A Research Perspective

Vipin Sharma, Shakuntala TS

Civil aviation medical research addresses a wide spectrum of domains with the central goal of safeguarding health, ensuring safety, and optimizing the performance of aviation personnel and passengers. Research spans aircraft-related issues, including strategies to improve pilot efficiency, passenger comfort, and the design of effective escape and egress systems. Public

health concerns, such as infectious disease transmission and in-flight containment, have gained increasing importance, particularly in the context of global pandemics. Major areas of focus include aerospace physiology (effects of hypoxia, spatial disorientation, and G-forces), occupational health (fatigue, noise exposure, ergonomics), and mental health (psychological resilience, stress, and cognitive function). Environmental medicine explores cabin air quality, circadian rhythm disruption, and thermal regulation, while accident investigation applies medical insights to human factors, survivability, and emergency responses. Passenger health studies emphasize DVT prevention, accommodations for vulnerable populations, and comfort. Emerging technologies such as telemedicine and wearable devices expand opportunities for in-flight monitoring. Research on aeromedical standards further underpins safe practice and medical fitness. Together, these domains advance aviation medicine through multidisciplinary, evidence-based approaches in aviation medicine.

Aircrew Certification at a Civilian Facility in India: Experience, Insights, and the Road Ahead

Sushree Sangita Khatua

With the exponential growth in India's civil aviation sector, there is an increasing demand for accessible, standardized, and efficient aircrew medical certification. In my experience operating at a DGCA-approved civilian facility, the transition has enabled broader reach, faster scheduling, and greater comfort for civil aircrew, particularly from remote or underserved areas. The multidisciplinary availability of specialists (ENT, ophthalmology, cardiology, and psychiatry) under one roof significantly enhances the assessment process. However, the shift also brings to light certain systemic gaps such as limited research, lack of policy updation as per new disease/treatment/acceptable medications, non-uniform implementation of DGCA guidelines across civilian AMEs/Boarding centres, limited exposure to complex decision-making protocols for borderline cases, lack of psychophysiological testing tools/Psychologist, absence of feedback to examiner/ follow up process for examiner, regular assessment of the centres, adequate facility to reach out to DGCA in complicated cases for decision making, absence of aviation-specific training of medical examiners, delay in the process in case of temporary unfit cases. Civilian facilities have a vital role to play in shaping India's future-ready aviation medical ecosystem. With investment in technology, training, standardization, research these centres can become globally competitive and contribute significantly to aviation safety and human performance standards.

Scientific Session – VIII
Aviation & Space – Mind Matters

Chairperson: AVM Sachin Souche, Dr ChN Sowgandhi Sc 'F'

A Machine Learning Based Approach to Differentiate Fatigue/Drowsiness State From An Alert State in Indian Air Force Pilots Utilising Physiological Sensor and Cognitive Battery Assessment

Praveena Mishra, Harleen Kaur, Kalyani Verma, Intiyaz Ali, Anshul Verma, Himanshu Kumar, Seema Choudhary, Alisha Raut, Rakesh Kumar, Urmimala Bhattacharya, Akansha Gautam, Kumari Soni, Kumardeep Choudhary, Naveen Sharma, Sumeet Saurav, Satish Bindal, Satish Kumar, Ajay Pratap Singh, Virendra Kumar, Anmol Mehra, Sanjay Singh, Rajni Verma, Viren Sardana

Introduction. Fighter pilots' function in extremely demanding environments and are subjected to prolonged vigilance, high-pressure decision-making, complex mission demands, and exposure to severe physiological stressors like high-G environments, unstructured schedules, and circadian disruption. These elements create susceptibility to fatigue, which can impair situational awareness, attentional control, working memory, and decision accuracy—finally jeopardising mission effectiveness and aerospace safety. Cognitive fatigue is exhibited by decreased mental alertness, slower information processing, impaired executive functioning, and attention lapses, which can result in slowed or inappropriate responses in high-stakes situations. Physical fatigue, on the other hand, is characterised by decreased muscular efficiency, reduced endurance, and compromised motor coordination. Despite an appreciation of its importance, comprehensive studies addressing both mental and physical fatigue in aviation are few. The current study seeks to comprehensively analyse pilots' performance when rested, mentally fatigued, and physically fatigued. Research outcomes are anticipated to enhance the understanding of how fatigue accrues and provide insights for early detection as well as efficient countermeasures within high-risk aviation settings.

Material and Methods. The present study examined the psycho-physiological reactions of Indian Air Force fighter pilots on the performance of cognitive tasks under three states: well-rested baseline, mental fatigue (induced by extended cognitive tasks), and physical fatigue (after 24 hours of wakefulness). Sixty male fighter pilots aged between 25 and 35 years participated in the experiment that was conducted in a controlled laboratory setting, with 55 subjects undergoing a wakeful cycle and 5 subjects in a normal sleep cycle. The cognitive battery was created to examine several functional areas such as executive functioning, working memory, and attention. Standardised instruments such as the Vienna Test System (VTS) and the E-Prime cognitive batteries were used for cognitive testing. Physiological signals: electroencephalography (EEG) for brain activity monitoring, heart rate variability (HRV) and photoplethysmography (PPG) for cardiac activity, galvanic skin response (GSR) for emotional arousal or stress, electromyography (EMG) for muscle activation linked to fatigue and a Blink detection algorithm for eye blink records were acquired utilising Power Lab and Brain products Actichamp system and an in house developed blink detection system.

Result and Discussion. It was observed that STROOP task performance, especially Audio STROOP, deteriorated under fatigue, with Reaction times increasing consistently across all

variants. All other tasks and batteries in e-Prime and VTS involved faster responses in fatigue and drowsiness state, potentially due to adaptation and learning Effect. HRV measures demonstrated autonomic diurnal changes along with certain parameters reevaluating differentiation between the two states on a logistic regression model. Eye-blink parameters-eye closure time and number of blinks and KSS scores validated increasing drowsiness, while GSR validated increased cognitive load. Notably, machine learning models combining behavioural (Stroop results) and physiological characteristics (HRV, GSR, Eye Blink) provided a high accuracy of $88 \pm 8\%$ in distinguishing alert from a drowsy /fatigue state, while sensor-only data provided an accuracy of $77 \pm 9\%$ with SVM utilising five-fold cross-validation. Combined, these results underscore fatigue's multifaceted effects and the potential of multimodal, ML-based monitoring in aviation.

A Structured Aeromedical Evaluation of Three Space Analogue Missions: A Flight Surgeon's Perspective

Ghosh G, Pratap A, Dahiya YS, Sowgandhi Ch N, Biswal P, Sannigrahi P, Mishra S

Introduction. The challenges of human spaceflight necessitate robust ground-based simulations. While many analogue missions exist, a standardized framework for evaluating their aeromedical effectiveness is crucial for operational preparedness. This paper presents a comparative analysis of three distinct space analogue missions carried out in India in 2025, from the perspective of a flight surgeon.

Materials (Analogue Scenarios). Study - I: An 8-hour habitability trial in a static Crew Module simulator. Crew tasks of pre-launch, launch and orbital phases were simulated inside the module, with suited crew. Study - II: A 10-day space analogue mission in an Isolation and Confinement ICC habitat (Mission *Anugami*). It focussed on the psychological, physiological, and operational challenges in a controlled environment with minimal external inputs. Study - III: A 10-day isolation and confinement at 14,500 feet in a resource-critical ICE environment. It simulated the stressors of deep space travel and planetary habitation.

Method. The three analogue missions were compared against a common rating scale which was vetted by subject matter experts. The rating scale included operational factors such as medical preparedness, resource fidelity, pre-mission training, crew autonomy, communication protocols, habitability and life-support systems, fidelity of mission tasks, contingencies, and failures. Each domain was rated and a cumulative score for mission effectiveness was obtained.

Results and Discussion. The findings highlight distinct aeromedical aspects of ICC and ICE analogues in replicating space habitats. These factors are important for a Flight Surgeon for keeping the analogue crew in optimal mental and physical state.

Conclusion. As India prepares for the challenges of human space missions, this structured evaluation provides a novel perspective of analysing different ground-based space analogue experiments.

Work Needs and Personality Profiles of Air Force Cadets and Commissioned Officers

Bagdai A, Sonali S, Chaturvedula S

Introduction. Human performance in aerospace and defence environments has been linked to underlying psychological needs and personality dispositions that shape persistence, adaptability, and interpersonal functioning. The present research was conducted as an exploratory, descriptive study to examine work need profiles and personality traits in a military sample using the Work Need Assessment Inventory (WNAI) and the NEO Personality Inventory-Revised (NEO PI-R).

Materials and Methods. Data were collected between 2023 and 2025 from 43 participants, comprising both cadets undergoing training and commissioned officers in service. The study focused on three central domains of work needs: achievement, affiliation, and power; alongside the five major personality dimensions of neuroticism, extraversion, openness, agreeableness, and conscientiousness. A cross-sectional design was employed, and comparative analysis was undertaken to explore differences between cadets and officers.

Results and Discussion. Preliminary profiling indicated that the configuration of work needs and personality traits varied according to stage of military career, suggesting potential implications for training, leadership development, and adaptability in high-demand contexts.

Conclusion: While exploratory in scope, the study established baseline patterns that may guide future investigations into the combined role of needs and personality in performance optimization, crew composition, and psychological support for individuals in aerospace and defence operations.

Scientific Session – IX Research by the Young Mind

Chairpersons: Surg R Adm R Ravi (Retd), Col KK Sharma

Changes in Physiological and Cognitive Parameters with Continuous Wakefulness of 36 Hours

S Kumar, SS Mohapatra, Santosh SR

Introduction. Sleep deprivation disrupts physiological homeostasis and cognitive performance. While prior research has examined 24-hour sleep loss, gaps remain in understanding prolonged wakefulness (36 hours), integrated physiological–cognitive responses, and recovery patterns. This study investigates the effects of 36-hour continuous wakefulness on autonomic function (HRV, BP & HR) and cognitive performance (SRT, DTT, DSST, Stroop test, PVT-B) with post-sleep recovery assessment.

Method. A prospective experimental study was conducted on 25 healthy male volunteers (20–45 years) at the Institute of Aerospace Medicine. Participants underwent 36 hours of supervised wakefulness with physiological (HRV, BP, HR) and cognitive (SRT, DTT, DSST, Stroop test, PVT-B) assessments at 6-hour intervals. Post-recovery sleep measurements were taken. Data were analysed using Friedman test followed by post hoc comparison with Bonferroni correction.

Results. Physiological: Significant increases in systolic BP (119→134 mmHg, $p < 0.001$) and pulse rate (71→79 bpm, $p < 0.001$) alongside HRV decline ($p < 0.001$) indicated sympathetic dominance. Partial HRV recovery post-sleep suggested persistent autonomic strain. **Cognitive:** Reaction times slowed (SRT: 286→367 ms, $p < 0.001$; PVT-B: 271→285 ms, $p < 0.001$), while accuracy declined (Stroop: 76%→82%, $p < 0.001$). Dual-task performance deteriorated ($p < 0.01$), reflecting executive dysfunction. Full cognitive recovery occurred post-sleep.

Discussion. The findings align with models of fatigue-induced autonomic dysregulation (sympathetic overdrive) and prefrontal cortex suppression. Cognitive declines mirrored prior studies but extended to 36 hours, revealing progressive degradation in vigilance, executive function, and divided attention. The dissociation between rapid cognitive recovery and delayed autonomic normalization highlights residual physiological strain despite behavioural restoration. Operational implications include integrating HRV and PVT-B for real-time fatigue monitoring in aviation.

Conclusion. Thirty-six hours of wakefulness induces significant, reversible cognitive decline and autonomic stress with lingering physiological effects post-recovery. Structured sleep interventions and multimodal fatigue monitoring are recommended for high-risk professions.

Study Utility of Markers for Examining Accuracy of Anthropometric Measurements Using Vitus 3-D Anthroscan

Uday Bansal

Introduction. Anthropometry is the scientific discipline dedicated to measuring the human body and its segments and holds profound significance in aerospace environments, particularly within the realm of military aviation. Recent advancements in 3D digital anthropometry have revolutionized the field, offering non-contact, rapid, and highly accurate measurement capabilities. At IAM, the VITUS 3D Anthroscan—a state-of-the-art whole-body laser scanner from Human Solutions GmbH, Germany was installed keeping in touch with the modern technology. Previously comparative studies have been carried out comparing the measurements by the Vitus 3-D Anthroscanner with the IAM anthropometer which is the current standard for measurements in the IAF. But these studies have shown a considerable difference between the two sets of measurements. Whether these differences were solely due to the different techniques of measurement or the algorithms of the software are erroneous, needs to be established. Thus, the need for present study with aim to check the accuracy of the VITUS 3-D Scanner by using physical markers.

Methodology. Two scans of the same individual were taken with and without markers. Data was collected for 15 parameters that can be directly measured by the Scanner and have importance in aviation were selected. Point of measurement (POM) was adjusted in the scan with markers to align with the physical markers where ever necessary. Two sets of measurements thus generated were then compared.

Results. Data was collected and compared for 191 individuals. 182 were males and 09 were females. For Body height, Point Of Measurement (POM) aligned with physical markers in 100% of cases. For other parameters the numbers varied from 13.1% for calf girth to 94.2% for head circumference. CCC showed good concordance for 14 parameters except cross shoulder (0.61). Bland Altman Analysis showed good agreement for 06 parameters. Other 09 parameters either had large LoA or % of readings outside LoA were >5%. Analysis of

parameters for which no adjustment was made showed good concordance for all parameters, but cross shoulder had least value at 0.82 with all others being >0.85. Bland Altman analysis of this set showed that 5 of the 13 parameters had large LoA with less numbers outside limits of agreement.

Discussion and Conclusion. There was a need to adjust the POM in >50% individuals for 07 of the 13 parameters that were changed and 45% in other 04. Bland Altman analysis showed large LoA for 09 parameters after application of markers. When the set consisting of only those parameters that did not require adjustment of parameters the number dropped to 05. This shows that there are inaccuracies in the anthroscan software. These inaccuracies are more for girth parameters than linear parameters. Hip height is the only linear parameter that shows large LoA. These inaccuracies could also be due to demographic factors of the individuals. A precision study should be carried out to check for the robustness of the software.

Dynamic Radiographic Assessment of Lumbosacral Instability in Indian Air Force Pilots: A Four- Case Series

Y Sai Chandra, Pradeep

Introduction. Pilots in high-performance military aviation are exposed to unique biomechanical stressors — sustained vibration, high-G loading, and prolonged seated posture — that predispose them to degenerative lumbosacral spine conditions. Static radiographs, while standard in aeromedical evaluation, may fail to detect functional instability such as occult anterolisthesis or retrolisthesis. This case series describes four Indian Air Force pilots diagnosed with lumbosacral spondylosis and listhesis and evaluates the added diagnostic yield of dynamic flexion–extension radiography.

Methodology. Four active-duty aircrew presenting with chronic low back pain and reduced operational tolerance were retrospectively reviewed. Inclusion criteria: Persistent lumbar symptoms, radiological evidence of degenerative change, and active flying status. Imaging protocol: Neutral-position lumbar spine radiographs followed by dynamic flexion–extension views. Outcome measures: Degree of vertebral translation (mm), detection of instability missed on static films, and impact on aeromedical disposition. Data correlation: Radiographic findings were matched with clinical presentation, flight limitations, and rehabilitation outcomes.

Conclusion. Dynamic flexion–extension radiography provided critical diagnostic information not evident on static imaging, directly influencing both treatment and flight safety decisions. Given the operational implications of undetected spinal instability, the inclusion of dynamic lumbar sacral spine X-rays in the aeromedical evaluation protocol for pilots with chronic lumbar symptoms or suspected listhesis would be of utmost use. Early detection enables timely intervention, optimizes recovery, and safeguards mission readiness

Does contrast sensitivity improve at night after breathing supplemental oxygen?

Bhavana

Background and Objectives. The ability to conduct effective operations at night has been recognized as advantageous to Armed forces from past experiences. During night flying, there is a change in the ambient luminance from photopic to scotopic condition. Contrast Sensitivity (CS) in actual night flying scenarios is one of the visual parameters of enormous importance

in identifying visual cues. But CS is known to decrease with a decrease in ambient light and hypoxia. However, the effect of breathing supplemental oxygen on CS at lower altitudes is poorly understood and therefore, this study was planned to understand the effects of supplemental oxygen at lower altitude on CS at various illumination conditions.

Methods. In an experimental study design, the CS of 35 voluntary participants was assessed using the Pelli-Robson CS chart under standardized illumination conditions. Participant's CS was then measured after 30 minutes of dark adaptation while breathing ambient air and after 10 minutes of dark adaptation while breathing supplemental oxygen, each under the three different ambient moonlight conditions: Full Moon (FM), Half Moon (HM) and Quarter Moon (QM) in the eye lane room of the NVG lab.

Results. The results of this study brought out that the Log CS value at standard illumination was $1.841 + 0.122$. The value improved with increase in ambient illumination ($p < 0.001$) and by breathing supplemental oxygen ($p = 0.001$). Effect of supplemental oxygen in improving the contrast sensitivity was consistent across all moonlight conditions ($p = 0.125$).

Interpretation and Conclusion. This study brings out that breathing supplemental oxygen in reduced ambient light conditions enhance the contrast sensitivity which can aid in night flying operations. However, keeping in view the dynamic changes in night sky illuminations during flying operations, the findings of the study need to be validated in operational conditions.

To Study Vestibular Adaptation Time with Varying Rate of Onset and Angular Velocity.

Harshitha

Background & Objectives. The time required for the vestibular system to adapt to stable velocity/rest following acceleration/deceleration is referred to as VAT. VAT depend on ROO & attained angular velocity because of underlying cupula dynamics in semicircular canals. This study was primarily aimed at measurement of VAT at 04 different ROO & 04 different angular velocities both in CW & CCW direction. Secondary objectives were to assess motion sickness if any on exposure to different simulated motion conditions both subjectively & objectively.

