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Military Medicine

Aeromedical solutions for aerospace safety

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ABSTRACT

All facets of activity in the speciality of Aviation Medicine are essentially aimed at enhancing aerospace safety. This paper highlights some innovative changes brought about by Aerospace Medicine in the three major fields of the speciality namely, medical evaluation, aeromedical training and research.

Based on lab and field studies, military aircrew are now permitted flying with Modifinil as 'Go' Pill and Zolpidem as 'No-Go' Pill during sustained operations. Several other drugs for disabilities like Hypertension and CAD are now permitted for aviators. Comprehensive revision of policy permitting early return to flying is an on-going process. OPRAM courses for all three streams of aircrew in IAF have contributed to reduce aircraft accident rates. Human Engineering Consultancy and expert advice is provided by specialists at IAM as well as those in the field. In future, the country needs to provide better post-service opportunities to aerospace medicine specialists. This, in turn, will attract bright young minds to the specialty. The ISRO Humanin-Space programme will be an exciting challenge for all in this unique field.

Aerospace Medicine continues to provide aerospace safety solutions to the IAF and the aviation industry. The nation needs to continue to utilize and support this specialty.

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Introduction

The *raison de etre* for Aerospace Medicine is Aerospace Safety. All facets of activity in the speciality of Aerospace Medicine are essentially aimed at enhancing Aerospace Safety. This includes medical evaluation of pilot-aspirants and trained pilots, training of doctors and aircrew as well as research and consultancy aimed at providing solutions enabling enhanced pilot-cockpit interface and improved life-support systems on aerial platforms.

The practitioners of Aerospace Medicine, by virtue of their close working association with aircrew in varied flying environments and with other experts, while investigating aircraft accidents, gain multi-faceted hands-on expertise that is unavailable to any other medical professional. This practical knowledge, coupled with a solid foundation of theoretical training makes the Flight Surgeon of the Indian Air Force a most sought-after professional in the Service.

Modern medicine has only one constant. And that is 'change'. What was state-of-the-art just a decade ago may be archaic and proven grossly unscientific today. So, is it with

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Aerospace Medicine. The need to constantly challenge established paradigms in selection and evaluation of pilots, permitting flying while on various medications (which was unthinkable till a decade ago) and utilising newer simulators and techniques to enhance aircrew performance is an ever-evolving reality. This paper throws light on some such innovative changes brought about in the Indian Air Force in recent years.

Utilisation of trained aviators

When today's Senior Advisors in Aerospace Medicine were undergoing their MD Course and even when they were serving as young specialists, one of the commonly taken lectures for aircrew used to be 'Drugs and Flying'. They grew up teaching the aircrew how **any** kind of medication was taboo for the aviator. In the recent past, we have permitted fighter pilots to fly if their hypertension is controlled on a single drug. Similarly, flying is permitted for Transport and Heprtr pilots after PCI/CABGS, when they are on a host of permissible medications.¹ All aircrew are permitted use of Modafinil as 'Go-Pill' and Zolpidem as 'No-Go' Pill, during sustained operations. In short, the 'drugs and flying' paradigm has been literally turned on its head. All this has been achieved after laborious studies in the Lab, in the field, on Simulators and in actual flying. More important, has been the **will** to implement change and our mindset to conserve trained manpower, especially aircrew.

Dynamic policy for medical examinations and return to flying

The "Mother Document" for medical examinations and Boards in the IAF is the IAP 4303. This is a constantly evolving document, largely because of a small group of specialists in HQ, but equally due to the painstaking inputs gathered by IAM, CHAFB and AFCME.

At times, change has also been driven by affected individuals – a lady candidate challenged our policy on incidentally discovered hepatic calcification and supported her case with scientific evidence. This led us to take the opinion of concerned specialists and a change in policy. Similarly, a query and suggestion on the DGMS (Air) Interactive Forum led to change in the Schedule and Validity period of Annual Medical Examinations.

