



ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

IMPLEMENTING A FULL-CYCLE MULTI-DISCIPLINARY AVIATION HEALTH
MANAGEMENT SYSTEM CONSIDERING SMS PRINCIPLES

(Presented by China)

EXECUTIVE SUMMARY

With the rapid development of the aviation industry and the emergence of new technologies, traditional aviation health management models are facing new challenges. Building a full-cycle aviation health management system based on multi-disciplinary health risk management, taking into consideration safety management system (SMS) principles, is of great significance for reducing health-related risks and improving flight safety. This paper aims to explore the value of building an effective full-cycle aviation health management system and outline implementation principles.

Action: The Assembly is invited to:

- recognize that the rapid development of the aviation sector will continue to challenge existing aviation health management frameworks and that it is necessary to adopt a full-cycle multi-disciplinary risk-based aviation health management system, considering SMS principles to effectively manage health-related safety risks while accommodating innovation;
- support ICAO in developing guidance to assist regulatory authorities, operators, and medical assessment organizations (if applicable) in implementing a full-cycle multi-disciplinary aviation health management system; and
- support Member States in utilizing ICAO guidance to develop and adopt new and effective tools and methods for health risk assessment, so as to evaluate the effectiveness of aviation health management.

<i>Strategic Goals:</i>	This working paper relates to <i>Every Flight is Safe and Secure</i> .
<i>Financial implications:</i>	The activities referred to in this paper are expected to be undertaken with the resources available in the 2026-2028 Regular Budget and/or from extra-budgetary contributions as guided by the ICAO Business Plan 2026-2028.
<i>References:</i>	Annex 1 — <i>Personnel Licensing</i> Annex 19 — <i>Safety Management</i> Doc 8984, <i>Manual of Civil Aviation Medicine</i> Doc 9859, <i>Safety Management Manual</i> Doc 9379, <i>Manual of Procedures for Establishment and Management of a State's Personnel Licensing System</i>

¹ English and Chinese versions provided by China.

1. INTRODUCTION

1.1 Performance impairment of pilots related to medical factors, a key focus for the aeromedicine community, has always been one of safety risks in the air transport. Additionally, health-related factors contributing to impaired performance have become increasingly complex and more diverse, which include not only existing physical health issues such as cardiovascular-related disease and hearing loss, but also new challenges, for example, mental health, health changes associated with advancing age, drug abuse, fatigue, and long COVID.

1.2 As the foundation of current aviation health management, the medical examination, at regular intervals, verifies whether pilots continue to meet the medical standards required to perform flight tasks. The rapid advancement of aviation technologies, especially breakthroughs in automation, artificial intelligence, and unmanned aerial vehicle technologies, necessitates aviation health management to adapt to the dynamic interactions between these new technologies and pilots' health and capabilities. For instance, highly automated cockpits may reduce pilots' operational workload, but require strong abilities in terms of cognitive and decision-making aspects. Additionally, complex operational conditions, such as longer routes and operations across multiple time zones, may affect the health of crew members. The Safety Management System (SMS), long advocated and emphasized by the International Civil Aviation Organization (ICAO), is essential to ensure civil aviation safety. Its core lies in identifying and analysing hazards to develop appropriate control measures to keep the risks at acceptable levels, similar to the core practices of several medical specialist areas.

1.3 In February 2016, the ICAO Council adopted Amendment 173 to Annex 1 — *Personnel Licensing*, which clearly stated that “as part of their State Safety Programme, States shall apply basic safety management principles to the medical examination process of licence holders”, and also required that “the Licensing Authority shall implement appropriate aviation-related health promotion for licence holders subject to a Medical Assessment to reduce future medical risks to flight safety”. The revision emphasizes the integration of medical assessment, health promotion, and safety management, providing an international standard for implementing an SMS-based aviation health management system, so as to identify and reduce medical risks in a more proactive and systematic manner.

2. DISCUSSION

2.1 Limitations of only using medical examinations to mitigating medical risks

2.1.1 Routine medical examinations, conducted at specific intervals (e.g., one year), are “one-time and periodic” assessments and only report the pilot's health status at the time of the examination, but the health status will change over time. Sometimes additional medical reports might be required proactively in the intervals between aviation medical examinations. Medical incidents during flight, such as acute cardiovascular problems, might still occur at intervals of those medical examinations.

2.1.2 With advances in medical science and the application of evidence-based medicine, the focus of aeromedical standards has shifted from requiring “absolute health” to “fitness for flight”. However, many cases deemed fit for flight require continuous monitoring and long-term follow-up, so as to intervene in potential risks in advance to ensure safety, a function currently not being consistently implemented by all member states in the existing medical examination and certification system.