Methods. 30 healthy non aircrew individuals took part in the present study. They were given 16 conditions with varying ROO & angular velocities both in CW & CCW direction & VAT was measured. For assessment of MS, MSRS score was obtained after the run & physiological parameters were taken pre, during & post run. Multivariate ANOVA was done to assess VAT variation with ROO, angular velocity & direction. For assessment of physiological parameter variation between pre run, during & post run multivariate ANOVA was performed.

Results. VAT decreased with increase in ROO. VAT increased with increase in angular velocity. There was no significant change in VAT between CW & CCW direction rotation. There were no interaction effects. There was no significant MS in the individuals as indicated subjectively by MSRS score ≤ 3 & objectively there was no change in physiological parameters between pre, during & post run.

Interpretation & Conclusion. The findings suggest VAT is influenced by ROO & angular velocity but not direction of rotation also there is no interaction effects. Motion sickness does not occur even with higher rate of ROO & angular velocities as confirmed subjectively & objectively in the present study.

Scientific Session – X

Free Papers

Chairpersons: Dr Biswajit Sinha Sc 'F', Col Saurabh Bhardwaj

CT Coronary Angiography as an Alternative to Invasive Coronary Angiography in the Assessment of CAD in Aircrew

Navreet Singh

Cardiac risk evaluation during the medical fitness of aircrew is stringent due to the strenuous nature of their employment. Cardiac risk assessment by various risk scoring tools, Coronary artery calcium score (CACs), Stress Tests and more recently Coronary Computer Tomography Angiography (CTCA) have been employed to objectively assess, predict, and prevent catastrophic cardiac events. Here we discuss the potential use of CTCA in place of Invasive Coronary Angiography (ICA) in the assessment of coronary artery disease (CAD) in aircrew. With the advancement of hardware and software, the CTCA is able to not only define the luminal occlusion but also its functional significance and pathological state in the surrounding vessel wall. This could thereby avoid invasive procedures and the complications associated with them.

Development of a Predictive Model to Determine “Biological Age” based on Lifestyle Behaviours in Healthy Pilots

Sudhanshu Shekhar Mohapatra

Introduction. Modern healthcare organizations emphasize preventive strategies and healthy lifestyle promotion to reduce the burden of chronic non-communicable diseases (NCDs). Civil pilots, as high-profile professionals, may have unique lifestyle challenges that influence their health status, yet data on their lifestyle practices and NCD prevalence in India is limited.

Aim. This study aimed to assess the lifestyle practices of civil pilots in India, examine the association between demographic and occupational variables with healthy practices, and evaluate the utility of a biological age-based scoring system in predicting NCD risk.

Materials & Method. A descriptive cross-sectional survey was conducted among 276 civil pilots reporting for medical evaluation. Data were collected via a self-constructed questionnaire assessing demographic, occupational factors, and lifestyle habits, along with an online biological age calculator. Statistical analyses included Chi-square tests, logistic regression, and ROC curve analysis to validate the predictive utility of the scoring system.

Results. The majority of participants were aged 30-40 years (59.8%) and male (91.3%). No significant association was found between demographic or occupational variables and healthy lifestyle practices. However, 8.3% of pilots reported NCDs; those categorized as “SMART” (biological age less than chronological age) showed a significantly lower prevalence of NCDs (4.1%) compared to non-SMART counterparts (11.7%, $p=0.023$). Logistic regression indicated that being SMART reduces NCD odds by approximately 68% ($OR=0.32$, $p=0.030$), demonstrating the scoring system's potential as a predictive tool.

Discussion. While demographic and occupational factors did not influence lifestyle practices, adopting a healthier lifestyle as indicated by biological age was associated with lower NCD

prevalence. The validated scoring system could serve as a useful screening instrument to identify pilots at higher risk for NCDs, facilitating targeted interventions.

Conclusions. The study underscores the importance of lifestyle in NCD prevention among pilots. A biological age-based scoring tool proved effective in risk stratification and has practical applications in aviation health management to promote healthier behaviors and reduce disease burden.

Desert Skies and Combat Medicine: Aeromedical Lessons from a Joint Air Force Drill

Shruthi B Chandran, Polash Sannigrahi, Gaurab Ghosh

Introduction. The Indian Air Force contingent participated in a multi-national Large Force Employment warfare practice exercise (Ex Tactical Leadership Program) in Egypt. The objective of this exercise was to evaluate training amongst the pilots, foster international relationships between friendly foreign countries and to learn tactical innovations and best practices of other Air Forces. This paper explains the medical lessons learnt from this Ex-India exercise which served as a platform for exchange of best practices between India and other friendly foreign countries.

Pre-exercise phase. The contingent members were briefed on the peculiarities and diseases prevalent in the host nation. General hygienic conditions and medical precautions were explained. Aeromedical issues pertaining to long duration fighter flying were also explained to the aircrew. A medical kit specific for the mission was prepared and carried along. On reaching the destination, the host nation's medical set up and emergency responding systems were visited and safety factors ensured.

Exercise phase. During the exercise no untoward aeromedical issues were reported in the Indian contingent. Many value addition points from participating countries were gathered during interaction with their aircrew and flight surgeons.

Post-Exercise phase. The contingent ferried back to India after successful participation in the exercise. Important debrief points were discussed amongst contingent members.

Discussion. Important aeromedical considerations were brought to light during the multinational multi-air force exercise. These include the necessity of better interoperability in evacuation procedures, equipment compatibility, and medical documentation. The significance of shared SOPs and collaborative training could be highlighted by variations in pre-deployment screening, in-flight care standards, and casualty management techniques, such as emergency medical kit used by USAF, etc. Performance was also found to be impacted by human factors and communication difficulties, highlighting the importance of crew resource management. All points considered, the exercise reaffirmed that coordinated aeromedical planning, training, and systems alignment are essential for successful multinational operations.

Conclusion. Enhancing operational readiness, strategic coordination, and interoperability amongst allied air forces were made possible through this Exercise Tactical Leadership Program. The exercise demonstrated the on-ground practicality of combining various doctrines, communication systems, logistical frameworks, and medical support structures in addition to the tactical and mission-specific goals. Notably, it emphasized how crucial cooperative planning, established procedures, and intercultural awareness are in ensuring smooth cooperation in fast-paced, high-pressure settings. The lessons learned, which cover everything from command-and-control integration to aeromedical evacuation protocols,

provide insightful information that can guide future international operations and training. Building operational cohesiveness, mutual confidence, and collective defence capabilities amongst all air forces requires sustained investment in joint exercises.

Medical Operations of Air Force: Global Review with National Perspective

GS Basra, Piush Renjhen

Introduction. Since inception, the medical branch of the IAF has taken many strides with rich history of achievements. Over the years our country has also started to assert itself globally and has become a global power to reckon with, this also led to transformation of the IAF and its operations. The aim of this paper is to answer as to how are the Air Force Medical Services (AFMS) of the other major economies conducting their operations, and what could be the future direction of Indian Air Force Medical Services (IAFMS)? With this aim single researcher Qualitative Secondary Analysis was done on publicly available non-numerical data such as available organisational documents, pre-recorded interviews and organisational structures as available on public websites. An inductive analysis was performed without any preformed codes. Following questions were tested against the available data. 1) Do the AFMS of these services work in tandem with the medical services of other arms? 2) Who leads the AFMS? 3) What are the various organisational verticals of the AFMS? 4) Aim of the organisation? 5) Demarcation between operational and operation support roles? 6) Presence of a separate advisor/head of medical operations under AFMS leader? 7) Presence of a separate medical operations wing?

Findings & Discussion. Data was available for AFMS of western English-speaking countries, whereas very limited data could be accessed for others. Where ever data was available most of them prioritised Aeromedical Evacuations, HADR and Deployable Medical Assets. They have structured their medical echelons as well as command and control to optimise these operations. Like any other Qualitative Study this study also aims to raise pertinent questions

Scientific Session – XI

Aeromedical Decision Making: Challenging Cases

Chairpersons: Air Cmde P Ghana, VSM, Surg Capt PD Ayengar

Management of Motion Sickness: Recent Advances

S Dinakar, A Kumar

Introduction. Air sickness, a subset of motion sickness, is an operational concern in military flying. Motion sickness is a physiological response to either real or virtual motion. The pathophysiology has been studied across the world. Sensory neural mismatch has been the most accepted theory. Air sickness countermeasures in military flying have been mainly directed towards habituation and behavioural therapy. Utility of pharmacotherapy is limited and never sustainable. In the IAF, the countermeasure focus has been on ground-based

vestibular habituation and behavioural therapy. Chinese agencies have used acupuncture for treating motion sickness; however, the results are inconsistent.

Objectives. To look for possible utility of GVS as an adjunct in the management of air sickness in military trainees reporting with symptoms of air sickness.

Discussion. Galvanic Vestibular Stimulation (GVS) has been in use for long, the application of this for treating motion sickness including simulator sickness is being studied for over a decade. GVS is non-invasive low-volt current applied on the mastoid process to stimulate the vestibular afferent nerves. This bypasses hair cell transduction to simulate movement. This method does not have side-effects and is being used along with standard Coriolis simulation to improve habituation. GVS has produced positive results in retaining the motion stimuli. Studying the effect of GVS can bring newer insight to the existing usage of ground-based countermeasures.

Top of the Basilar Syndrome in a Fighter Pilot: Early Intervention Matters!

Pradeep, Devdeep Ghosh, Krishnaveni M

Introduction. Basilar top syndrome, characterized by infarction of the thalami, midbrain, and occipital lobes, is a rare but serious manifestation of Posterior Circulation Stroke (PCS). Vertebral artery dissection (VAD) has been documented in literature as an important underlying cause of this type CVA in young adults. Early diagnosis and timely endovascular intervention are critical in preventing long-term morbidity.

Case Details. A 36 years old male fighter pilot, occasional alcohol consumer, chronic smoker, without any comorbidities, relevant family history of metabolic or cardiovascular disease, presented with sudden onset giddiness, vomiting, generalized weakness, right-sided hemiparesis, and gait imbalance. Neurological examination revealed dysarthria, mild divergent squint, past pointing, cerebellar signs and right-sided motor weakness. Brain imaging studies were suggestive of left vertebral artery occlusion with tip of basilar thrombus with acute posterior circulation infarcts. Digital subtraction angiography (DSA) demonstrated a left Vertebral Artery Dissection (VAD) with thrombus occluding the basilar artery tip. The patient underwent emergency endovascular thrombectomy and stenting of the dissected left vertebral artery. Post-procedural clinical recovery was satisfactory. Follow-up MRI brain after one year was suggestive of chronic lacunar infarcts with no new ischemic events. The patient achieved complete neurological recovery (mRS 0); however, he was recommended further observation period till clinical finality is achieved.

Discussion. VAD is a recognized but underdiagnosed cause of posterior circulation stroke in young individuals exposed to intense physical stress. In this case, the occupational hazards viz. history of recurrent high-G force exposure along with head movement (e.g. Check-6) are presumed to have contributed to the clinical event. In addition, the role of underlying modifiable risk factors may have contributed in the pathogenesis. Basilar top occlusion represents a neurologic emergency due to its anatomical location at critical vascular territory. Rapid diagnosis using MRI and DSA, followed by prompt thrombectomy and stenting, played a pivotal role in this patient's favourable outcome. Nevertheless, prior PCS, vertebral artery stenting and recurrence risk remain as concerns for aeromedical decision making.

Conclusion. This case underscores the importance of early neurovascular imaging and aggressive endovascular therapy in young patients with basilar top syndrome due to VAD. With timely intervention, even high-risk cases may achieve full clinical recovery. Aeromedical

consideration for re-fighting in such cases remain conservative due to recurrence risk and inherent stressful situation in aviation environment.

Aeromedical Decision Making in Cases of Androgen Insensitivity Syndrome (AIS)

Krishnaveni M, G Harshavardhan

Background. Androgen Insensitivity Syndrome (AIS) is a rare disorder of sex development caused by mutations in the androgen receptor gene leading to impaired tissue response to androgens in 46, XY individuals. In Complete AIS (CAIS) also known as *Testicular Feminization Syndrome*, affected individuals present as phenotypic females despite a male genotype, with primary amenorrhea, absent uterus/ovaries and undescended testes. CAIS is inherited in an X-linked recessive manner, with an incidence ranging from 1 in 20,000 to 1 in 60,000 male births. The condition poses unique challenges for aeromedical decision-making due to endocrine dependence, gonadal malignancy risk, bone health and psychosocial considerations.

Case Details. We present two cases of CAIS in young civil aviation cabin crew aspirants. *Case 1:* A 20-year-old assigned female at birth, genotypically 46XY, presented with primary amenorrhea. Evaluation revealed absent uterus and ovaries, bilateral undescended testes in the inguinal canals, and a short blind-ending vagina. Hormonal profile showed raised LH/FSH, normal estradiol, and male-range Testosterone. Clinically she had normal breast development with sparse body hair. She had no systemic or psychiatric illness and was psychologically well adjusted. Specialists recommended gonadectomy with subsequent estrogen therapy. At present, gonads are intact and she is clinically stable. She was deemed fit for civil aviation duties with periodic endocrine follow-up. *Case 2:* A 24-year-old assigned female at birth, genotypically 46 XY, presented with primary amenorrhea. Evaluation showed absent uterus and cervix, a short blind-ending vagina with rudimentary upper vagina, and bilateral gonadal tissue with a right adnexal cyst. Hormonal profile revealed elevated LH, normal estradiol, low Testosterone and high DHEAS. Clinically, she had normal breast development with sparse body hair. She had no systemic or psychiatric illness and psychological assessment confirmed stable female gender identity. Gonadectomy was advised with endocrinology follow-up; she was not on hormone therapy. She was considered fit for civil aviation duties with recommendation for regular endocrinology follow-up.

Discussion. From an aeromedical perspective, the main concerns in CAIS are endocrine stability, gonadal malignancy risk, bone mineral density and psychosocial health. Civil aviation authorities adopt a guideline-based approach that allows certification with regular surveillance while military policies remain restrictive disqualifying intersex conditions at entry. In these cases, both individuals were clinically stable, psychologically well-adjusted and considered fit for civil aviation duties with periodic endocrine follow-up, consistent with best practices for individualized aeromedical decision-making.

CNS Vasculitis in Civil Aircrew: A Case Report

Rahul Tiwari, Pradeep, BN Vasudev, V Rajesh Reddy

Background. Cerebral vasculitis is characterized by inflammation of blood vessel walls, with or without necrosis, resulting in luminal obstruction diverse neurologic manifestations. Central

nervous system (CNS) vasculitis may occur as part of systemic vasculitis, affecting vessels of varying sizes, or as an idiopathic condition confined to the CNS. The pathogenesis of vasculitis is complex and poorly understood. Diagnosing CNS vasculitis is challenging due to nonspecific symptoms. Neurologic and psychiatric symptoms, including cognitive decline, are common, and diagnosis is particularly difficult when cerebral symptoms are the initial or sole presentation of an underlying systemic disorder.

Case Details. We report the case of a 37-year-old male civil pilot, who presented with multiple recurrent transient focal neurological deficits. His initial neurological episodes were documented in 2015 and further relapses in 2022, 2024 and 2025 lasting 5-10 min. On 01 Nov 24 he had slurring of speech and weakness of Lt upper limb while driving car, lasted for 30-45 min and resolved spontaneously. MRI Brain dt 21 Nov 24 S/o micro-bleeds in B/L Cerebral hemisphere small old hemorrhages in LT cerebral hemisphere. He was admitted to AIIMS (New Delhi) on 26 Dec 24 and evaluated for the same. DSA showed pseudo-phlebitis noted in early venous phase in B/L cerebral hemisphere and cerebellum consistent with clinical and imaging features of cerebral vasculitis. He was diagnosed with Primary CNS Vasculitis and managed with high-dose IV Corticosteroid followed by long-term immunosuppressive therapy.

Discussion. Primary angiitis of the CNS can present with any neurological complaint depending on the area of brain or spinal cord affected. Headache is the most common symptom, followed by altered cognition and persistent neurological deficit. Ischemic strokes, Intracranial haemorrhage, and subarachnoid haemorrhage can also be seen. Treatment of CNS Vasculitis includes High Dose Corticosteroids as the first line treatment and immunosuppressive agents. Aviation medicine standards, including those of ICAO, the FAA, and Rayman's Clinical Aviation Medicine, emphasize that any progressive or relapsing neurological disorder that poses a risk of sudden or unpredictable incapacitation is disqualifying for aircrew duties unless an acceptably low risk of recurrence can be demonstrated.

Conclusion. Primary CNS vasculitis is a rare but high-risk neurological disorder in aviators, with relapsing-remitting course and uncertain long-term prognosis despite therapy. This case underscores the importance of early recognition, comprehensive diagnostic work-up, multidisciplinary management, and stringent aeromedical decision-making to ensure flight safety.

CLOSED DOOR SESSION

Scientific Session – XII

Human Factors in Aircraft Accident

Chairpersons: Air Cmde Manas Saha, VSM, Gp Capt Ranjan Sarkar

Human Factors in Aircraft Accident	-	<i>S Devesar</i>
Prevention of Ejection Spinal Injury: Role of Ejection Procedure Simulator	-	<i>Polash Sannigrahi</i>
Aircraft Accident Investigation: LCA Ejection	-	<i>Suma Deepika</i>

Scientific Session – XIII
Clinical Aerospace Medicine

Chairpersons: Gp Capt SS Mohapatra, Col Rohit Kochhar (Retd)

**Research and Development of a New Dental Restorative Material for Dental Clinics,
Supersonics and Outer Space**

Manu Krishnan

Introduction. Dental caries, a major non-communicable disease, is traditionally treated with bis-glycidyl methacrylate (bis-GMA) containing dental resin restoratives. However, recent reports suggest, bis GMA as an endocrine disrupting chemical (EDC). Also, its polymerization shrinkage, causes clinical failures and barodontalgia or pressure related pain in high altitudes, deep seas, supersonics, and outer space. Therefore, aim of this research was to develop a new visible light curable dental restorative material, without bis-GMA, useful for routine clinical as well as combat applications of Army, Navy and Air Force.

