

Medicine in space: taking what we know, to places we don't

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When was the last time you were faced with a problem that no one in the history of humankind has ever been able to define a clear solution?

As humans venture further and further into space, we begin to encounter more and more challenges, with increasing levels of complexity. Just as the early explorers ventured past the horizon, we now attempt a similar adventure by reaching deeper and deeper into space. While there may be a myriad of unknown problems waiting ahead of us, we are called upon as professionals to solve the ones immediately ahead of us.

By starting with what we know and building from there, we are able to take the first of many steps forward. Humans have been studying the human body since before the time of *Pliny the Elder* and studying the effects of space on the human body since the 1960's. Even though mountains of data are collected after each crew returns from space, we are still left collecting data from what we have done, to extrapolate for anything we have not done.

There is a mountain of current issues faced by doctors and health practitioners in regard to moving people through space and then living there successfully. Problems like moving bodies into and out of microgravity; how to survive the harsh environment; the vacuum of space; and how to practise regular medicine when getting information to and from a doctor could mean hours, days or months of waiting for a reply.

I was recently given the opportunity by the Air and Space Power Centre to attend an event entitled, Space Medicine for Earthlings, which featured a panel discussion of Australia's leading minds in space medicine and research. The event was held at the Australian Academy of Science Shine Dome in Canberra and the panel of discussants included: aeromedical specialists, Professor Tracy Smart AO (Air Vice-Marshal (ret'd)) and Professor Gordon Cable; philosopher Dr Ben Bramble; and historian Professor David Kim. The panel was able to articulate many of the issues facing current and future astronauts as well as discuss issues put to them by the crowd.

After the panel discussion, I had an aviator-to-aviator chat with Professor Smart, who showcased what we as an ADF can do as our next step into space. Professor Smart highlighted that "*While the ADF will not be sending humans into space in the short and perhaps even medium term, they will very likely do so in the future; therefore the development of a space medicine capability in Defence should be resourced as part of the longer term plans*".

While talking about Australia's possible contributions to the space domain she stated, "*The RAAF has been a leader in aerospace medicine since World War II and the RAAF Institute of Aviation Medicine remains the only Centre of Excellence in the field in Australia. As the Australian space industry starts to move towards putting humans in space, they will look to the ADF once again to be leaders in space health. As such, the ADF must take steps to develop a space health capability in association with the broader industry and academia (like ANU), not just to ensure its own future astronauts are properly trained and supported, but to*

support the entire Australian Space Industry”.

The words from Professor Smart and the discussions I had with her at the Space Medicine Panel, left me thinking of how I could personally contribute to the space domain and how I could do my part for the development of the Australian space industry. What part would (or could) my colleagues and I, as health professionals, play to establish the foundational knowledge for the next intrepid explorers. This is a conversation I implore for Defence to begin since health and medical personnel could provide key insights into how this will effect troops in the space domain. For a long time, the ADF has been at the forefront of operational aviation medicine and research. I believe that raising the concept of Defence’s requirement to start investing or developing the capability of medicine for the space environment is crucial. While we may not provide foundational knowledge, we, as medical practitioners, may be able to contribute pragmatic “eureka moment” ideas.

Excitingly, we stand on the brink of the unknown. As we endeavour into the space domain, we are taking what we know to uncharted places. This situation is not new to explorers. While it would take mere seconds for us to open up our phone to find our current longitudinal and latitudinal geolocation, explorers in the early 1700s had no way of knowing their geo-location accurately. They used a simple measure of the angle the sun at noon was enough to find their latitude, but to establish longitude was a different story. This needed an accurate measure of their speed, and time it took them to travel away from the clock at from their last port.

That problem explorers faced forced great minds from across the globe to come together and focus on a common cause. The British government came together and Longitude Rewards or the *Longitude Act 1714*¹ to those who made valuable contributions. Prizes were awarded for contributions like improvements to telescopes, the creation of lunar distance table and accuracy improvements of time-pieces. With the most significant award going to a man called John Harrison, who spent forty-five years developing and perfecting time-pieces that were accurate at sea².

Harrison’s crowning achievement was the “H4 Sea Watch”, which is a dinner-plate-sized pocket watch, allowed navigators to calculate their speed time and distance away from port enabling them to successfully calculate their longitude.

I think that the world is slowly coming together again to work on the challenges of the space domain. I believe that Australia and Defence can, and should, make as many contributions as possible to the already established space agencies like National Aeronautics and Space Administration ([NASA](#)) or the Japan Aerospace and Exploration Agency ([JAXA](#)) and commercial enterprises like [SpaceX](#), to aid their development. While we may not be creators of the “sea watch” of interplanetary travel or microgravity vascular surgery, you can bet that we will be there to contribute what we can, where we can.

In closing, I pass the question to you, how do you think we as Defence can help humankind make its next giant leap into the unknown?

¹ An Act of Parliament of Great Britain passed in July 1714, which establishes the Board of Longitude and offered monetary awards for anyone who could find a practical method to determine a ship’s longitudinal location precisely.

² Royal Museums Greenwich, Longitude found: the story of Harrison’s clocks, Retrieved from Royal Museums Greenwich <https://www.rmg.co.uk/stories/topics/harrisons-clocks-longitude-problem>