

AsMA's Mid-Term Report

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This will be the mid-term President's Report - even though it is being written in mid-September.

After postponing the annual meeting from May to October, the AsMA Council decided to cancel the 2020 Annual Scientific Meeting, making it the first time since 1945 we had to do so. Council considered a virtual meeting, but planning one so close to the 2021 meeting proved to be too difficult. Other aerospace medical organizations also canceled their meetings. The International Air Transport Association meeting, scheduled for September in Paris, and the Aviation Medicine Doctor's Association meeting, scheduled for October in Moscow, were also canceled.

However, even with the difficulties imposed by the Coronavirus pandemic, our Association's accomplishments so far this year have been impressive. The transition to the 2020 AsMA Slate of Officers went smoothly. Work has started to add Constituent Organization membership lists to the Impexium database. The 2020 awards were announced on time with a decision to present them at the 2021 meeting in Reno. Dr. Kris Belland became the AsMA Subject Matter Expert for the Task Force on Health Issues Outbreaks in Aviation, a newly-formed ICAO task force, and Dr. Tom Nesthus was nominated as the AsMA Human Factors Expert to the ICAO Personnel Training and Licensing Panel, which is also being formed. The AsMA Air Transport Medicine Committee, in collaboration with the International Air Transport Association and the International Airline Medical Association, drafted a COVID Patient Information Page to be published in the Journal of the American Medical Association. AsMA sent a letter to Senator Jeff Merkley in response to his draft legislation "Maintaining Important Distance During Lengthy Epidemics (MIDDLE)." The AsMA Aerospace Mental Health Working Group Report has completed a draft of a Mental Health Position Paper, which is expected to be published soon in the *Aerospace Medicine and Human Performance* journal. In addition, Resolution 2020-01, "Resolution on Aerospace Medicine Specialist," was approved at the August Executive Committee meeting and sent to Council for a vote at their November meeting. If approved by Council, it will be posted on the AsMA website for 60 days for review and comments by the membership. Following the comment period, there will be a 30-day window for member voting.

I want to close by sincerely thanking all of you for your hard work, especially during a very difficult time, without which none of this would have been possible.

THE NAWCAD HUMAN SYSTEMS ENGINEERING DEPARTMENT

Many thanks to the NAWCAD HSE, another outstanding example of an excellent aeromedical research laboratory, for this month's

submission, and to Barry Shender for authoring it.

The Naval Air Warfare Center Aircraft Division (NAWCAD) Human Systems Engineering Department (HSE) is located in Patuxent River, MD, USA. HSE's mission statement is to "Provide full spectrum life cycle research and engineering expertise to advance/support warfighter performance and survivability." HSE is NAWCAD's center for Human Systems Integration, which is a mandated interdisciplinary technical and management process to "optimize total system performance and ownership costs, while ensuring that the system is designed, operated, and maintained to effectively provide the user with the ability to complete their mission."

HSE's products and services include: 1) **Personnel Protective Equipment & Survivability:** research and engineering (R&E) to address eye, hearing protection, helmet mounted and crew station displays, and pilot aids; 2) **Human Performance and Threat Protection Assessments:** health hazards, downwash and outwash assessments, workload assessments, and physical endurance; 3) **Human Integration:** R&E of human interfaces including task analysis, human-computer integration, and personnel/skills analysis; and 4) **Human Systems Certification:** crew systems, primary flight references, acoustic/thermal environments, and internal and external aircraft lighting. HSE is the Airworthiness Technical Area Expert that ensures body-borne and life support systems, displays, and aeromedical systems safety of flight.

Research, development, and test personnel are organized into four divisions: *Systems Engineering & Integration*, *Human Performance*, *Aircrew Protection and Survivability*, and *Aeromedical and Life Support*. These divisions are supported by a number of unique laboratories and test facilities, including Aircrew Accommodation; Aviation Maintainers; Body Mounted Systems Integration; Dynamic Testing (Windblast, Ejection Tower, and Horizontal Accelerator); Electro-Optics (displays, vision, aircraft lighting, and transparencies); Environmental Physiology & Human Performance; Hearing & Speech Intelligibility; Helmet Systems; Human Computer Interaction; Mishap Investigation Support; Oxygen Systems; Vision Laboratory; and Human Survivability Modeling, Design, and Analysis. Developing solutions in these areas often involves collaboration with public and private sector laboratories, academia, and international partners.