Material and Methods. The unique composition of this resin was made through *sol-gel* reactions of certain polymers and multiple fillers. The optimized final composition was comprehensively evaluated for physicochemical, thermal, biologic features through in-vitro and in-vivo toxicity studies and in animal models. Its military applications in hypobaric and hyperbaric chambers were also assessed. The new biomaterial was also compared with 5 leading international brands.

Results. The new biomaterial without bis-GMA resin has better safety /toxicity profile and mechanical / thermal properties than all the lead brands. Polymerization shrinkage of the material is the lowest ever reported. Material is bioactive and self-adhering without requiring a bonding agent. It has antimicrobial properties and low water absorbing / leaching properties.

Discussion. The new biomaterial satisfies all the ideal requisites for a dental filling material and is useful for the *Tri services* - *Army* (Personnel deployed at high altitudes), *Air Force* (Supersonic military aircrafts) and *Navy* (Deep Sea divers and submariners) and for outer space applications of ISRO. The product won the Innovation and Creativity Award of the DGAFMS in 2023. As of now, Col Manu Krishnan has been granted with a Patent for the same from the Ministry of Commerce, Govt of India. Product is now slated for a Transfer of Technology (ToT).

Conclusion. The innovation is thus a world first response from India to the call given for the research of an ideal dental restorative by the WHO, UNEP, and international dental fraternity - Federation Dental International (FDI), International Association for Dental Research (IADR), International Federation of Dental Educators and Associations (IFDEA), Clinicians, Academia, Researchers, and Public Health Policy Makers.

**Acoustic Neuroma in a Commercial Airline Pilot:
Aeromedical Implications in Reflighting**

Ashu Chandra

Introduction. Vestibular Schwannoma (VS) is a benign tumor that originates from Schwann cells. It is most often found in the internal auditory meatus or cerebellopontine angle. Less frequently, intralabyrinthine localization (IL) can be found. These benign lesions usually present with progressive sensorineural hearing loss, tinnitus, and vertigo. Most of the

symptoms associated with Vestibular Schwannoma are of particular aeromedical significance directly impacting flight safety. Magnetic resonance imaging (MRI) allows a precise diagnosis of these tumors, also defining their exact location within the labyrinth. There are different classification systems based on size and extent of the tumour which help in determining the treatment modality and predicting the outcome. Currently, the treatment of VS may require radiosurgery or tumor removal surgery, and tumor follow-up with neuroimaging and vestibular functional tests. The management adopted is also significant in prognostic outcome and reflighting decision making.

Case. A 61 years old commercial airline pilot was incidentally detected with moderately severe Right sided hearing loss with no associated history of tinnitus, vertigo, imbalance or facial weakness. On further MRI Brain imaging he was diagnosed as a case of **Right Small Vestibular Schwannoma**. Later, he underwent Image Guided External Beam Radiotherapy (SRS technique). After being observed on ground for about 10 months he was granted restricted medical certification and allowed to fly as Pilot in Command with another Qualified Experienced pilot.

Discussion. In an aircrew with VS, his or her fitness to fly is determined by the symptoms, size of the tumor, balance, auditory status, complications arising out of treatment and the follow-up results of these findings. Management of VS ranges from conservative approach to invasive microsurgery or stereotactic radiosurgery with their own share of outcomes and prognosis. In a pilot, pre or post treatment features of VS such as vertigo, tinnitus, imbalance, intractable headache or dizziness are detrimental to aerospace safety. ICAO Manual of Civil Aviation Medicine (2012) 3rd Edition, Doc. 8984 recommends flying fitness only after complete surgical excision of the tumour. However, in this case the evidence based aeromedical decision was arrived at in contradiction to above guidelines, considering the tumor stage, symptoms, treatment modality and clinical features.

Impact of Otorhinolaryngological Disorders on Flight Safety– an ENT Assessment

Srujan Vallur, Sanjay Kumar, Jagadeeswaran V U

Background. Flight fitness is crucial to aviation safety, and otorhinolaryngological (ENT) disorders can significantly impact an aviator's ability to perform flight duties. Conditions such as barotrauma, vestibular dysfunction, chronic sinusitis, and chronic otitis media can impair auditory and vestibular function, increasing the risk of flight disqualification. This study evaluates the prevalence of ENT conditions among aviation personnel and their implications for flight safety.

Methods. This prospective observational study was conducted at a certified Aeromedical Evaluation Centre from January 2023 to December 2024. 100 civil aviation personnel underwent detailed ENT examination including nasal endoscopy, audiological evaluation, vestibular testing, imaging and aeromedical assessment per international guidelines. Associations between ENT conditions and disqualification risk were analysed using logistic regression.

Results. ENT disorders were identified in 42% of participants. Barotrauma was the most frequent (25%), followed by vestibular dysfunction (10%), chronic sinusitis (5%), and chronic otitis media (2%). Vestibular dysfunction was the strongest predictor of aeromedical disqualification (OR 4.2, 95% CI 2.5–6.8, $p < 0.001$), while barotrauma also significantly increased risk (OR 2.3, $p = 0.02$). Severe symptoms across all conditions conferred more than

a fivefold higher disqualification risk (OR 5.6, $p < 0.001$). Audiometry showed mild threshold shifts in barotrauma and vestibular dysfunction, whereas chronic otitis media caused clinically significant deficits (mean PTA 35 dB, 20% moderate-to-severe). Surgical therapy restored flight fitness in most cases of barotrauma (85%), sinusitis (90%), and otitis media (80%). Vestibular rehabilitation was most effective for balance disorders (80%).

Conclusions. ENT disorders are common among civil aviation personnel. Barotrauma is most prevalent, while vestibular dysfunction poses the greatest operational risk. Symptom severity, more than diagnosis, determines disqualification. Early surgical and rehabilitative management can restore aeromedical fitness, underscoring the need for standardized screening and preventive strategies.

Ocular Misalignment and Visual Fatigue in Attack Helicopter Aircrew: Case Series and Aeromedical Perspective.

Vikas Sharma

Background. Apache helicopter pilots are subjected to unique visual stressors due to prolonged monocular visual tasks and use of integrated helmet-mounted display systems (IHMDs). These systems can induce ocular strain, fusion disruption, and binocular vision issues. Intermittent exotropia—a form of strabismus where one eye occasionally drifts outward—is a significant concern in aircrew, as it can lead to diplopia (double vision), impair mission performance, and compromise flight safety.

Objective. To present and analyse three cases of intermittent exotropia in Apache helicopter pilots, highlighting clinical presentation, evaluation, management, and implications for aeromedical disposition.

Methods. Retrospective case series involving three serving flying personnel (F(P)) diagnosed with intermittent exotropia. All cases underwent evaluation by squint specialist and were managed based on severity, symptomatology, and occupational impact.

Results. All three pilots presented with binocular vision symptoms (diplopia, eye strain, outward deviation) during or after prolonged sorties. Two were diagnosed with basic type intermittent exotropia; one underwent surgical correction (lateral rectus recession). All were placed in low medical category (LMC) post diagnosis and continue under observation and specialist care. Symptoms were commonly exacerbated by prolonged use of monocular helmet systems.

Conclusion. Intermittent exotropia is an emerging occupational hazard among Apache pilots, potentially related to prolonged monocular viewing and visual fatigue. Early recognition, specialist evaluation, and appropriate management are essential. This condition poses a challenge to aeromedical fitness and necessitates refined screening and cockpit ergonomic considerations in rotary-wing platforms. These three cases merely represent the tip of the iceberg; the underlying situation is considerably more severe and warrants our serious attention

Scientific Session – XIV
Physiology of Atmosphere and Beyond
Chairpersons: Gp Capt MPS Marwaha, Col Yogendra Vidhani

From Earth to Orbit: Simulated Microgravity Induced Biphasic Intraocular Pressure Response Over 24 Hours

Manu N, Anupam Agarwal, Neha Rao, DR Bhatt

Introduction. Dry supine immersion (DSI) is a validated analogue for simulating microgravity and to induce physiological changes similar to the changes envisaged in microgravity, particularly rapid cephalad fluid shifts that may influence ocular hydrodynamics and intraocular pressure (IOP). This original study investigated the effect of 24-hour DSI on IOP in twelve healthy male volunteers, with serial measurements of both eyes taken at baseline and designated intervals using non-contact tonometry.

Methods. 12 healthy male subjects were exposed to simulated microgravity using Dry Supine Immersion (DSI). Their IOP was measured using an iCare IC 200 tonometer which measures IOP using rebound technology. The IOP was measured at 0,1,2,3,4,5,6,12,18,24 and after removing the patient from DSI tank. The IOP measurements were statistically analysed using repeated measure ANOVA in the IBM SPSS statistics 20 software.

Results. IOP showed a significant biphasic response in both eyes. The baseline values averaged 20.60 ± 4.14 mmHg (right) and 20.51 ± 2.55 mmHg (left), dropped sharply within the first 3 to 6 hours reaching values averaging between 15.77–16.13 mmHg. It remained suppressed through mid-exposure, and gradually recovered to near-baseline levels by 24 hours post-DSI. Repeated-measures ANOVA confirmed a robust main effect of time on IOP. The values were significant in both eyes in the right eye $F(3.97, 43.64) = 6.88, p < 0.001$, partial $\eta^2 = 0.39$. In the left eye left eye, $F(3.59, 39.48) = 7.89, p < 0.001$, partial $\eta^2 = 0.42$, with significant reductions at 1–6 hours versus baseline and symmetry between eyes. Post-hoc comparisons further supported the time-dependent nature of IOP changes, with resumption of normalization as early as 12 hours after exposure to simulated microgravity.

Discussion. These findings indicate that DSI induces rapid, reversible alterations in IOP, consistent with short-term microgravity exposure effects previously described in spaceflight and analogue studies. Such changes may reflect acute vascular and aqueous humor redistribution mechanisms. Understanding IOP fluctuations in microgravity analogues is critical for anticipating neuro-ocular risks during spaceflight and designing effective countermeasures for astronaut ocular health.

Effects of Simulated Microgravity on Central Retinal Artery (CRA) Dynamics and It's Correlation with Increased Optic Nerve Sheath Diameter (ONSD)

M K Sneha, Pradeep, B Sinha, S O George

Introduction: The recent momentum in the Indian Human Space program highlights the critical need for comprehensive data collection to support future space missions and to develop effective lifestyle countermeasures for space crew members. By elucidating the relationship between neuro-ophthalmic changes and intracranial pressure in dry supine

immersion, we can unravel the underlying mechanisms and devise strategies to mitigate adverse effects on astronauts' vision and overall well-being.

Aim: To examine neuro-ophthalmic response in simulated microgravity (Dry Supine Immersion-DSI).

Methodology: This was a prospective observational study with a repeated-measures design. The study was carried out at Department of Space and Env Physiology using Dry Supine Immersion Facility on 34 individuals (24 females and 10 males) from Jul 2024 to Jul 2025. The Optic Nerve Sheath Diameter (ONSD) and Peak Systolic Velocity of Central Retinal Artery (PSV-CRA) dynamics were recorded at 0 Hrs, 3 Hrs and 6 Hrs using Ocular Ultrasonography. IOP was also measured at these time intervals.

Results and Discussion: Significant temporal changes were observed across all three parameters, with ONSD showing the most pronounced and consistent increases (9.6% in females, 9.9% in males), IOP demonstrated a progressive decline, reaching a 12.4% reduction by 6 hours and PSV-CRA showed modest but significant early increases in females. Among these, ONSD changes were the most striking and consistent across both genders. The expansion of ONSD began within the first 3 hours of exposure and persisted through 6 hours, suggesting sustained elevation of optic nerve sheath pressure, serving as a surrogate marker for intracranial pressure.

Conclusion: This comprehensive analysis of ocular parameters during 6-hour simulated microgravity exposure provides crucial insights into the acute physiological adaptations underlying SANS development.

Effect Of Simulated Microgravity on Sensory-Motor System Using Computerized Dynamic Posturography

Preethi R, P Biswal, Stuti Mishra, S Dinakar

Background & Objectives. Postural instability following spaceflight is an inevitable concern; therefore, astronauts undergo physical and postural rehabilitation programs before being certified fit to resume routine activities post space flight. Some of these effects have been reproduced by long duration Head Down Bed Rest studies. However, information on effects of short duration HDBR on postural balance and stability is limited. The objective of this study was to determine the effects of 6-degree head down tilt on Computerized Dynamic Posturography parameters.

Methods. After informed consent, 17 healthy volunteers underwent baseline Computerized Dynamic Posturography (CDP) evaluation in form of sensory organization test (SOT), motor control test (MCT) & adaptation test (ADT). The tests were carried out using NeuroEquilibrium™ CDP equipment followed by which the participant underwent 6 hours of 6-degree head down tilt. Post head down tilt CDP parameters were collected. Normality of the data was statistically assessed using Shapiro Wilk test and paired t test was applied to all the normally distributed data and Wilcoxon signed rank test was applied to non-normally distributed data.

Results. No statistically significant differences were observed between CDP parameters in any of the tests (Sensory Organization Test, Motor Control Test and Adaptation test) pre and post 6-degree head down tilt of 6 hours duration. Participants developed symptoms of back pain, headache and nasal congestion during head down tilt.

Interpretation & Conclusion. 6 hours of 6-degree head down tilt test does not have any significant impact on the postural stability of a person. Since the main physiological effects of short duration head down bed rest studies are mainly due to impact of acute cephalad fluid shift, it may be inferred that acute fluid shift within 06 hours has no significant role in postural instability. This finding may have a bearing on short duration sub-orbital space flights.

Transcriptomic Profiling of C2C12 Cells Exposed to Microgravity and Radiation: Identifying Stress-Responsive Genes and Therapeutic Targets

Subhrajit Barua, Subhrajit Hazra

Introduction. Spaceflight, a unique condition marked by microgravity, ionizing radiation, circadian disruption, confinement, psychological stress, and altered nutrient intake, induces profound physiological changes. Skeletal muscle is particularly vulnerable with mitochondrial dysfunction, oxidative stress, and activation of DNA damage repair (DDR) pathways accelerating atrophy. Previous studies show suppression of PGC-1 coactivators and induction of RAD51/XRCC5-mediated repair. Identifying druggable molecular nodes within these pathways is critical for developing countermeasures against long-duration mission-related muscle loss.

Materials and Methods. C2C12 murine myoblasts were subjected to simulated microgravity (rotary cell culture system, 72 h) or low-dose γ -radiation (2 Gy, ^{60}Co source). RNA-seq data were analyzed using DESeq2 (FDR < 0.05, $|\log_2\text{FC}| > 1$) to identify differentially expressed genes (DEGs). Principal component analysis (PCA) was used to assess global variance, and Gene Ontology (GO) enrichment identified affected biological processes. Pathways were cross-referenced with known drug targets, including PPAR δ agonists, SIRT1 activators, and DDR modulators.

Results. Transcriptomic analysis revealed distinct signatures: simulated microgravity primarily downregulated mitochondrial biogenesis and oxidative metabolism genes, whereas radiation exposure upregulated DDR genes associated with homologous recombination and non-homologous end joining. PCA demonstrated clear separation between the two stress groups. Pathway mapping highlighted convergent oxidative and apoptotic signaling nodes with potential pharmacological intervention points.

Discussion. The findings confirm that microgravity and radiation activate unique yet complementary stress pathways in muscle cells. PGC-1/PPAR δ agonists or SIRT1 activators can address mitochondrial decline, while small-molecule repair modulators may optimize DDR hyperactivation.

Conclusion. Comparative DEG analysis of C2C12 myoblasts under spaceflight stressors identifies druggable pathways that can inform precision therapeutics to protect skeletal muscle in long-duration missions.

Evaluation of Impact of Fighter Index of Thermal Stress (FITS) Restrictions in Basic Trainer Aircraft and Ground Conditions Towards Prevention of Heat Stress in Aircrew

Srinivasa AB

Thermal stress in aviation is a combination of high ambient environmental temperature amplified by the cockpit greenhouse effect trapping radiant heat, heat generated by engine,

electrical circuits & avionics and metabolic activity of aircrew. The risk increases significantly in low altitude flying because of frictional forces between denser air at low altitude and the aircraft surface increasing the cockpit temperature. The capability of the aircraft to counter effects of high ambient temperature can vary with upgradation of technology of environmental cooling systems. When there is limited technology capability or lack of cockpit data precautionary measures are instituted like Stress Indices. Fighter index of Thermal Stress is one such index. In the present study we evaluated the impact of Fighter Index of Thermal Stress (FITS) restrictions in basic trainer aircraft and ground conditions towards prevention of heat stress in aircrew. Nine sorties (Trainer Aircraft-1: 4, Trainer Aircraft-2: 5) were flown and real time cockpit(c) and ground(gr) Dry bulb Temperature ($^{\circ}\text{C}$)-DB, Wet Bulb($^{\circ}\text{C}$)-WB and Cockpit WBGT/FITS were recorded & analysed during Ground Phase(GP), Ascent and Low Altitude (ALA), Medium Altitude Phase (MA), Descent & Circuit (DC), Post Landing Phase (PL) and all phases combined (AP). Data for cWBGT and FITS was separately analysed for medium (M-Alt) and low altitude (L-Alt) sorties. All parameters in c were significantly different compared to gr during AP with significant correlation between c & gr DB & WB for both Trainer Aircrafts 1 & 2. The parameters were significantly different with c values being significantly lesser compared to gr values for all the phases individually and LA & MA in Trainer Aircraft-1. The same was true for Trainer Aircraft-2 except DB and WB during GP where values were not different and $c > gr$ values respectively. Statistically significant linear regression equations were generated among parameters recorded in trainer Aircraft 1; $c\text{DB vs grDB}$ ($R^2=0.36$ -MA) in GP & DC, $c\text{WB vs grWB}$ in ALA & MA & Aircraft-2; $c\text{DB vs grDB}$ ($R^2=0.37$ -GP), $c\text{WB vs grWB}$ $c\text{WBGT vs FITS}$ in GP and MA phases, $c\text{WB vs grWB}$ & $c\text{WBGT vs FITS}$ in ALA phase and $c\text{DB vs grDB}$ in DC. The 15-min average cockpit WBGT values were all below 32°C for both aircrafts. The relative humidity values during ground to ingress and low altitude phases of Trainer Aircraft-2 were considerably higher in comparison to Trainer Aircraft-1. Based on the findings relaxation of FITS restrictions was recommended for low altitude sorties for Trainer Aircraft-1 and medium altitude sorties in both Trainer Aircraft-1 and Trainer Aircraft-2. The recommendations were valid for FITS: 36.3 - 41.6 for Trainer Aircraft-1 (low & medium level sorties) & FITS: 34.4 - 39.6 for Trainer Aircraft-2 (medium level sorties only).