Over the last year or two, there have been path-breaking amendments to the IAP 4303. These include a complete revision of Section VI that deals with "Assessment of Trained Serving Personnel".¹ Also, we now permit flying on ejection seat aircraft with incidental findings of Schmorl's nodes in the spine at multiple levels and permit acceptable degree of IV disc prolapse to return to flying. Refractive surgery is now permissible with some caveats. For ATC and FC officers' intake, the visual acuity standards have been relaxed. The list is long. All such amendments are approved only after recommendations from experts in the respective fields are obtained and in keeping with international best practices. Often, amendments are vigorously debated with representatives from IAF Medical Boarding Centres and specialists from Army Hospital (R&R) at the office of DGMS (Air). Whilst conserving trained manpower is a crucial parameter, flight safety is always kept paramount.

Several instructions on improving 'procedures' in conduct and approval of medical examinations and boards have also led to substantial improvement in clientele satisfaction. This is essentially due to a reduction in the Trained Young Pilot-on-Ground (TYPO-G) time. These include local upgradation of aircrew flying category for musculo-skeletal injuries and other diseases, E-vetting of medical boards when recommending upgradation to flying category. Collegiate Vetting of Release Medical Boards when considering award of Disability Pension as also introducing flexibility in the schedule and validity of annual medical examinations.

Aeromedical training – keeping pace with the times

The IAF hierarchy has always been most supportive of efforts of the Medical Branch in enhancing the infrastructure and specialised equipment for effective training. The Spatial Disorientation Simulator at IAM has completed 13 years of excellent service and has just recently received a much-awaited upgrade. The High Performance Human Centrifuge, which was commissioned in 2009 is also getting ready to be upgraded to "Dynamic Flight Simulator" that will allow more realistic fighter aircrew training as part of the immensely successful and popular OPTRAM-F Course at IAM.

Newer acquisitions of two Ejection Procedure Simulators are already in place at both AMTCs. A third will be acquired for IAM after these two have proven worth. New Explosive Decompression Chambers and Rapid Recompression Chambers for both AMTCs are being procured.

With an ever-increasing thrust on aerospace safety in the IAF, we believe that OPTRAM Courses for all three streams have contributed substantially towards reducing accident and incident rates. The visionary, Dr. APJ Abdul Kalam, while leading the Committee on Fighter Aircraft Accidents (COFAA) in 1997, had recommended investing in aeromedical simulators as one of the measures to reduce "Human Error" accidents. Effective utilisation of these simulators in the unique OPTRAM courses of the IAF, have vindicated the legendary scientist.²

Training of young doctors of the IAF in short courses of Aviation Medicine as well as the three-year PG programme for MD (Aerospace Medicine) under the Rajiv Gandhi University of Health Sciences, Bengaluru is a major academic activity at IAM. Young specialists serve as Squadron Medical Officers in the field and build excellent rapport with the aircrew, serving as their friends, philosophers and guides.

Aeromedical research – the cutting edge

Operational research

The IAF's four-phase study on Modafinil and Zolpidem as "Go" and "No-Go" pills for use in sustained operations was a huge success. This directly led to a belief in the Air Staff that aerospace medicine research could lead to introduction of new and exciting change in policy. Similarly, change was brought about in shorter acclimatisation schedules for aircrew

operating from high altitude and a ready reckoner for fighter pilots involved in long duration flying.

Human engineering consultancy

The IAM stamp of “aeromedical testing and evaluation” is respected by the entire military aviation industry of the country, including HAL, ADA, DRDO Labs and the certifying agency – CEMILAC. Our contributions to the LCA cockpit geometry have directly led to safer flying for our pilots. IAM has contributed to the LCA's life-support system, DASH helmet integration and ejection seat evaluation on a regular basis. Similarly, the ALH, LCH and IJT programmes have all witnessed a committed involvement by IAM. ADA presented a scaled model of the LCA to IAM on the Diamond Jubilee of the Institute recently, in recognition of this contribution.