2.1.3 Sometimes, medical examinations might lag medical standards updates. Another major limitation is that new medical standards are only considered for implementation after serious accidents or

incidents. This means that although medical standards are reviewed based on past experiences, events and recent scientific developments, its implementation cannot adequately keep pace with emerging medical risks and health issues in the aviation field.

2.2 A full-cycle multi-disciplinary aviation health management system considering SMS principles

2.2.1 The system integrates SMS principles into all health-related aspects of the entire aviation safety system, including occupational entry, medical assessment, health promotion, and incident investigation. In line with the principles of SMS, the full-cycle aviation health management system relies on four core elements: safety policy and objectives, risk management, safety assurance, and safety promotion. Building on the foundation of medical assessment, the system carries out risk assessments, performs safety oversight, reviews the results of health safety performance evaluation, and fosters a health and safety culture.

2.2.2 By clearly defining, documenting and monitoring the responsibilities and outcomes of activities of aviation medical examiners, medical assessors, medical assessment organizations, operators, regulatory authorities, and pilots in health and safety management, this system forms a multi-layered protection network covering “individuals, teams and organizations”, which is an evidence-based and data-driven framework that integrates medical assessment, regulation compliance, safety management, and health promotion into an increasingly improved closed-loop management process.

2.3 Benefits of implementing a full-cycle multi-disciplinary aviation health management system considering SMS principles

2.3.1 SMS and multi-disciplinary health risk management share many commonalities in their core concepts and methodologies. Both places high priority on risk prevention and control, employing systematic and preventive approaches to enhance overall effectiveness. A full-cycle multi-disciplinary aviation health management system integrating SMS principles, health promotion, and outcomes of medical examinations will enable the industry to proactively, effectively, and comprehensively identify, assess, and mitigate medical risks in a collaborative manner, thereby enhancing the safety of the entire aviation system.

2.3.2 SMS emphasizes proactive safety management by reducing accidents through preventive measures, rather than merely adopting responsive measures after incidents. With the rapid development of new aviation technologies and the increasingly pivotal role of human factors in complex operational environments, a full-cycle multi-disciplinary aviation health management system considering SMS principles can adapt to new requirements and challenges in a more proactive and flexible manner. Through continuous optimization of health monitoring and evaluation of safety performance, it aims to improve health and safety measures, enhance the efficiency of aviation health management, refine relevant medical standards, and increase resource utilization.

2.3.3 A multi-disciplinary aviation health management system considering SMS principles can be used to identify, assess, and control both short-term and long-term health-related risks in a more comprehensive, systematic and structural way. This system covers more than existing medical examinations and medical assessments, thereby improving pilots’ health and well-being, extending their careers, saving costs for airlines, optimizing operational management, and promoting sustainable development.

2.3.4 Moreover, the system facilitates collaboration and information sharing across different sections, contributing to a unified safety culture and changing the bad reputation and discrimination related to health issues. It also encourages closer interdisciplinary cooperation between aeromedicine and other

fields such as aerospace engineering, psychology, and data science. Such collaboration can lead to the development of more effective tools and methods for health risk assessment and management.

2.4 Guidance and implementation

2.4.1 While a multi-disciplinary aviation health management system considering SMS principles may bring a number of benefits for improving aviation safety, its effectiveness may be compromised if there is a lack of practical implementation guidance for stakeholders. Therefore, it is essential to formulate clear guidelines and build a widely recognized implementation framework. This will ensure that all stakeholders, including aviation medical examiners, medical assessors, medical assessment organizations, operators, regulatory authorities, and pilots, not only understand how the system operates but also clearly know their specific responsibilities within the system and the required competencies to accurately identify and analyze health-related risks and develop effective risk control measures to mitigate the risks.

2.4.2 By using the system, Member States will have the ability to continuously improve the specialization and systematization of aviation health management to ensure aviation personnel's health and keep their health at an optimal level, thus promoting the safe development of the industry. Member States and stakeholders should utilize the guidance from ICAO to actively develop and adopt new methods and tools related to health risk assessment, contributing to a more scientific evaluation of aeromedical management effectiveness, ensuring the system remains adaptable to changing operational environments, thus providing strong support for the aviation safety globally.

3. CONCLUSION

3.1 Facing the evolving operational environment for civil aviation, medical assessment processes and procedures need to be adapted sufficiently to manage medical risks effectively. The focus of aviation health management should continue to detect and manage potential health risks, including physiological limitations, lifestyle factors and diagnosed conditions. The implementation of a full-cycle multi-disciplinary aviation health management system taking into consideration SMS principles continues to be a feasible solution to achieve this transition, while also delivering long-term values for both pilots and airlines, thereby facilitating to realize the goal of ICAO GASP: continuously enhancing the safety, as well as improving operational resilience through standardization and performance improvement driven by sustainability.

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