ABSTRACTS

POSTER PRESENTATION

DAY 1: 20 NOV 25 (THURSDAY)

Poster Session – I

Noise-Induced Temporary Hearing Loss – From Exposure to Recovery Through Targeted Interventions

Drona Sharma, Deepak Khukkar

Background. Noise-Induced Hearing Loss (NIHL) causes temporary threshold shifts following loud noise exposure, primarily affecting cochlear outer hair cells through metabolic overstimulation. While typically reversible within hours to days, repeated exposure risks permanent damage. Common in occupational and recreational settings, early recognition enables preventive interventions including noise control, hearing protection, and routine audiological monitoring to preserve long-term auditory function.

Case Report. A 29-year-old army aviator experienced left ear fullness, tinnitus, and hearing loss after loud music exposure. Examination revealed intact tympanic membranes with Weber test lateralizing right. Pure tone audiometry at 10 hours post-exposure, dip was present in the 3 to 8 kHz range on a pure-tone audiogram. The aviator was grounded and proceeded on 30 days with conservative management including noise avoidance and hearing protection counselling. Follow-up audiometry at 38 days showed complete recovery, demonstrating reversible noise-induced temporary hearing loss and emphasizing early intervention's importance.

Discussion. Temporary Threshold Shift (TTS) is reversible hearing threshold elevation following intense sound exposure, warning of potential permanent damage. Noise-induced hearing loss affects 5% globally, with 44.4% prevalence among Indian Air Force personnel. Caused by noise exceeding 85 decibels, it creates cochlear stress affecting outer hair cells. This case demonstrates recreational TTS, highlighting aviation medicine's noise-related challenges and emphasizing early intervention importance. This case demonstrates NIHL's reversible nature through timely diagnosis and management. Grounding facilitated complete recovery, emphasizing early recognition and preventive education importance. Comprehensive hearing conservation programs and noise protection protocols are essential for maintaining aviator auditory health, safety, and operational excellence in high-risk aviation environments.

The Skin Microbiome in Space: A Narrative Review on Microbial Shifts and Dermatological Implications

Diksha Garg

Background. The human skin microbiome plays a pivotal role in cutaneous immunity, barrier function, and overall systemic health. Alterations in microgravity, radiation exposure, and closed ecological systems during spaceflight have been shown to significantly impact microbial communities on astronauts' skin, potentially predisposing them to dermatoses and

systemic infections. Recent studies indicate that microgravity can disrupt microbial equilibrium, leading to dysbiosis and altered skin homeostasis. However, comprehensive analyses focusing solely on skin microbiome changes during spaceflight remain sparse.

Objective. This narrative review aims to summarize and analyze current literature regarding the effects of spaceflight on skin microbiome.

Methods. A systematic search was conducted on PubMed using the keywords “skin microbiome” AND “spaceflight”. Inclusion criteria encompassed English-language original research articles, reviews, and case reports published up to July 2025. A total of 15 articles were selected that provided definitions for our key terms to compose a unified review.

Results. The reviewed literature suggests a consistent pattern of microbial shifts during and after space missions, characterized by reduced microbial diversity and proliferation of opportunistic pathogens such as *Staphylococcus aureus* and *Candida* species. Notably, several studies reported decreased abundance of commensal *Cutibacterium acnes* and *Staphylococcus epidermidis* post-flight. Environmental factors like spacecraft humidity, altered hygiene practices, and immune dysregulation were identified as key modulators. Moreover, parallels were drawn between spaceflight-induced skin dysbiosis and terrestrial conditions such as atopic dermatitis and chronic wounds.

Conclusion. Spaceflight exerts a profound influence on the skin microbiome, with potential repercussions on astronaut dermatological and systemic health. This underscores the necessity for developing targeted countermeasures, such as prebiotic or probiotic interventions, and integrating microbiome monitoring into long-duration mission health protocols. Further longitudinal, multi-omic studies are imperative to elucidate causal pathways and mitigation strategies.

Curious Case of Soft Tissue Mass Shoulder- Synovial Chondromatosis Vs Chronic Synovitis of Shoulder Joint in Young, a Clinic-Histological Diagnostic Dilemma.

Mainak Das

Objective. Soft tissue mass limiting activity in a young individual needs multidisciplinary approach with various diagnostic modalities. However, contrasting perioperative opinion regarding aetiology makes treatment difficult. The occurrence of synovial chondromatosis or chronic synovitis in shoulder is relatively rare and this demonstrates the challenges in diagnosis and the importance of review of differential diagnosis and multidisciplinary approach for managing such cases.

Result. With methodological multidisciplinary approach, patient with surgical excision and further clinico-radiological follow up showing significant improvement in 2 years follow up despite dilemma in histological diagnostic confirmation.

Conclusion. A comprehensive approach while diagnosing soft tissue masses to be employed including adopting an extended culture criteria for all biopsy specimen to rule out any less virulent infective etiology.

A Study of the Stability of Biochemical Analytes in Serum of Healthy Population and Its Aeromedical Significance

Ashwini Kumar, Amrinder Singh A

Background. Errors in the lab at preanalytical phase contribute to a significant number. This type of error can be minimized by subjecting sample to a proper storage and transport. Any variation in the storage condition may lead to erroneous result.

Methods. 51 healthy personnel were included in the study. Total of 5 aliquots of serum was made. 2 aliquots were kept in refrigerator at 4 degrees Celsius and 2 aliquots were kept at room temperature. Analysis of all the analytes urea, creatinine, sodium, potassium, lactate dehydrogenase (LDH), Calcium, phosphorous, uric acid and total cholesterol were made within 1 hour of serum separation. Second analysis of all the analytes were made after 5 hours of serum separation from both the aliquots kept at room temperature and in refrigerator similarly third aliquots from refrigerator and room temperature were analysed after 24 hours of serum separation.

Results. Urea, creatinine, LDH, uric acid and total cholesterol did not show any statistically significant variation in the values when stored at room temperature up to 24 hours or is refrigerated at 4-degree Celsius up to 24 hours. Values of total protein, potassium, sodium, calcium and phosphorous showed statistically significant changes

Conclusion. Urea, creatinine, LDH, uric acid and total cholesterol analytes can be analysed without any compromise when stored at room temperature up to 24 hours or is refrigerated at 4-degree Celsius up to 24 hours. Values of total protein, potassium, sodium, calcium and phosphorous showed statistically significant changes. Since IAM Bangalore is dealing with medicals of serving aircrew, civil pilots, candidates medicals for fitness, AME for officers and other, all these procedures undergo various lab investigations and knowledge of stability of routine biochemical analytes will help in various decision makings during final medicals of these personnel.

Lingering Symptoms Following Exposure to Simulated Hypobaric Hypoxia

Deepan Rai, SS Mohapatra, Ranjan Sarkar, Manu N

Introduction. The term "hypoxia hangover" refers to the effects of hypoxia that may persist and linger even after exposure to hypoxia has ended and oxygen saturation levels have returned to normal. This study assesses the time duration of hypoxia hangover in terms of subjective symptoms after exposure to simulated hypobaric hypoxia.

Material and Methods. This study was conducted in the Department of High Altitude Physiology and Hyperbaric Medicine, Institute of Aerospace Medicine, Bengaluru. A total of 30 healthy volunteers (25 male and 05 female) aged between 20 to 40 years participated in this study. Lists of 33 common symptoms of hypoxia were prepared. All subjects were briefed about the process of marking it. Prior to exposure to hypoxia, they were asked about any existing symptoms, and only subjects without any symptoms were exposed to simulated hypobaric hypoxia at 25,000 ft for 05 minutes. Hypoxia symptoms questionnaire was administered during exposure, after reaching the ground, and every hour for another 05 hrs.

Results. Out of 30 participants, 86.60% developed symptoms of hypoxia during exposure, with the percentage declining gradually. At 0+5h, 23.30% still had symptoms of hypoxia. After exposure, the participants mostly had mild symptoms. The most common symptoms reported by participants were light-headedness, unable to concentrate, fatigue, and dizziness.

Discussion. Various effects of hypoxia during exposure are well known and researched. Post exposure, the lingering effects of hypoxia are yet to be explored. In this study significant number of participants had lingering symptoms of hypoxia post exposure. The existence of the phenomenon of hypoxia hangover has aeromedical implications and ramifications.

Conclusion. This study has demonstrated the lingering symptoms of hypoxia after cessation of hypoxia and restoration of oxygen saturation to normal, also termed as 'hypoxia hangover'

Measurement of Peak Sound Levels at an Operational Airstrip: Aeromedical Concerns & Mitigation Strategies

Shruthi B Chandran, Polash Sannigrahi, Gaurab Ghosh

Introduction. Noise is a known aviation stressor in air bases conducting high performance aircraft activities. Hence, it is paramount to detect the exposure of noise level in the personnel associated closely with aircraft operations as well as compare it with existing standards of occupational guidelines.

Material & Methods. M Labs HT-80A Sound Level Meter of range 30-130 dB was used to record the sound levels. Four dispersals (02 fighter and 02 helicopter squadrons) and runway end were chosen for sound level measurements. The phases of flight wherein the sound levels were recorded were: engine start-up, take-off, landing and taxiing back from runway (in fighter aircrafts)/ hover (in helicopters) and take-off and landing at runway end. The time duration and peak observed values at each location were categorised and compared as per standard guidelines.

Results. The maximum peak in sound levels (111.76 dB for 1.52 minutes) was identified in the runway end during take-off. The next peak was observed at the helicopter dispersal (107.54 dB for 02 min) during helicopter hover prior to forward acceleration.

Discussion. The runway end recorded the highest sound level peak during take-off affecting personnel at runway controller hut. The next peak was noted during helicopter hovering, due to the Main Gear Box (MGB) and the main rotor blades producing most of the noise. Though no personnel working close to these locations reported having NIHL, it is essential to encourage ear protection during all aircraft operations for better ear health. Utilizing the levels of prevention effectively can help mitigate risks and prevent undesirable outcomes of noise. Strict adherence to Hearing Conservation Programmes and utilization of Artificial Intelligence would be helpful in mitigating these issues.

Conclusion. This study into the exposure of noise levels in an operational airbase sheds light onto the degree and possible effects of acoustic exposure in major operational areas. Results show that noise levels at operationally active locations could endanger hearing and general health of the personnel if adequate protective measures are not undertaken. The findings highlight the pressing need for effective noise control strategies such as use of PPE, planning of high-volume events, etc. To reduce long-term health hazards and guaranteed adherence to workplace safety regulations, regular monitoring, spreading awareness and training initiatives are recommended. Future research should investigate novel methods for noise reduction in high-risk areas and take into account the cumulative effects of noise exposure.

HBOT as Silver Lining in Era of Antibiotic Resistance.

Divya Singh, C S Mohanty, Rohit Verma, Subhranshu Kumar.

Hyperbaric oxygen therapy (HBO) is administering medical grade oxygen 99% oxygen at a pressure of not less than 2.0 atmosphere absolute. HBO is used as an adjunct or primary therapy in various disease ranging from decompression sickness, air/ gas embolism, CO poisoning, clostridial myositis ,crush injury, arterial insufficiencies, severe anaemia, intracranial abscess, necrotizing soft tissue infections, osteomyelitis, delayed radiation injury, compromised grafts and flaps, acute thermal burns, SNHL, AVN, while hyperbaric oxygen therapy is upcoming branch in medical field its use is restricted by non-availability of randomised control trial. Hyperbaric oxygen therapy (HBOT) is increasingly being used as an adjunct treatment across a variety of chronic and infectious conditions due to its ability to enhance tissue oxygenation, promote healing, and support immune function. This case series highlights the therapeutic impact of HBOT in diverse clinical scenarios. A patient with skull base osteomyelitis complicated by MRSA infection, diabetes, and chronic otitis media was treated with intravenous broad-spectrum antibiotics and Caspofungin, alongside HBOT, leading to clinical improvement. Similarly, HBOT proved effective in patients with Hansen's disease, including cases with foot drop and Lepa 2 reactions, where it contributed to symptom resolution and functional recovery following 20–30 treatment sessions. Additionally, two female patients with radiation cystitis—one with a history of cervical cancer—underwent 20 HBOT sessions, resulting in notable symptom relief, including reduced urinary discomfort and infection control. These cases collectively demonstrate the versatility of HBOT as a supportive therapy, particularly in conditions marked by chronic inflammation, infection, or impaired tissue healing. While HBOT is not a primary treatment modality, its adjunctive use has shown favourable outcomes and highlights its potential role in integrated care strategies for complex or refractory cases. Further studies are warranted to establish standardized protocols and broader clinical guidelines. Also emphasising on antibiotic resistance and how use of HBOT can help in preventing antibiotic resistance. Further, review of literature has emphasised HBOT's use in treating infected wounds.

Comparative Analysis of Knowledge, Attitude, and Practice Pretest and Posttest on Hyperbaric Oxygen Therapy Among Healthcare Professionals

Renny Justine

Introduction. Despite established clinical applications, HBOT remains underutilized due to limited awareness among healthcare providers. KAP studies provide insight into readiness for adopting such therapies. This study evaluated the impact of a structured educational intervention on the knowledge, attitude, and practice (KAP) related to HBOT among nursing officers and cadets. This study aimed to assess pre- and post-intervention changes in KAP toward HBOT.

Materials & Methods. A quasi-experimental pretest-posttest design was conducted among 50 participants (nursing officers and cadets) at a tertiary care center. A validated questionnaire assessed three domains: knowledge (5 MCQs), attitude (5 Likert-scale items), and practice (5 Likert-scale items). A structured teaching session on HBOT was delivered, and responses

were analyzed using percentage improvement for knowledge and mean score changes for attitude and practice.

Results. Knowledge improved significantly in clinical applications (+27.6%) but declined in awareness of side effects (-19%). Attitude scores showed marked improvement, particularly belief in HBOT effectiveness (+2.18). Practice scores indicated increased willingness to recommend HBOT (+0.65) and improved self-reported understanding (+1.63).

Discussion. The findings demonstrate that structured educational interventions enhance HBOT-related KAP among nursing staff, consistent with earlier studies. However, reduced knowledge of side effects highlights the need for balanced teaching that equally emphasizes benefits and risks. Incorporating interactive modules and refresher training may strengthen retention.

Conclusion. Targeted educational interventions significantly improve awareness and acceptance of HBOT among nursing professionals. Embedding HBOT education into nursing curricula and continuing education programs could support wider clinical integration.

Poster Session – II

Prediction of Human Lung Parameters During Simulated Push Pull Maneuvers of Modern Aircrafts

Munna Khan, Sumaiya Khan, Kashif Islam Khan Serwani

Introduction. Pilots of modern fighter and aerobatic aircrafts are subjected to intense difficulties when a -Gz maneuver (push) is performed before a +Gz maneuver (pull). Push-pull maneuver (PPM) responsible for accidents involving G-induced loss of consciousness (G-LOC) may cause physical stress to lung tissues. Human lung capacity (HLC) affecting oxygen transmission to the brain may be life threatening to the pilots. An attempt has been made to assess HLC of human volunteers during simulated PPM.

Material And Methods. The PPM was simulated using tilt table keeping head down and legs up of human volunteers as Push. Inversion of human body simulated as Pull. The 25 healthy subjects were enrolled with age range 21 to 27 years and RMS Helios 401 PC based spirometer used to measure forced vital lung capacity (FVLC) of the subjects. The spirometer data was recorded during four distinct positions: sitting, supine, Push, and Pull positions. Artificial Intelligences (AI) Ridge Regression (RR) and Support Vector Regression (SVR) techniques were applied using python software.

Results. A relationship established in the graphical form between predicted and recorded FVLC values during PPM. The Various analysis yielded a drop of 10.70% in the FVLC during transition from the sitting position to the Push position compared to Pull position. The difference was obtained as 12.27 % in the FVLC during the simulated PPM.

Discussion. Trained model estimated Push spirometry values from Pull values of human volunteers. The model may eliminate testing need of the pilots in Push maneuvers. The results may be used to refine fitness assessments of an of aircraft pilot during high-G maneuvers. Future research should focus on expanding sample size to include more diverse pilot population.

Conclusion. Output of research works done yielded relationship between phases of PPM and HLC parameters. A novel application of AI techniques has been explored in the field of aerospace medicine.

How far will you venture within Heliosphere & beyond!!