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HSE aeromedical science and technology aligns with U.S. Navy aircrew systems health and safety priorities established by the Aircrew Systems Enabler Navy Aviation Requirements Group. These priorities represent the combined aeromedical needs of the uninhabited vehicle, fast jet, rotary, and fixed wing communities.

The following highlights some current HSE efforts addressing these issues.

Physiological Episode Protection: To detect and predict the onset of in-flight "physiological episodes," HSE and the Naval Air Systems Command Aircrew Systems program office are developing an aircraft independent physiological monitoring/warning system to unobtrusively estimate aircrew vital signs and cognitive status. This includes the development, human volunteer testing (altitude chamber and centrifuge), and fast jet flight-testing of sensors and aircrew status algorithms. Technologies include blood oxygen saturation, cerebral tissue oxygen saturation, mask CO₂, ECG, and respiratory mechanics. Status algorithms include estimating cognitive decrement, G-induced fatigue, physical workload, and an overall summary status index.

Endurance; Aircrew Back and Neck Injury Mitigation: 1) The Applied Solutions to Address Chronic Musculoskeletal Pain and Injury Working Group has been established with action-level subject matter experts from the operational force, safety, medical, requirements, and administration. This provides a platform for centralized communication and visibility of efforts to address chronic musculoskeletal pain and injury within the U.S. Navy. Due to Department of Defense wide travel restrictions, focus has shifted to establishing a digital collaboration space. This will maintain the up-to-date needs and priorities from top-level as well as user perspectives, status updates on current efforts to address prioritized needs, interactive space for requests for information, centralized repository of key references/resources/strategic documents, and key points of contact. A long-term goal of identifying location(s) and securing command support for a NAVAIR pilot program of the Aircrew Conditioning Program/Tactical Athlete Model was achieved over a year ahead of schedule.

2) Military pilots and aircrew from both fixed-, propeller-driven, and rotary-wing aircraft communities have identified prolonged exposure to aircraft vibration as a source of fatigue, discomfort, and degraded mission performance. Other factors

contributing to increased chronic and acute injury risk include poor accommodation, occupant position, and interaction with body-borne and aircraft equipment. To mitigate these factors, HSE and the Naval Air Systems Command Aircrew Systems program office led development and fielding of the Next Generation Helicopter Gunner Seat (NGGS).

3) In addition to the passive vibration mitigation included in NGGS, the HSE is investigating the ability of the Magnetorheological-based damping system to withstand harsh naval operational environments. Development and evaluation have been expedited through a Project Agreement with Defense Research and Development Canada and the National Research Council Canada.

4) The Office of Naval Research, HSE, with support from the Naval Air Systems Command Aircrew Systems program office, are developing the Incapacitation Prediction for Readiness in Expeditionary Domains--an Integrated Computational Tool (I-PREDICT) to assess injury potential, equipment design including tradeoff analysis, validation, and testing. I-PREDICT will provide an integrated biomechanical/biofidelic response model of male and female personnel that predicts acute and chronic injury and functional incapacitation in response to low-level repetitive loading, blunt/accelerative loading, and vibration.

Hearing Protection and Communications Intelligibility: Recent efforts include quantifying the benefits of custom molded ear-plugs and supporting the transition of digital ear scanning methodologies while developing the ability to digitally print ear molds on-site. The Navy's Triple Hearing Protection program is completing lab evaluation to reduce hearing loss and risk of head injury for maintainers during carrier flight deck launch and recovery operations. Shipboard testing is scheduled for fall 2020.

Enhanced Visual Situational Awareness: NAWCAD and the U.S. Army are jointly developing the next generation Digital Night Vision Sensor that will ultimately provide higher resolution, sensitivity, with lower head-borne weight. A Wide Field of View Night Vision System (40° x 60°) is under development, which represents a breakthrough providing 24/7 operation without needing to change hardware between a day and night module. The optics will display symbology to aid while operating in degraded visual environments.