HE evaluations – old and new

Specialists from IAM have always provided human engineering solutions to aeromedical concerns in imported aircraft. From efforts to minimise injury during semi-closed capsular ejection of the Type-77 to suggested modification of the Hawk Mk 132 ac, aerospace medicine continues to address aerospace safety concerns in our aircraft.³

Aeromedical solutions in the field

Young specialists at flying stations have always risen to the occasion to address the concerns of the aviator. Designing and using an 'SAR Jacket' to store drugs and equipment during rescue in a helicopter has been a useful innovation.⁴ Many years ago, another young specialist had improvised the use of MiG-21 oxygen tubes on the Jaguar oxygen mask, when pilots of his squadron had complained of some irritating powdery material being inhaled whilst using brand-new Jaguar masks. The innovation was duly tested on ground and then by the CO in flight. The DPMO of the Command was the Senior Advisor (Av Med) (now a retired Air Vice Marshal) and he duly 'approved' the 'Mod'! Aircrew flew with this 'mod' at the airbase for more than 10 years. Today, such a 'Mod' may not get approved at Command level, but the authors are convinced that the passion remains.

Medical aspects of aircraft accident investigations

Aircraft accident investigation is a laborious process that tries to piece together all evidence and analyse all possible contributory factors. Human factors are responsible for as many as 80% of all aircraft accidents. The aerospace medicine specialists, by virtue of their training and experience are always an important part of the investigating team in military and civil aviation accidents.

In many Inquiries into fatal aircraft accidents the inputs from the autopsies of the pilots and passengers provide vital clues that help to understand the large mosaic of causative factors. In one MiG accident the post mortem radiograph of the deceased fighter pilot revealed surgical emphysema. The extent of the surgical emphysema established conclusively

that it was an ante-mortem injury. This proved that the injury had been sustained during the firing of the main gun of the ejection seat. In turn, this provided crucial evidence to the investigators in pinpointing the reason for failure of the ejection seat, leading to the fatality.

In the Mangalore airliner accident of 2010, evidence from the Cockpit Voice Recorder established that the Captain was in deep sleep till about 20 min from touch down. The reconstruction of the accident identified sleep inertia as a major contributory factor in this major accident in which 158 lives were lost. Aviation Medicine expertise was crucial in understanding preventable factors and improvement in practices and procedures including permitting “controlled rest in seat” for one pilot at a time.⁵

The challenges ahead

The speciality of Aerospace Medicine is providing stellar service to the nation in both military and civil aviation. The need of the future is to attract bright and dedicated minds to join this challenging field. The country needs to provide opportunities to those who retire after serving the Armed Forces as Aerospace Medicine specialists. For the airlines, the Airport Authority and the DGCA to utilise this expert manpower should be a 'no-brainer'. It will indeed be a win-win situation for the employer and the employee. To make this a reality is one big challenge.

The other challenge is Space – The Final Frontier. IAM has earlier been the approved centre and contributed immensely in the evaluation of Cosmonauts Rakesh Sharma and Ravish Malhotra in 1984. An MoU with ISRO in March 2009 saw renewed interest in space medicine and an upgrade of IAM labs. ISRO has shown renewed interest in shaking hands with IAM for their Human-in-Space programme. We must stand up and deliver on all fronts and plan and execute research projects aimed at empowering us in Astronaut selection, training, in-flight monitoring and recovery.

Conclusion

Aerospace Medicine in India has proven its worth to all stakeholders in the country. The Indian Air Force has nurtured the speciality and has also been its biggest beneficiary. The aircraft industry, civil aviation sector and ISRO have all derived immense benefit from this unique speciality.

The Medical Branch of the IAF, with full support of the entire hierarchy of the Air Force, has been striving to constantly promote the multi-faceted activities in this field. Interactions with the best in the world have continued to be promoted for constant improvement. New equipment is always readily procured. The need of the hour is to attract bright talent. We must strive to secure the future – which can only be achieved by the young and restless.

Conflicts of interest

The authors have none to declare.

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