S Jhariya

As we are under constant threat from few known & largely unknown variable sized asteroids & comets, so to ensure continued survival of mankind, we are bound to explore extra-terrestrial locations for colonization. These locations may be within heliosphere or beyond it. The sun sends out a constant flow of solar material called the solar wind, which creates a bubble around the planets called the heliosphere. The heliosphere acts as a shield which protects the planets from interstellar radiation. As one moves far enough away from the Sun, the pressure of the solar wind drops to where it can no longer maintain supersonic flow against the pressure of the interstellar medium, at which point the solar wind slows to below its speed of sound, causing a shock wave. Further from the Sun, the termination shock is followed by the heliopause, where the two pressures become equal and solar wind particles are stopped by the interstellar medium. Except for regions near obstacles such as planets or comets, the heliosphere is dominated by material emanating from the Sun, although cosmic rays, fast-moving neutral atoms, and cosmic dust can penetrate the heliosphere from the outside. The heliopause is the final known boundary between the heliosphere and the interstellar space which is filled with plasma from other stars. Heliosphere is filled with solar magnetic fields and the outward-moving solar wind consisting of protons and electrons. The shape of the heliopause fluctuates and is influenced by a wind of interstellar gas caused by the Sun's motion through space. The Heliosphere is the area under the influence of the Sun; the two major components determining its edge are the heliospheric magnetic field and the solar wind from the Sun. Frequent meteorite impacts, high-energy solar radiations, solar flares & galactic cosmic radiations constitute constant hazards during space voyage. Since heliosphere is constantly moving around galactic center, we need to make great calculations in planning & executing our space voyages. Para terraforming is a process of making a part of any celestial object, suitable for human survival. It is required to ensure continued existence of our civilization. For efficient & speedy transportation of crew and cargo from Earth/Moon/Mars/Asteroids and vice versa; 'great tech'nological advancements are prerequisite. Asteroids' bases could be a site for launching rockets with locally manufactured fuel to further planets and beyond. In two decades, we might witness "first selfie from ground zero" beyond Heliosphere!!

Autonomous Diagnostics and Biosensing in Astronaut Health Monitoring: Innovations in Aerospace Medicine

Shreya Manjusha Santhosh

Introduction. Human space missions pose distinctive health risks in microgravity, space radiation, and constrained access to in-flight medical facilities. Preventive diagnosis, ongoing monitoring, and prompt treatments are needed to maintain the health of astronauts. Biosensors with capabilities suitable for microgravity environments can continuously monitor

the health of astronauts in real time with minimally invasive techniques. For instance, multimodal sensor arrays implanted in flexible wearable systems can provide continuous surveillance of health and early anomaly detection in cardiopulmonary function, neuromuscular performance, and circadian rhythms.

Scope & Objectives. The current review evaluates current advancements (2015–2025) in aerospace medicine-dedicated biosensing technology, with a focus on wearable and portable devices for health monitoring and clinical assistance during spaceflight. Specifically, the idea of a Precision Space Health system, a stand-alone, AI-based biomonitoring and analytics platform has appeared as a major paradigm.

Methodology. A systematic literature review was conducted for the years 2015 until the first half of 2025. Terrestrial application-limited studies were excluded.

Observations. Notable recent developments include miniaturized flexible biosensors for multi-analyte detection, space telemedicine integration, and predictive analytics using artificial intelligence. For example, ESA is creating an optical biosensor with replaceable probes for on-line biomarker detection in microgravity. Similarly, sophisticated wearable devices with innovative materials, electronics, and algorithms are being developed for real-time monitoring of astronaut health. Cardiovascular health biosensors, metabolic profiling, and radiation exposure are highly promising. Time-resolved metabolite analysis in astronauts' blood and urine demonstrates how personalized monitoring can monitor immune and metabolic changes during long missions. Likewise, CRISPR-based diagnostics provide a frontier technology for rapid point-of-care testing in microgravity.

Discussion. There are still open issues of calibration in microgravity, sample handling of biological samples, regulatory clearance, and sparse long-term validation. Research groups have also provided experimental devices for non-invasive space disease diagnosis with possible autonomous space clinics.

Conclusion. Future research must focus on autonomous, closed-loop biosensing systems, extended performance validation in microgravity, and flight health care operations integration. Research in this area not only enhances astronaut health monitoring and mission safety but also has potential to advance terrestrial digital health technologies beyond space exploration limitations.

Ocular Injury in Aircrew Due to Shuttlecock - A Case Report

Tushendra Singh Rana

Introduction. Physical activities and sports help aircrew to develop confidence, lead more satisfying lives, and reduce their risk of developing chronic illness. But unfortunately, if aircrew do not take appropriate measures, they can end up in avoidable sport injury.

Case details. 36 years old helicopter pilot who was deployed in high altitude area sustained injury to right eye with shuttlecock. He developed pain, redness, and blurred vision in right eye. Because of persistent raised intraocular pressure, he was unfit for flying duties for approximately 20 weeks.

Discussion. Badminton is the second most popular sport worldwide. It is the most favoured sport in Armed Forces, as it can be played indoor as well as outdoor with minimum infrastructure. However, if proper precautions are not taken, Shuttlecock can cause injuries to eye due to its high velocity. Most of the cases develop hyphaemia (collection of blood in anterior chamber of eyes), with some patients developing impaired vision due to macular edema, traumatic cataract, or glaucoma.

Conclusion. Aircrew should be more careful, when indulging in sports activities. Any injury can make them unfit for flying duties for variable period depending on the severity of the injury, and may affect the operational role of the flying squadron.

Bariatric Surgery for Indian Obese Soldiers: Reshaping their SHAPE!

Shrirang Vasant Kulkarni

Introduction. The Indian Armed Forces is an extremely fit fighting force. However, due to some factors like injuries or lack of physical activities, a very small percentage of serving population, who fall under the morbidly obese category, is offered bariatric surgery if diet changes and exercises fail to achieve satisfactory weight reduction. In the absence of a study to look into this cohort of Indian obese soldiers who have undergone bariatric surgery, a need is felt to estimate the effects of bariatric surgery on Body Mass Index (BMI), co-morbidities and employability of these soldiers.

Methods. This is a retrospective study of medical records of Indian obese serving soldiers, who underwent bariatric surgery over a ten-year period at a service hospital with super specialty services and followed up for a period of minimum of a year after the surgery.

Results. The study included a total of 35 serving soldiers. Their mean body weight and BMI reduced significantly as compared to the pre-operative status. Though there was a significant improvement in the control of diabetes mellitus ($p < 0.001$) and obstructive sleep apnoea ($p = 0.002$); hypertension, though fared better, failed to achieve a statistically significant value ($p = 0.074$) after the surgery. Twenty-eight (80%) of soldiers not only got a promotable medical category, but also returned back to the active military duties.

Conclusion. Bariatric surgery stands as a valid option for management of serving morbidly obese soldiers in the Indian Armed Forces with good clinical outcomes and no major morbidity and mortality in the 30-day post-operative period.

AED with ECG Monitoring Onboard: Advancing In-Flight Medical Response Readiness

Shagufta Hasnain

Introduction: Sudden cardiac arrest remains the leading cause of in-flight medical deaths, accounting for up to 70 percent of aircraft diversions worldwide. Early defibrillation is the single most critical determinant of survival, yet current in-flight response is limited by the absence of real-time cardiac rhythm analysis. Conventional automated external defibrillators (AEDs) onboard commercial aircraft are designed only for automated shock delivery and lack ECG monitoring capability, restricting diagnostic insight during prolonged or non-shockable events.

Materials and Methods: This paper examines the feasibility and clinical advantages of introducing ECG-enabled AEDs in commercial aviation. Drawing on international literature, operational case reviews, and comparative analysis of commercially available models (Philips HeartStart FR3, Defibtech Lifeline ECG, ZOLL AED Pro, LifePak 1000), it evaluates functionality, certification compliance, cost, and operational suitability for airline use.

Results: Evidence from the U.S. National Library of Medicine (2023) shows that in 129 in-flight monitoring cases, ECG-capable AEDs detected sinus rhythm, atrial fibrillation, and heart block with no inappropriate shocks or deaths reported. Global adoption by Delta, United, American, and Lufthansa demonstrates clinical utility and operational feasibility.

Discussion: Continuous rhythm monitoring would enable inflight physicians and ground-based doctors to document cardiac activity, detect arrhythmias, and make informed diversion decisions especially during long-haul, multi-crew operations. Cost-benefit analysis indicates that the modest price increase (₹1.5–2.5 lakh vs ₹1 lakh) is outweighed by improved safety, reduced diversions, and medico-legal clarity.

Conclusion: Integrating AEDs with ECG display bridges the gap between automated defibrillation and informed medical assessment. Pilot implementation across Indian carriers could substantially strengthen in-flight medical preparedness and set a new benchmark for readiness in Indian civil aviation.

Case Report: Atrial Septal Defect in a Prospective Pilot

Nikeata Jha, G Harshavardhan

Introduction. Atrial Septal Defect (ASD) is one of the commonest congenital cardiac anomalies and may remain clinically silent until detected incidentally. While many small ASDs are well tolerated, larger defects can predispose to arrhythmias, right heart dilatation, pulmonary hypertension, and paradoxical embolism. For aviation, even asymptomatic lesions are important because they may affect cardiovascular performance under hypoxia, G-forces, or during rapid decompression. This case highlights how routine aeromedical evaluation can reveal such conditions in apparently healthy young aircrew candidates.

Case Details. A 17-year-old male candidate for Class-2 DGCA medical certification was incidentally found to have an ASD during his initial medical examination. He had no history of breathlessness, palpitations, fatigue, tiredness or syncope, and his general physical and cardiac examination were within normal limits. The abnormality was suspected during his Class-2 medical examination, when he was evaluated for ECG abnormality. On evaluation, he was found to have Ostium Secundum ASD with left-to-right shunt and evidence of right atrial and right ventricular dilatation. He underwent transcatheter device closure without complications, and follow-up echocardiography confirmed well-seated device position, no residual shunt, and normalization of chamber dimensions. Current ICAO and DGCA guidelines allow medical certification after successful closure provided there is no residual shunt, pulmonary hypertension, or rhythm abnormality. In this case, device closure effectively restored cardiac physiology and eliminated the associated risks. The candidate was advised a defined period of grounding with cardiology follow-up before re-consideration for certification.

Aeromedical Significance. This case underlines the importance of thorough evaluation even in an apparently asymptomatic individual, in identifying occult congenital heart disease in young applicants. It also demonstrates how multidisciplinary management - timely cardiological intervention and structured aeromedical review - can enable otherwise fit candidates to safely pursue flying career.

Aeromedical Deliberations in Reflighting An Aircrew with Pulmonary Embolism

Aman Arya

Introduction. Pulmonary embolism (PE) is a potentially life-threatening condition caused by a thrombus in the pulmonary arterial vasculature. It can present with sudden incapacitation in-flight along with unique aeromedical challenges due to the risk of recurrence and complications from long-term anticoagulation which is a concern for aerospace safety. This case report outlines the aeromedical considerations for a pilot following a sub-massive (intermediate-risk) PE, with focus to *bring pilot back to the cockpit* – the primary motto of Aerospace Medicine ensuring Aerospace Safety.

Case Details. A 41-year-old serving aircrew, with a history of left femoral vein Deep Vein Thrombosis (DVT) in 2009 [managed with a 6-month course of oral anticoagulants (OACs) and subsequently upgraded to full flying category in 2011], presented with dyspnoea on exertion progressing to NYHA Class IV. This was associated with tachycardia, tachypnoea, and a loud P2. Investigations revealed ECG: Sinus tachycardia, S1Q3T3 pattern, Chest X-ray: Decreased vascular markings, 2D-Echo and CTPA: Bilateral segmental and lobar PE with right ventricular dysfunction. Management included initiation of Apixaban [Direct Oral Anticoagulant (DOAC)], later switched to oral Aspirin in 2018. In August 2022, lupus anticoagulant (APTT-LA & DRVVT) tested positive, leading to medical grounding. The executive report on flying showed no in-flight discomfort, but the aircrew remained symptomatic until February 2024, when he presented with chest pain. Evaluation at that time was unremarkable, and he was discharged. He has remained asymptomatic since then.

Discussion. The aeromedical decision depended on favourable factors such as Uneventful recovery, Stability on anticoagulation, Absence of in-flight symptoms, Low risk of complications, Balanced against adverse issues, Positive lupus anticoagulant profile, Episode of atypical chest pain. Despite being declared unfit for HAA (High Altitude Areas) and ECC (Extreme Climate Conditions), the aircrew was posted in an area predisposed to thromboembolic disorders. Focused monitoring and comprehensive education on DVT prevention during travel (hydration, leg exercises) were emphasized. Delay in obtaining the executive report further prolonged medical board proceedings, contributing to loss of flying hours.

Conclusion. Aircrew with a history of PE can be safely returned to flying duties following comprehensive aeromedical evaluation, provided they achieve an uneventful recovery period, demonstrate stability on approved anticoagulation, and show no residual complications. Strict adherence to medical board recommendations is essential, and executive report requirements should be expedited to minimize unnecessary grounding and operational loss.

DAY 2: 21 NOV 25 (FRIDAY)

Poster Session – III

HBOT In Sports Injuries

Pallavi Goswami

Introduction. Hyperbaric oxygen therapy (HBOT) is a medical treatment where a patient breathes 100% oxygen in a pressurised chamber, increasing the amount of oxygen in blood and tissues. This increased pressure allows more oxygen to dissolve in the blood plasma, which can be delivered to tissues to promote healing, fight infections and reduce inflammation.

Scope and Objectives. For high performing athletes, sports injuries can side-line careers and activities. Recovery from sports injuries can take months. HBOT can be used for mild to moderate TBIs (traumatic brain injuries) by promoting tissue repair, recovery, oxygen delivery to the brain, promoting healing, improving neurological function and cognitive outcomes. Non-brain injuries like cartilage/ tendon/ ligament/ bone injuries can hamper mobility. These tissues (cartilage, ligaments, tendons) are not supported by a robust vascular bed, thus limiting recovery rates. Bone repair and bone grafting are greatly enhanced using HBOT, thus enhancing a rapid repair of the fracture or bone stress.

Methodology. HBOT treatment prior to surgery can improve surgical outcomes and decrease recovery time. Eg: ACL reconstruction. Pre-surgery HBOT treatment can prepare the wound-site by reducing inflammation and swelling/ edema. These benefits are carried forward after surgery and by repeated treatment with HBOT. In cases where surgery compromises or partially blocks the blood supply of surgical site, HBOT can decrease the amount of reperfusion injury and spare compromised tissue.

Observations. In order to increase the odds of a successful recovery from injury, sports medicine and hyperbaric community have been employing HBOT to help accelerate healing and reduce the time to recovery.

Discussion and Conclusion. While HBOT can be a valuable treatment for various conditions, it is often a part of a comprehensive treatment plan and not a standalone solution.

Yoga for Improving the Cardiovascular Health of Astronauts

Kushal Madan

The human body is used to function under a constant vertical force of one earth gravity, our heart pumps blood against it. Change in the gravitational force, as is the case with astronauts living in the microgravity of space leads to many changes in the cardiovascular system. There is a shift in autonomic balance leading to alterations in the heart rate & Rhythm and orthostatic intolerance. Autonomic dysfunction is an important problem after human beings are exposed to microgravity. Knowledge about autonomic neural functions in space is very useful to develop effective countermeasures for gravity dependent autonomic dysfunctions. I visited Ames Psychophysiology laboratory NASA in Nov'2018 to observe the setup of Autogenic Feedback Training Exercise (AFTE). AFTE is a training method which involves teaching

subjects to voluntarily control several of their own physiological responses to environmental stressors. If astronauts are trained to voluntarily control their own physiological responses, it will accelerate the physiological adaptation and improve the performance. This is exactly what Yoga does. In fact the proposed mechanism underlying the beneficial effects of yoga that is shift the autonomic nervous system balance is similar to the technique of Autogenic Feedback Training Exercise (AFTE). Yoga practices shift the autonomic nervous system balance from sympathetic to parasympathetic possibly via vagal stimulation. Increased parasympathetic activity can also improve neurohormonal, hemodynamic and inflammatory profiles like reduction in heart and respiratory rate, cortisol and catecholamine concentration, rennin activity, skin conductance as well as increase in heart rate variability and improved baroreceptor activity. Thus, yoga can be used as an effective countermeasure for gravity dependent autonomic dysfunctions and Yoga practice may provide options that can be added to improve the astronaut's cardiovascular health.

Case Report: A Rare Case of Congenital Right-sided External Auditory Canal Atresia – An Approach to Aeromedical Disposition

Manish Kharub, Shikha Gianchand

Introduction. Congenital External Auditory Canal (EAC) Atresia is a rare developmental malformation in which the external auditory canal fails to form, often accompanied with microtia (auricular hypoplasia) resulting in conductive hearing loss on the affected side. Since hearing standards for aircrew entails adequate bilateral auditory function and incidence of such a clinical entity is very rare in aviation environment, EAC atresia presents a unique aeromedical challenge.

Case Details. A 21-year-old female civil pilot aspirant for DGCA Class-1 initial medical examination was found to be a known case of congenital right-sided EAC atresia, with history of undergoing two cosmetic pinna reconstruction surgeries. On comprehensive evaluation, pure tone audiometry revealed moderate conductive hearing loss on the right side (40–50 dB) with complete bony atresia of the external canal and preserved normal hearing on the left side. Tympanometry and middle-ear pressure testing could not be performed on the right side due to complete atresia and clinically, the patient denied otalgia, vertigo or any significant history of ear infections. The hearing loss in right ear exceeded the hearing loss threshold as per ICAO mandate in Class-1 medicals, necessitating further aeromedical consideration.

Discussion. Congenital EAC atresia typically produces unilateral moderate conductive hearing loss, often compensated by contralateral hearing. However, diagnostic limitations arise from inability to evaluate tympanic membrane integrity or pressure-equalizing mechanisms in the atretic ear. Further, long-term risks include cholesteatoma and if surgically managed, complications such as canal restenosis, graft failure, facial nerve injury or ossicular injury are a possibility. This case study highlights the operational and regulatory considerations of unilateral EAC atresia in an aspiring aviator – a clinical entity rarely encountered.

Aero-medical Implications. Current aerospace medicine regulations emphasis on flight safety by demonstration of adequate functional hearing but do not explicitly address unilateral complete EAC atresia. Although well-preserved contralateral hearing may allow satisfactory cockpit communications, concerns persist regarding risk of otitic barotrauma, failure to screen middle-ear status and reduced sound localization. This case study underscores the

importance of periodic ENT surveillance in such cases along with individualized assessment and functional testing.

Conclusion. This rare case of unilateral congenital EAC atresia in an aspiring aviator highlights critical considerations at the interface of otolaryngology and aerospace medicine. While clinical management is well described in otolaryngology literature, aeromedical implications remain underreported due to its rarity and complexity, bestowing a unique disposition challenge.

Personality Assessment of Flight Cadets Undergoing Pilot Course using IPIP-Neo Personality Inventory

Meghna

Introduction: Pilot personality affects various aspects of aviation and assessment of personality traits during induction or flying training can be useful to provide insights about success of flying training and assignment of various streams of aviation ie fighters, helicopters and transports. This study aims to understand whether personality traits are associated with successful completion of flying training, stream assignment and gender differences in traits.

Aim: To assess the personality traits of flight cadets undergoing pilot course using IPIP-Neo personality inventory.

Objectives: Following are the objectives of the project; a) To look for the Big Five personality factors amongst flight cadets. b) To compare Big Five personality traits amongst successful and unsuccessful flight cadets. c) To compare Big Five personality traits among stream assigned to flight cadets at end of stage-I. d) To compare any gender differences in Big Five personality factors.

Materials and Methods: This prospective cross-sectional study analysed IPIP-NEO-120 questionnaire data from flight cadets undergoing Pilot Flying Training at the Air Force Academy. Personality traits amongst cadets were analysed Cadets were grouped into various aircraft streams – Fighters, Transports and Helicopters on basis of Trifurcation Board, successful and unsuccessful flying training and according to gender. Statistical analysis included Descriptive analysis, Mann-Whitney U tests for trait comparisons, Kruskal-Wallis Test for more than two groups, post hoc test were applied to check for association.

Results: Average flight cadet personality showed high extroversion, average conscientiousness, openness, neuroticism and low openness. Unsuccessful cadets had higher impulsiveness and emotions than successful cadets. Females were different from their male counterparts in having high extroversion and low neuroticism. Statistically significant difference was found between three aircraft streams cadets; however, the effect size was small.

Discussion: Various studies have concluded that pilot personality consists of high extroversion, which has also been concluded in this study. Female aviators have been shown to have high extroversion than male pilot population which has also been found in this study. Differences in personality traits of fighter, transport, helicopter stream cadets have not been found in review of literature.

Giant Cell Tumour in A Helicopter Pilot – Aeromedical Consideration for Flying

Ashok B Warthe

Introduction. Giant Cell Tumours (GCT) of bone are the most challenging benign bone tumours having a tendency for significant bone destruction, local recurrence and occasionally metastasis.

Case Details. A young helicopter pilot presented with pain in left wrist for 03 months and was evaluated with X-ray Lt wrist suggestive of epiphyseal lytic lesion at distal end of Lt Ulna. His MRI was suggestive of aggressive neoplastic bony lesion most likely Giant Cell Tumour and few 2-4 mm nodules seen in lateral segment of Rt middle lobe, apical segment of lower lobe of lung. He received neoadjuvant chemotherapy followed by wide local excision with bone grafting. He had recurrence which was managed with implant removal plus wide local excision of GCT along with plating of proximal ulna.

Discussion. Most GCTs of bone are solitary lesions located within the epiphyses of long bones with most common involvement of distal femur, proximal tibia, proximal humerus and distal radius. Pain is the most common presenting symptom. Intralesional surgical procedures remain the treatment of choice for most GCTs. Relapse may be associated with new pain or swelling, therefore, long term monitoring with serial physical examinations and radiography of the involved site and of the chest is recommended.

Conclusion. After observing the aircrew in non-flying category for 03 years and declared disease free by tumour board, he was evaluated at Institute of Aerospace Medicine with adequate functional status and with complimentary executive report he was awarded restricted flying.

Cases of Congenital Anomalies of Kidney and Urinary Tract (CAKUT) in Civil aircrew Aspirants: Aeromedical Disposition

Manu Murali V, Harsha MR, Pradeep, Jeya Karthik, Y S Dahiya

Congenital Anomalies of Kidney and Urinary Tract (CAKUT) include developmental defects from simple vesicoureteral reflux to complete agenesis, affecting 0.04-1.1% of live births. Frequently asymptomatic & incidentally detected in civil aircrew, CAKUT poses long-term risks, such as obstruction/stasis, lithiasis, recurrent UTI, scarring, decreased renal function, CKD, HTN, CVD and ESRD. Diagnosis of these anomalies are by RFT, USG, CT urography, Functional assessment and scarring are tested by DTPA and DMSA scintigraphy. CAKUT raise concerns in aviation due to potential in-flight incapacitation from renal colic, urgency and hesitancy, along with the long-term risks. Three candidates, all asymptomatic, were identified with CAKUT during DGCA Class-1 medical evaluations conducted from May to July 2025 for civil aircrew applicants. The first case was a 22-year-old female with bilateral congenital Grade 3 hydronephrosis, normal renal function and non-obstructive drainage. Second case, a 19-year-old male aircrew member with history of pyeloplasty in childhood for left PUJO causing hydronephrosis, stable renal function and no complications. Third case is a 19-year-old male with Zinner syndrome (right renal agenesis and seminal vesicle cyst) with normal left kidney function. All individuals were asymptomatic, normotensive with normal renal function without any evidence of obstruction or scarring, and have been certified as fit with structured periodic follow-up to monitor for long-term complications. Study advocates retaining CAKUT as an

umbrella term in aviation, arguing mild forms should not be barred certification if renal function is well preserved. This report highlights importance of individualized aeromedical decision-making for rare congenital anomalies balancing the operational requirements with long-term health considerations.

Astronaut Monitoring System (AMS) During Long-Duration Human Space Flight Missions Focusing on Alerting, Orienting, And Executive Functioning of Astronauts Using Pupillometry Based Neuroscience

Iniya Pragati

Astronaut Monitoring System (AMS) study, conducted during a 22 days Lunar Isolation mission at AATC, Europe. focusing on pupil dynamics as a biomarker for cognitive function, alertness, and physiological stress in spaceflight conditions. Using real-time pupillometry, measuring blink rate, sclera redness, and light adaptation, providing insights into fatigue, irritation, and attentional shifts. Integrated with biometric markers like heart rate and blood pressure, AMS offers a cost-effective, non-invasive tool for neurophysiological assessment. The Paper Christoph Strauch's taxonomy which categorizes pupil dynamics across three levels: low-level (ambient light exposure, focal distance), intermediate (alerting, orienting), and high-level executive functions (mental effort, decision-making, emotional arousal). The Locus Coeruleus (LC) regulates pupil response via interactions with the Edinger-Westphal nucleus (EWN) and sympathetic pathways involving Orexin/hypocretin mechanisms.

Rising Inflight Medical Events: Rethinking Onboard Medical Kits and the Need for a National Surveillance System

Mithun Kumar, Manoj Kumar Nayak

The frequency and complexity of inflight medical events (IMEs) have shown a measurable rise in recent years, reflecting changing passenger demographics, increased flight durations, and post-pandemic health vulnerabilities. Current international and national regulations specify the minimum contents of onboard emergency medical kits (EMKs) and first aid kits; however, these standards vary widely and have not kept pace with the evolving medical realities of commercial aviation. Analysis of recent inflight incident reports indicates a growing prevalence of conditions such as cardiac events, metabolic disturbances, syncope, and allergic reactions — many of which require timely interventions that may not be supported by the presently mandated kit contents. While some airlines have voluntarily enhanced their medical kits with additional drugs and diagnostic tools (e.g., glucometers, pulse oximeters, AEDs with ECG displays), others await formal regulatory updates before modification, citing cost, standardization, and liability concerns. This paper explores the regulatory dilemma between compliance and proactive safety — questioning whether airlines should wait for regulatory revision or act ahead of mandates based on operational experience and medical evidence. It also highlights the urgent need for a national database on inflight medical events, enabling systematic data collection, trend analysis, and evidence-based policy formulation. Such a repository, modelled on aviation safety databases, would facilitate benchmarking, improve emergency preparedness, and guide future medical kit standards. The presentation will discuss current regulatory frameworks, case studies from selected airlines, cost-benefit

implications of enhanced medical provisioning, and a proposed structure for an Indian National Inflight Medical Events Registry under the aegis of DGCA or MoCA.

Poster Session – IV

Incidental Hepatobiliary Abnormalities in Military Aviation Candidates: A Retrospective Study

Abhilash P T, Pradeep, Bhanu Pratap, YS Dahiya, MB Suja, Satyajeet Singh H Raulji

Background. Hepatobiliary and splenic abnormalities are frequently encountered across diverse populations, often discovered incidentally during routine imaging. Ultrasonographic screening, particularly during pre-employment medical evaluations, offers a valuable opportunity to detect subclinical conditions in asymptomatic individuals. In military recruitment settings, such findings may carry implications for candidate eligibility.

Method. This retrospective study analysed ultrasonographic data from 215 clinically asymptomatic candidates (188 males; age range 16-37 years, 27 females; age range: 19–25 years) who underwent initial recruitment medical examinations at Indian Air Force boarding centres—namely, the Institute of Aerospace Medicine (IAM) and Air Force Central Medical Establishment (AFCME)—between 2020 and 2025. Standardized imaging protocols were employed to assess hepatobiliary, splenic, and pancreatic structures.

Results. The most prevalent finding was Fatty liver (Grade I >> II), observed in 28.83% of candidates, indicating early hepatic steatosis. Other commonly detected anomalies included calcified granuloma (15.81%), cholelithiasis (12.09%), gallbladder polyps (11.16%), hepatic haemangioma (10.69%), and post-cholecystectomy status (8.37%). Rare findings included hepatomegaly, hepatic calcifications, cystic lesions (possibly hydatid cysts), splenunculi, and space-occupying lesions in the liver, spleen, and pancreas.

Conclusion. Routine ultrasonographic screening during recruitment medical evaluations can uncover a spectrum of subclinical hepatobiliary and splenic abnormalities. These findings emphasize the need for early lifestyle interventions and may inform future screening protocols in both military and civilian health frameworks.

Brachial Neuritis (Parsonage-Turner Syndrome) in a Helicopter Pilot: A Rare Diagnostic Challenge with Occupational Consequences

Shaleen Pratap Singh, Vinod

Background. Brachial Neuritis is a very rare medical condition associated with pain and weakness in upper limb muscles. It is understood to be caused by viral infections and trauma after surgical interventions. Most cases fully resolve, some improve, and some relapse.

Case Report. Here is a case report of a 32-year-old male, helicopter pilot, who suffered from pain, numbness and sensation of heaviness in the left shoulder and hand with the inability to raise the collective of the aircraft, while flying. He was found to have wasting of the left deltoid muscle, increased two-point discrimination, hypoesthesia, decreased hand grip strength in the left hand, low power in the left arm (3/5), decreased flexion, adduction and abduction

movements. The nerve conduction test was abnormal in the C4 and C5 nerves. The condition improved over 72 weeks, with a regain of strength and a reduction in shoulder pain. The individual was managed with Tab Pregabalin 75 mg OD, Inj Optineuron, Inj Vitamin B12, physiotherapy of rotator cuff muscles, and electrical stimulation of the left deltoid muscle. No identifiable cause was found, and hence, diagnosed with Idiopathic (Lt) Brachial Neuritis.

Discussion. The article describes the disease aspects, the individual's presentation, aeromedical concerns, the evaluation modality, and the aeromedical disposal.

Psycho-Dermo-Immunology in Aviation Medicine: Integrating Mind, Skin And Immune Health in Aircrew

Shivaprasad D, Supriya Dsilva

Introduction. Aviation professionals encounter operational stress, circadian disruption, cabin dryness, ultraviolet exposure and perseveration. These factors activate the Hypothalamic-Pituitary-Adrenal Axis, Modulate Immunity and Weaken the Skin barrier. Psycho-Dermo-Immunology – linking psychiatry, dermatology and immunology offer a framework for understanding this Mind-Skin-Immune triad in Aircrew.

Scope and Objective. To describe Psycho-Dermo-Immunology as a nascent subspecialty in Aviation Medicine, emphasizing its relevance for flight safety, crew wellbeing and the design of integrated preventive and therapeutic strategies.

Methodology. A scoping review was undertaken through various Journals including Pub Med and Aero Medical Journal. Studies on stress related dermatoses, immune dysregulation and interventions in Pilots and cabin crew were analyzed for clinical and operational significance.

Observation. Psychological stress and circadian misalignment heighten cortisol and Pro-inflammatory Cytokines. Psoriasis, Atopic Dermatitis, Urticaria, Seborrheic Dermatitis and delayed wound healing are commonly precipitated or aggravated. Visible lesions impair self-esteem, intensify stress and perpetuate an inflammatory loop, affecting comfort and flight performance.

Discussion and conclusion. Psycho-Dermo-Immunology broadens the scope of Aero Medical Care. Early screening, education on skin stress interaction, adequate rest and collaborative psychological, dermatological and immunological management improves outcomes and preserve mission readiness. Protocol development and longitudinal research will further consolidate this field.

Neuropsychological Profiling and Fitness-to-fly in Military Aviators with Multiple Sclerosis and Viral Encephalomyeloradiculopathy

Bagdai A, Sonali S, Chaturvedula S

Introduction: Fitness to fly is a critical consideration in managing neurological disorders among aircrew, where cognitive function variability can significantly impact operational safety. This case series evaluates the neuropsychological profiles and fitness-to-fly of military aviators using neuropsychological battery.

Material and Methods: Four aircrew ($n=4$; three with MS, one with viral Encephalomyeloradiculopathy) underwent evaluation periodically to measure neuropsychological parameters that are critical in the context of flying. The parameters include

working memory, divided and shifting attention, psychomotor tracking, motor co-ordination, spatial rotation functioning, visual perceptual speed, visual memory (learning and recall), deductive reasoning, rule application, and mental flexibility.

Results and Discussion: Throughout periodical evaluation, it was revealed that consistent preservation or improvement in working memory, psychomotor speed, and executive reasoning, while mild deficits in divided attention and sequencing were common. Most aviators demonstrated adaptive cognitive strategies that maintained operational standards.

Conclusion: The study highlights the effects of neuropsychological deficits which are relevant to flight safety and making informed fitness-to-fly determinations. High-functioning individuals such as military aviators with neurological conditions may exhibit subtle, domain-specific deficits alongside significant compensatory strengths. Rigorous, individualized evaluation can support safe continuation of flight duties under supervision.

The Fifth Vital Sign: Handgrip Strength as a Window to Metabolic Health

Ketan Pakhale

Metabolic health assessment has traditionally relied on temperature, pulse, respiration, and blood pressure — parameters that primarily reflect acute physiological status rather than long-term metabolic integrity. Emerging research identifies handgrip strength (HGS) as a simple, non-invasive, and highly integrative biomarker that reflects muscle quality, functional capacity, and overall metabolic reserve. This educational poster emphasizes the scientific basis for designating HGS as the “fifth vital sign” in metabolic health. Multiple studies have demonstrated that reduced HGS correlates with insulin resistance, central obesity, dyslipidaemia, hypertension, and metabolic syndrome, serving as a sensitive early marker of cardiometabolic dysfunction. Furthermore, diminished HGS predicts cardiovascular morbidity, frailty, and mortality, often outperforming traditional biochemical indices such as fasting glucose or lipid profiles in risk stratification. The poster highlights standardized assessment techniques using dynamometry, age- and sex-adjusted reference norms, and clinical interpretation. Its application in occupational and aerospace medicine is particularly relevant, where maintaining optimal muscle strength and metabolic efficiency is essential for performance, flight safety, and long-duration mission readiness. Recognizing HGS as a core clinical marker fosters a paradigm shift from disease-centric to performance- and prevention-centric healthcare, positioning muscle strength as a superior and dynamic indicator of metabolic vitality.

Medical Flight Kits (MFK's) in In-Flight Emergencies (IME): Are they good enough for children?

Nadakuditi Naveen Kanth

Introduction. In-flight medical emergencies (IME) are acute incidents that threaten the life (or) long-term health of airline passengers, particularly vulnerable paediatric groups. While airline safety concepts inspired healthcare safety protocols, there remain notable deficiencies in on-board emergency preparedness for children.

Objectives. To highlight deficiencies in medical flight kits (MFKs) regarding paediatric emergency care and advocate for improved equipment, standardized reporting, and regulatory changes to enhance the safety for children during air and space travel.

Methods. This viewpoint synthesizes clinical experience, a review of aviation and paediatric emergency data, and an assessment of MFK contents under Directorate General of Civil Aviation (DGCA) through its Civil Aviation Requirements (CARs) mandates. Data on the incidence and outcomes of paediatric IME and flight diversions are documented.

Results. Annually, approximately 44,000 IME occur worldwide, with a serious IME estimated on every 24 flights carrying 400 passengers. Paediatric IME incidence is about 1 in every 27,290 flights (0.004%), with infectious (27%), neurological (15%), respiratory (13%), and allergic (10%) emergencies being most common. Infant fatalities (<2 years) account for 90% of paediatric deaths related to IME, with median age of fatalities being 3.5 months. Standard MFKs lack essential paediatric equipment (e.g., appropriately sized bag-mask ventilators, nebulizers, paediatric drug formulations). Inadequate crew training for paediatric emergencies and highly variable kit contents among airlines further compromise care. Absence of standardized incident reporting and central registries likely underestimates true IME burden in children.

Conclusions. Current MFKs are inadequate for paediatric emergencies, potentially compromising safety for children during flights. There is insufficient regulation, variability in kit contents, and lack of paediatric training among crew. Paediatricians, organizations, and authorities should advocate for improved MFK standards and documentation, ensuring optimal care for infants and young children on-board during air travel and in upcoming years, for space travel.

Heart Rate Optimisation for Efficient High G Training: A Relook

Rahul Dev, Nataraja MS, Avinash BK

Increased heart rate (HR) is a known preliminary compensation effort by cardiovascular system to counteract physiological effects of hyper gravity. The anti-G straining manoeuvre (AGSM) is the crucial technique for withstanding High Sustained G forces. The individual contribution of compensatory tachycardia and AGSM techniques in improving G tolerance is well researched. On retrospective review of High G training in IAF, it was noted that, the trainee aircrew who could reach 70-80% of Maximum HR within 5 seconds could achieve 9G qualification run without difficulty. Also, the sustained effort of AGSM was most efficient in these trainee aircrew. However, the trainee with slow HR response had more odds of GLOC during High G training. On coaching these aircrew (with slow HR response) using good AGSM and HR management techniques, it was found that optimal G tolerance could be achieved. Thus, good AGSM performance seemed to reduce the negative effect of weak HR responses. This paper discusses the importance of HR optimisation during AGSM training for improved G tolerance.

Transitioning Flight Decks: Aeromedical & Ergonomic Challenges of Transitioning Medically Unfit Rotary Wing Pilots to RPA Operations

Srihari Iyer, Sahana Srihari, V Raghunandan

Introduction. Pilots found medically unfit for flying rotary wing aircraft in the Army—due to conditions such as migraine, prolapsed intervertebral disc (PIVD), fractures, or cervicgia—are often reassigned to fly remotely piloted aircraft (RPAs), yet continue to face significant operational, ergonomic, and health challenges in their new roles. This case series abstract outlines the persistent issues observed and proposes interventions to address ongoing aeromedical concerns.

Background. Transfer of unfit rotary wing pilots to RPA roles is predicated on the presumption that RPA operations are physically less demanding, potentially enabling continued service regardless of some medical limitations. However, the sedentary and static postures, prolonged visual demand, and ergonomics of RPA stations may exacerbate or fail to mitigate pre-existing conditions such as cervical spine disorders or migraines.

Case Series Highlights. Subjects: Army pilots previously medically downgraded from rotary due to migraine, PIVD, fracture sequelae, and cervicgia etc, now flying RPAs. Persistent Issues: Continued or increased frequency of neck/back pain and headaches, likely due to prolonged static posture and suboptimal workstation ergonomics, psychological adjustment difficulties, including frustration with loss of flying status and lack of fulfilment, sometimes impacting psychological well-being, Visual fatigue and exacerbation of neuro-musculoskeletal symptoms, aggravated by suboptimal visual displays and continuous monitoring requirements.

Operational Impact. Reduced attention and situational awareness leading to potential flight safety implications even in RPA missions. Reduced job satisfaction and morale among affected pilots.

Challenges. Ergonomics and Workstation Design: Standard RPA ground stations typically lack individualized ergonomic adjustments, often failing to support those with cervical or spinal pathology. Lack of Tailored Aeromedical Standards: Current medical and operational assessments do not fully account for the unique occupational exposures of RPA operators with pre-existing conditions. Inadequate Rehabilitation and Monitoring: Periodic monitoring and targeted rehabilitation for chronic conditions are often missing when pilots are redeployed to RPAs. Psychological Support Gaps: Transition impacts psychological health; loss of previous role identity and peer standing requires structured mental health support.

Solutions And Recommendations. Ergonomic Assessment and Modification: Implement individualized ergonomic evaluations and modifications to RPA stations, ensuring proper seating, screen placement, and frequent breaks. Comprehensive Aeromedical Policy Update: Revise aeromedical policies to include specific fitness criteria, periodic review, and support mechanisms for RPA pilots with chronic conditions. Integrated Rehabilitation Programs: Develop and mandate physical therapy and wellness programs designed for chronic musculoskeletal or neurological disorders in RPA staff. Psychological and Career Support: Provide psychological resilience training, access to mental health support, and peer support structures to facilitate smoother transitions and career satisfaction. This case series identifies a pressing need for a holistic and proactive approach to the aeromedical management of pilots reassigned to RPA platforms due to medical disqualification from rotary wing duties, ensuring safety, effectiveness, and well-being in their new roles.

Poster Session – V

Nutrition and Hydration Attitudes and Practices Among Aircrew: A Questionnaire-Based Study

A Rakesh, P Sannigrahi, YS Thakur

Introduction. Military aircrew operate in demanding environments that require sustained physical and cognitive performance. Nutrition and hydration are key determinants of operational readiness, yet limited data exists on these practices among Indian aircrew. This study aimed to evaluate their dietary and hydration attitudes, knowledge, and practices.

Methodology. A cross-sectional questionnaire-based survey was conducted among military aircrew from fixed wing and rotary-wing platforms who had reported for Operational Aeromedical training at 1 AMTC between March – April 2025. A tool adapted from the Military Eating Behaviour Survey (MEBS) was used for the study. Data were analysed using descriptive statistics.

Results. A total of 122 aircrew with mean age 32.5 ± 7.3 years and BMI 24.4 ± 2.1 kg/m² participated in the study. Majority of the aircrew consumed fruits (56.5%) and vegetables (86%) frequently. Pre-flight food avoidance was common (78.7%), especially for high-fat, spicy, and gas-producing foods. Meal planning was inconsistent; 68% struggled to maintain regular timings and 32% reported frequent unintentional meal skipping. Fluid restriction before or during flight was reported by 45.1%, leading to dehydration symptoms in 32.8%. Awareness regarding carbohydrate function and dehydration effects was high (84%), though only 56.6% correctly identified recommended daily water intake. Caffeine use was prevalent (76.2%), while use of other supplements was limited.

Discussion. The findings of the study highlight operational and behavioural influences on nutrition and hydration among Indian military aircrew. While general awareness exists, practical challenges such as irregular schedules, limited access to healthy food, and intentional fluid restriction contribute to suboptimal practices. These issues were particularly evident in long-duration transport flying, where aircrew often skip meals due to time pressure, and often have to depend on processed, ready-to-eat foods that do not provide balanced nutrition.

Conclusion. Significant gaps in nutrition and hydration behaviours exist among Indian military aircrew, with implications for performance and safety. Targeted education, operationally feasible meal, hydration and stress management strategies are recommended to optimize aircrew health and operational readiness.

Efficacy of Hyperbaric Oxygen Therapy in Osteoradionecrosis: A Retrospective Study

Venkatesh E, DK Khukhar, Renny Justine, Harshavardhan,

Introduction. Osteoradionecrosis (ORN) is a debilitating complication of radiotherapy for head and neck malignancies, characterized by necrosis of irradiated bone. Hyperbaric Oxygen Therapy (HBOT) has been advocated as an adjunctive treatment, aiming to enhance tissue

oxygenation, neovascularization and wound healing. This retrospective study evaluates the outcomes of HBOT in patients with ORN.

Methodology. A retrospective analysis was conducted on 10 patients diagnosed with ORN between September 2023 and May 2025. Data on demographics, primary cancer site, radiation modality, radiation dose, latency to ORN development, ORN stage, HBOT sessions, and clinical response were collected. All patients underwent HBOT @ 2.4 ATA for 90 min per day, with a mean of 26.5 sessions. Treatment response was assessed clinically and radiologically.

Results. The cohort comprised 10 male patients, with a mean age of 55.6 years. The most common primary malignancy was carcinoma of the tongue, followed by buccal mucosa and carcinoma of the oral cavity. All patients had Stage 2 ORN. The latency between radiation and ORN onset ranged from 2 to 36 months. All patients completed HBOT, with objective clinical improvement observed in 100% of cases. The average number of sessions required for noticeable improvement was 26.5. No major adverse effects of HBOT were reported.

Discussion. Our findings indicate that HBOT is an effective adjunct in managing ORN, even in patients with moderate-stage disease. The universal improvement observed in this series supports the role of HBOT in promoting bone healing and mitigating the morbidity associated with ORN. However, the limited sample size and retrospective design warrant cautious interpretation. Larger prospective studies are necessary to validate these results.

Conclusion. HBOT demonstrated significant clinical benefit in all patients with ORN, suggesting its role as a valuable adjunct in management. Early initiation may optimize outcomes and prevent disease progression.

Anthropometric Surveillance and Obesity Prevalence in Armed Forces Personnel: a Cross-Sectional Study

Manohar Dutt, Mohin Sakre, Alok Gupta, NK Tripathy

Background: The increasing prevalence of overweight and obesity among Indian adults is now a recognized health concern. The concern is equally alarming in armed forces personnel. Assessment of prevalence of overweight and obesity in a representative sample of serving Armed Force personnel and its correlation with age, rank, and abdominal girth was the desired objective.

Material & Methods: A cross-sectional point prevalence study was conducted in July 2023 across nine data collection centres. Using a convenient sampling technique, anthropometric data including height, weight, and abdominal girth at umbilicus were collected from 1388 serving personnel. BMI was calculated and data were stratified by age and rank.

Results: Of the 1388 participants, 70.24% were within the normal permissible weight range. The prevalence of overweight and obesity combined was 29.8%, with officers showing the highest rates. Statistically significant correlations were found between BMI and age ($p = 0.024998$), as well as abdominal girth and both age ($p < 0.00001$) and BMI ($p < 0.00001$). Rank-based BMI differences were not statistically significant.

Conclusion: Substantial portions of serving personnel are either overweight or obese, with a clear association to age and abdominal girth. These findings underscore the need for targeted health and fitness interventions to preserve the health of the Armed Forces personnel.

Factors influencing the outcome of Airsickness Desensitization Therapy (ASDT) among flight cadets at the Air Force Academy

Reddy R, Sneha Dinakar, Ajay Kumar

Introduction. Airsickness (AS), a form of motion sickness, poses a significant challenge for flight cadets during their basic flight training. Literature review suggests that 30–40% of flight cadets are affected initially, often with provoking symptoms that can affect cadet performance, out of which 8–9% experience persistent symptoms contributing to attrition. Airsickness Desensitization Therapy (ASDT) at No. 2 Aero Medical Training Centre (2 AMTC) employs physical exercises, psychological counselling and graded exposure to mitigate AS. In spite of this therapy, some cadets remain refractory. This study investigates the effectiveness of ASDT and the factors influencing its outcomes among flight cadets, focusing on history of motion sickness in the childhood, environmental conditions, training phases, and therapy-related responses.

Methods. A retrospective observational study analysed medical records of 70 cases referred to 2 AMTC for ASDT from January 2022 to December 2024. Inclusion criteria is the availability of complete case records at 2 AMTC. ASDT success was defined by completing ground desensitization (tolerating a 25-RPM run on Airfox Disorientation Simulator) and air desensitization (completing 2 FLEX sorties without significant symptoms) and further continued their flying training. Data included demographics (age, height), history of motion sickness in the childhood, phase of flying training, weather conditions, and therapy responses (vomiting frequency, rpm at which the cadet first vomited while undergoing therapy). Statistical analysis using SPSS v.30 employed for descriptive statistics, t-tests, Chi-square tests, and logistic regression to identify predictors of ASDT success or failure.

Results. Out of the 70 cases (92.9% male, mean age 22.36 years), 80% successfully completed ASDT, while 20% failed, primarily due to inability to tolerate ground (17.1%) or air (2.9%) desensitization. Childhood motion sickness history (61.4% positive) showed no significant correlation with outcome ($p = 0.285$). Environmental factors like weather (clear: 42.9%, cloudy: 57.1%) and month of onset lacked statistical association with success ($p > 0.05$). Most of the cases emerged in the Supervisory Phase (67.1%), with higher failure rates linked to early vomiting during therapy (60.9% of vomiters failed, $p = 0.007$ for frequency).

Conclusion. ASDT proved effective for 80% of cases, aligning with prior desensitization success rates. Demographic and environmental factors did not predict outcomes, but vomiting frequency during therapy emerged as a key indicator of failure, suggesting a lower vestibular adaptation threshold. Early training phases were most susceptible to airsickness onset. These findings recommend tailored therapy adjustments and prospective studies to refine screening and psychological support, enhancing ASDT efficacy.

Psychometric Tests used in Pilot Selection: A Comparative Analysis

Kamya Bihari

The aviation sector operates in a high-stake and demanding environment that places significant pressure on the pilots. Pilot selection is proven to be a vital process to select the best fit for the organisation. This places a critical emphasis on the psychometric evaluation to assure optimal safety, performance, and well-being of the pilots. This poster presents a

comparative analysis of psychometric tools used globally in aviation for pilot selection-particularly the NEO Personality Inventory, AON Assessment Solutions, and Computerized Pilot Aptitude Screening System (COMPASS). Each of these tests provides unique insights into cognitive abilities, personality traits, attitudinal and behavioural tendencies crucial in aviation. This analysis evaluates the tools based on ICAO competency mapping, test items, theoretical framework, psychometric properties and adaptability to the pilot population. Results show that while NEO Personality Inventory gives a comprehensive view of the personality domains, AON offers an integrative approach of cognitive and behavioural assessments. COMPASS, on the other hand, focuses on cognitive, psychomotor and technical skills. The strengths and limitations of each test, along with the recommendations are also highlighted to integrate them into a holistic, evidence-based framework that enhances safety outcomes and wellbeing of pilots.

EEG Tracking Earbuds

Shrutika Dandekar

In a world where mental wellbeing is increasingly challenged by stress, cognitive overload, and sleep disturbances, our EEG tracking earbuds offer a groundbreaking, non-invasive solution for real-time brain health monitoring and personalized mental wellness support. These earbuds gently encourage a holistic lifestyle change to improve cognitive fitness and mental resilience. This innovative design integrates EEG sensors with AI-driven analytics to provide users with actionable insights into their cognitive and emotional states. By combining traditional health metrics like heart rate, temperature, and respiratory patterns, the device offers a comprehensive view of mental and physical wellbeing. Whether aiming to improve focus, reduce work-related stress, enhance productivity, improve sleep quality, or detect early signs of health imbalances, the earbuds seamlessly adapt to individual brain activity and physiological markers. They offer tailored interventions such as guided breathing, meditations, and focus-enhancing soundscapes. Designed for comfort and all-day wearability, the product features an open ear design that blends cutting-edge technology into a sleek, lifestyle-friendly form. By empowering users to understand and optimize their mental health in real-time, this device redefines personalized well-being in the fast-paced digital age. It serves as a smart wellness companion for the modern world, helping to alleviate cognitive overload, reduce stress, and significantly increase productivity.



PREVALENCE OF DRY EYE DISEASE IN INDIAN CIVIL PILOTS

Robin Mallik

Introduction. The prevalence of Dry Eye Disease (DED) in general population has been reported to range from 5 to 50%. DED is a cause of ocular morbidity with varied symptomatology. As pilots are exposed to controlled cabin conditions, estimation of dry eyes is important for time detection and management. Review of literature showed paucity of such data from Indian subcontinent making this study extremely relevant.

Materials and Methods. It was a prospective observational cohort study conducted between Jul–Aug 2024 at a Premier Medical examination Centre for Civil Pilots in Delhi. 100 Civil Pilots who reported for their periodical Medical examination during Jul 2024–Aug 2024 were included in the study with informed consent. All participants filled the OSDI (Ocular Surface Disease Index) Questionnaire during the visit and also underwent NI-TBUT (Non-Invasive Tear Break Up Time) for both eyes during same visit which is an objective test with cut off value <10 sec as diagnostic criteria for DED. Data recorded & analysed.

Results. The study included a total of 100 participants with a mean age of 45.74 years. 91% of study participants were males and 9% females. Dry Eye Disease diagnosis by OSDI score was NIL. Prevalence of Dry Eyes was found to be 34% in cohort by the NI-TBUT.

Discussion. Exposure to controlled cockpit environment make civil Pilots predisposed to DED. Contrary to the fact that approximately one third of the Pilots were detected to have DED neither of them was found to have a significant OSDI score. This highlights the apprehension among the Pilots for reporting of any symptoms and importance of objective tests for the diagnosis of DED. Among the various factors associated with DED, the study showed increased DED with prolonged flying hours (>4 Hours).

Conclusion. In conclusion the study showed a prevalence of 34% DED in Indian civil pilots and it was associated with prolonged flying hours. The study also emphasizes on importance of Objective tests for diagnosis of DED.

The Clinical Assessment with Holistic Ultrasound (POCUS) reduces Morbimortality of the Critical Patients during MEDEVAC

Karina UGO

Objective. Demonstrate that the assessment with ultrasound of critical patients during MEDEVAC reduces morbimortality in 25%.

Materials and Methods. A review of the effectiveness of the assessment of critical care patients with ultrasound during MEDEVAC in reducing 25% in mortality and morbidity rate. It is essential to put into practice an holistic Point of Care Ultrasound using VEXUS, Cardiac POCUS and Lung POCUS guidelines and protocols within MEDEVAC.

Discussion. POCUS ultrasound in critical care patients during MEDEVAC reduce in 25% mortality and morbidity rate as it helps to determine the feasible causes of death in these types of patients. The Sooner certain life-threatening pathologies might be diagnosed the sooner they can be treated. That is why there is higher chance of survival during MEDEVAC. For example, there are common causes of cardiac arrest secondary to pneumothorax should be recover with a needle in the chest or even secondary to pneumothorax should be recover with a needle in the chest, or even secondary to cardiac tamponade or massive pleural effusion.

Transport of critical care patients is also not free of complications or even adverse effects. The use of hands-on training in ultrasound is very useful in the assessment of critical care patients, even more the holistic POCUS ultrasound might be very effective within any kind of transfer of these patients.

Conclusion. Holistic POCUS ultrasound assessment of the critical care patients might reduce in 25% morbimortality rate within MEDEVAC. Life-threatening pathologies which can be detected immediately and they might be treated in situ increasing the survival.

Visual Adaptation Time on Discontinuation of Gen 2++ and Gen 3 Night Vision Goggles (NVG) Use at Various Light Levels

Binu Sekhar M

Objective: Night Vision Goggle (NVG) display brightness can impair visual adaptation to low ambient light levels at night. Therefore, it is important to estimate the time required to restore visual adaptation after discontinuing NVG use. Visual acuity and contrast sensitivity serve as measurable indicators for monitoring this recovery. This study estimated and compared the recovery time for visual acuity and contrast sensitivity under various operational night light levels following the discontinuation of Gen 2++ and Gen 3 NVG use.

Methods: An indigenously fabricated and standardized NVG eye lane was used for the study. ANVIS Gen 2++ and F4949 Gen 3 NVGs were utilized for night vision assessments. Visual acuity and contrast sensitivity were measured using the USAF 1951 Tribar chart and the Pelli-Robson chart, respectively. Participants were having a minimum corrected visual acuity of 6/6 and CP-II color perception. Visual acuity with Gen 2++ NVGs was assessed in 22 subjects (18 males and 4 females), while contrast sensitivity with Gen 2++ NVGs was measured in 8 subjects (7 males and 1 female). For Gen 3 NVGs, both visual acuity and contrast sensitivity were evaluated in 11 subjects (10 males and 1 female). Baseline (unaided) visual acuity and contrast sensitivity were recorded under four different light levels: 0.1 lx (approximately full moon), 0.05 lx (approximately half moon), 0.01 lx (approximately quarter moon), and 0.001 lx (approximately starlight). The time required to recover baseline visual acuity and contrast sensitivity under these lighting conditions was measured after 10 minutes of NVG use.

Results: The recorded mean baseline visual acuity for Gen 2++ NVG study subjects was 20/244, 20/103, and 20/74 under quarter-moon, half-moon, and full-moon conditions, respectively. For Gen 3 NVG study subjects, the corresponding values were 20/386, 20/204, 20/115, and 20/73 under star-light, quarter-moon, half-moon, and full-moon conditions, respectively. Following the removal of Gen 2++ NVG, the time required for visual acuity to return to baseline was 6 minutes 9 seconds (± 1 minute 28 seconds), 2 minutes 53 seconds (± 1 minute 34 seconds), and 1 minute 41 seconds (± 52 seconds) for quarter-moon, half-moon, and full-moonlight conditions, respectively. For Gen 3 NVG study subjects, the recovery times were 5 minutes (± 1 minute 7 seconds), 4 minutes 43 seconds (± 1 minute 11 seconds), 2 minutes 16 seconds (± 1 minute 1 second), and 1 minute 31 seconds (± 37 seconds) for star-light, quarter-moon, half-moon, and full-moon conditions, respectively. The recorded mean baseline contrast sensitivity values for Gen 2++ NVG study subjects were 0.431, 0.712, and 0.937 log CS units under quarter-moon, half-moon, and full-moon conditions, respectively. For Gen 3 NVG study subjects, the values were 0.177, 0.409, 0.654, and 0.927 log CS units under star-light, quarter-moon, half-moon, and full-moon conditions, respectively. After the removal of Gen 2++ NVG, the time required for contrast sensitivity to return to baseline was 3 minutes

36 seconds (± 1 minute 40 seconds), 2 minutes 19 seconds (± 57 seconds), and 1 minute 14 seconds (± 29 seconds) for quarter-moon, half-moon, and full-moonlight conditions, respectively. For Gen 3 NVG study subjects, the corresponding recovery times were 3 minutes 58 seconds (± 1 minute 9 seconds), 2 minutes 52 seconds (± 52 seconds), 2 minutes 2 seconds (± 45 seconds), and 1 minute 10 seconds (± 33 seconds) for star-light, quarter-moon, half-moon, and full-moon conditions, respectively. The visual adaptation time, measured in terms of visual acuity and contrast sensitivity, was found to vary significantly across different light levels for both Gen 2++ and Gen 3 NVGs. The visual adaptation time for visual acuity under quarter-moon conditions was significantly longer for Gen 2++ NVG compared to Gen 3 NVG, but no significant differences were observed at higher light levels. In contrast, no significant differences in visual adaptation time for contrast sensitivity were found between Gen 2++ and Gen 3 NVGs. For Gen 2++ NVG, visual adaptation time under quarter-moon conditions was significantly longer for visual acuity than for contrast sensitivity, though no significant differences were observed at higher light levels. Similarly, for Gen 3 NVG, visual adaptation time under star-light conditions was significantly longer for visual acuity than for contrast sensitivity, but this difference was not significant at higher light levels. The recorded display brightness in the laboratory for Gen 2++ NVG was 1.01 lx, 1.31 lx, and 1.43 lx under quarter-moon, half-moon, and full-moon conditions, respectively. For Gen 3 NVG, the corresponding values were 2.91 lx, 3.31 lx, 3.72 lx, and 3.96 lx under star-light, quarter-moon, half-moon, and full-moon conditions, respectively.

Conclusion: The recovery duration for visual acuity and contrast sensitivity following the removal of Gen 2++ and Gen 3 NVGs under varying operational night light conditions has been quantified in this study. The recovery time exhibits an inverse relationship with light intensity. These findings offer an approximate estimation of the time required for optimal visual identification and recognition of the surrounding cues after de-goggling during NVG-assisted flight operations. The study highlights the superior performance of Gen 3 NVGs over Gen 2++ NVGs, particularly in facilitating faster visual adaptation under low-light conditions.

Precision Study of Selected Anthropometric Parameters of Vitus 3D Laser Whole Body Scanner

Sabyasachi Nayak, Uday Bansal, DK Kagti, YS Dahiya

Introduction: Digital anthropometry using 3D laser body scanners is an upcoming alternative to manual anthropometry. A single scan captured in a few tens of seconds can produce a 3D image of the body along with the measurements of 150 standard anthropometric parameters. A study was carried out to study the precision of these automatically measured parameters using the 3D laser scanner present at the Department of Human Engineering, IAM, IAF. The study was undertaken to find the agreement within repeated measurements of selected anthropometric measurements of the same individual and hence measure the precision of the measurements.

Materials and Methods: A total of $n=42$ individuals were scanned six times in the standard standing posture using the 3D laser scanner and 33 anthropometric measurements were measured automatically. For each scan the individuals being scanned had to reset their standing posture by coming out of the scan room and then reentering it, thus resulting in independent scans. For each individual, the standard deviation of the six different values of each of the 33 anthropometric parameters of interest was taken as an indicator of

measurement precision. The mean and SD are calculated for each individual and plotted. The parameters having a mean SD of less than 0.5 cm are deemed as being precise and those having a mean SD greater than 0.5 cm are deemed imprecise. The measurements were also analyzed using ANOVA to check for statistically significant differences between independent measurements.

Result and Observation: 20 parameters showed a mean standard deviation less than 5 mm, with minimum being 0.1 mm for ankle height and 0.6 mm for calf girth. 13 parameters showed a mean standard deviation greater than 5mm. This variation was seen in more than 50% of the individuals for 12 parameters and in 45% of the individuals for 01 parameter. The highest mean standard deviation was of 15.5 mm for chest girth, followed by 7.9 mm for forearm length and 7.8 mm for waist girth. Circumferential measurements showed higher mean standard deviations, as did parameters measuring across multiple landmarks.

Conclusion: The parameters showing mean standard deviations greater than 5 mm should not be considered for use as analogous parameters for manual anthropometric measurements.

Assessment of Changes in Respiratory Parameters in Simulated Microgravity under Hypobaric Hypoxic Condition

Avishek Sharma, SS Mohapatra, Preethi R, G Harshavardhan

Introduction. Hypobaric Hypoxia and Microgravity are two aeromedical stressors which have always limited the human activities in space. The study aimed to investigate the physiological effects of hypobaric hypoxia combined with simulated microgravity on respiratory parameters, particularly respiratory rate (RR) and end-tidal carbon dioxide (etCO₂). Understanding these changes is crucial as they influence the respiratory function of astronauts during space missions.

Material and Methods. Fifteen healthy male subjects, aged 24 to 40 years, were exposed to hypobaric hypoxia at 18,000 feet, both with and without a 6- degree head-down tilt (HDT) to simulate microgravity. RR and etCO₂ were measured at ground level, upon reaching 18,000 feet, and during continuous exposure at this altitude. The study design included a three-day gap between exposures to eliminate the effects of hypoxia hangover.

Result. The study found that there was non-significant increase in RR when subjects were exposed to hypobaric hypoxia at 18,000 feet both with and without HDT. The etCO₂ levels initially rose upon reaching 18,000 feet but showed a non-significant decrease during prolonged exposure. With HDT, etCO₂ levels were consistently lower, indicating improved CO₂ clearance and possibly enhanced ventilation-perfusion matching in the simulated microgravity condition.

Conclusion. The study concludes that simulated microgravity, as achieved through HDT, moderates the increase in RR and enhances the clearance of CO₂ under hypobaric hypoxia. This suggests that the combination of these conditions may help stabilize respiratory function, reducing the strain on the respiratory system during space missions.

Dysregulation of resting state brain dynamics in trait anxiety: A network neuroscience perspective

Shilpi Modi, Pawan Bairwa, Prabhjot Kaur, Soumya Verma, Pawan Kumar

Introduction. An individual's susceptibility to perceive stress and worry in everyday life is generally identified as trait anxiety in non-clinical population and is assessed by measures of anxiety such as the Spielberger's State-Trait Anxiety Inventory (STAI). Moderate levels of anxiety, if persistent, can represent a risk factor for the future development of clinical anxiety disorders. When anxiety is maladaptive, it results in heightened emotional reactivity to aversive events along with deficits in efficient attention regulation. It is therefore an essential dimension to be studied in aviation. The present study attempted to investigate if trait anxiety disrupts the dynamic functional connectivity (dFC) within and between the major functional networks of the brain such as default mode, salience, executive control, attention and the fronto-affective network.

Material and Methods. Resting state fMRI data was acquired on a 3 Tesla whole body MRI system from 45 right handed, healthy and educated participants. After pre-processing (fMRIPrep), dFC measures- recruitment, integration and flexibility were computed (sliding-window approach) for the hub subsystem of the above networks using Cole parcellation. Trait anxiety was correlated with the dFC measures.

Results. After controlling for state anxiety, trait anxiety was found to be negatively correlated with recruitment of and integration between various subsystems.

Discussion and Conclusion. The current study highlighted a multiple network dysfunction to be associated with trait anxiety. The reduced integrations suggest an aberrant communication between self-referential, affective and executive control systems that might result in increased rumination with an impact on executive functions like attention and working memory, disruption in the ability to focus on relevant tasks and ignore distractors, and an impaired emotional processing. The findings further highlight the importance of studying trait anxiety in association with the performance in aviation.

Comparative Analysis of Body Composition between Overweight and Normal Weight Flight Cadets Using Bioelectrical Impedance Analysis

Harsha MR, Varun Y, Sneha Dinakar, Ajay Kumar

Introduction. The global rise in overweight and obesity, reflected in military populations, poses significant health risks, including cardiovascular, metabolic, and musculoskeletal disorders, along with adverse career implications. Traditional methods, such as BMI, are commonly used but often misclassify individuals by failing to differentiate between fat and muscle mass. Although highly accurate, reference methods like hydrostatic weighing are impractical in military settings due to their cost, time requirements, and need for specialized equipment. Bioelectrical Impedance Analysis (BIA), a non-invasive and practical alternative, provides greater precision in assessing body composition. This study aims to compare BIA parameters between overweight and normal-weight flight cadets, offering valuable insights into the rising trend of overweight cadets, enabling more accurate classification, and supporting targeted health interventions.

Methods. This case-control study included 60 male flight cadets, divided into two groups: 12 overweight cadets (cases) and 48 age and height-matched, normal-weight cadets (controls). Body composition was assessed using Bioelectrical Impedance Analysis (BIA), measuring key parameters such as total body fat, visceral fat, subcutaneous fat, and skeletal muscle mass, both for the whole body and specific segments. The data were analysed using independent t-tests and Mann-Whitney U tests, with statistical significance set at $p < 0.05$.

Results. Overweight cadets had significantly higher total body fat, visceral fat, subcutaneous fat, and fat distribution across various body segments compared to normal-weight cadets ($p < 0.05$). No significant differences were observed in skeletal mass for the whole body or trunk, but overweight cadets had lower skeletal mass in the arms compared to their normal-weight counterparts ($p < 0.05$).

Conclusion. The study found that the weight difference between overweight and normal-weight cadets was due to increased fat mass in the overweight group. Variability in body fat percentages within both groups highlighted the limitations of traditional weight-based classifications, emphasizing the need for more precise methods, such as combining anthropometric measurements with Bioelectrical Impedance Analysis (BIA), for accurate body composition assessment.

OPERATIONAL EDGE THROUGH MEDICAL READINESS: A TRUE FORCE MULTIPLIER

D Meera Madhav

Introduction: Operation Sindoor 2025 marked a landmark mission, underscoring the Indian Air Force's evolving role in internal security and counter-insurgency operations. It not only highlighted the combat capabilities of the Indian Air Force but also brought into sharp focus the role of Medical Readiness. This paper discusses how robust and responsive medical support functioned as a force multiplier, demonstrating that medical preparedness is integral to enhancing overall military effectiveness and operational success.

Methodology: The study involved the activities in an operational air base of South Western sector. The base is geographically dispersed across four separate pockets and also serves as the Nodal Centre for CBRN Contingencies and Casevac. The existing manpower of the unit was augmented during the Operation.

Result: This Operation stood apart from all previous operations in terms of its magnitude, mode of action and timelines. Proactive measures towards Healthcare, Training and Op-readiness were ensured in coordination with Ops and Adm authorities. Given that the base is geographically dispersed across four separate pockets, along with Detts, Hygiene and Sanitation were of paramount importance.

Discussion: The operation comprehensively tested various aspects of Op-readiness such as Preparation, Training, Logistics and Manpower. Preparatory efforts included emergency procurements of medical stores, setting up CTCs and conducting drills to refine medical response. Tactical Combat Casualty Care training was imparted to non medical personnel, while augmented medical staff was trained on CBRN contingencies. To enhance operational availability, a stringent review and analysis process was undertaken to upgrade eligible personnel, making more manpower available for flying duties. Fatigue in airwarriors was effectively mitigated through regular Aeromedical briefings, fatigue monitoring and usage and of Go/No- Go Pills. A PTU team was established to ensure rapid mobility and a dedicated CBRN setup was operationalised to respond to contingencies effectively.

Conclusion: Unlike routine exercises and drills, operations are characterised by their unpredictable and unforgiving nature. This paper not only highlights the pivotal role of medical support in operational settings but also outlines the key challenges faced and lessons learnt, offering actionable insights for future capability enhancement and preparedness.

Muscle Mass Matters: Linking Leg and Thigh Girth to G-Tolerance in Fighter Pilots

Bhowmick B, Mohapatra SS, Dahiya YS

Introduction: Sustained exposure to high gravitational forces (+Gz) during aerial maneuvers places fighter aircrew at risk of G-induced loss of consciousness (G-LOC). Individual variability in inherent G tolerance has been attributed to cardiovascular, anthropometric, and neuromuscular factors. While much focus has been given to cardiovascular conditioning, the role of lower limb musculature and girth parameters remains underexplored. This study investigates the association between leg and thigh girth with inherent G tolerance in military fighter aviators, aiming to identify anthropometric predictors of performance under high-G stress.

Methodology: A cross-sectional study was conducted on trained military aircrew (n = 140) reporting for OPTRAM (F) Course at Institute of Aerospace Medicine. Baseline basic anthropometric measurements, including mid-thigh and calf girth, were recorded using standardized protocols. Inherent G tolerance was assessed during Dynamic Flight Simulator (DFS) profiles without anti-G straining maneuvers, with endpoints defined by peripheral light loss (PLL) or loss of consciousness (LOC). Statistical analysis was performed to evaluate correlations between girth measurements and G tolerance values, adjusting for confounders such as body mass index (BMI) and physical fitness levels.

Results: Preliminary findings indicated a positive correlation between increased thigh and calf girth with higher inherent G tolerance ($r = 0.85$, $p < 0.05$). Aircrew with greater lower limb girth demonstrated delayed onset of PLL and higher +Gz tolerance compared to those with lower measurements. The relationship persisted after controlling for BMI and overall body size, suggesting localized muscular and vascular influences.

Discussion: The results suggest that enhanced leg and thigh girth, potentially reflecting greater muscle mass and venous capacitance, contributes to improved resistance to blood pooling during +Gz stress. These findings support incorporating lower limb strengthening training into aircrew physical conditioning programs. Further studies with larger cohorts and inclusion of muscle composition analysis are warranted to strengthen these associations.

Conclusion: Leg and thigh girth are independent predictors of inherent G tolerance in fighter aircrew. Anthropometric screening may serve as a practical tool in selection, training, and risk stratification.

Retrospective Analysis of Flight Cadet Attrition During A 07-Year Period in A Military Training Establishment

Y Varun , Harsha MR , Ajay Kumar , Sneha Dinakar

Introduction. Pilot training in military is one of the most rigorous and demanding forms of professional education requiring significant manpower and other resources. Student pilot attrition has significant implication in terms of monetary, human resource and operational readiness. This retrospective study aims to conduct analysis of flight cadet attrition over a 7-year period in a IAF training establishment. The primary aim is to quantify attrition during various stages of training with emphasis on medical causes. Other causes of attrition are also examined to provide a comprehensive overview.

Methods. Descriptive study design involving retrospective analysis of data pertaining to 338 flight cadets who were withdrawn/ removed from flying training during 2017 to 2023. The data was collected from the repository and collated. The collated data was statistically analysed to obtain descriptives, which is then used to identify the key medical causes and other causes of attrition.

Results. A total of 1,483 flight cadets were analysed with 337 Training Review Boards (TRBs) conducted, resulting in an overall attrition rate of 22.72%. The primary causes of attrition were failure to learn flying (FLF), accounting for 52.22% of cases, followed by medical causes at 28.78%. Among medical issues, airsickness was the leading factor, contributing to 32.98% of medical-related attrition. The variability in TRBs across different pilot courses ranged from twelve to 37, highlighting differences in training outcomes.

Conclusion. The study found an overall attrition rate of 22.72% among 1,483 flight cadets over a seven-year period, aligning with global trends observed in the USAF and USN. The primary cause was Failure to Learn Flying (FLF), accounting for 52.22% of attrition, followed by medical causes at 28.78%, with airsickness and musculoskeletal



Indian Society of Aerospace Medicine
Wishes all delegates
Healthy Scientific Interactions
&
Comfortable Stays

**Institute of Aerospace Medicine
Indian Airforce
Vimanapura Post, Bengaluru-560017
Karnataka, India
<http://www.isam.in>
Phone: 080-25224659, Fax: 080-25224131**