

# Addressing Key Psychological, Social and Physiological Factors in Preparation for Long Duration Manned Missions – Suggested Adaptations of the Current Astronaut Selection and Training

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## 1. Abstract

Long-duration human space missions (6 months or more) raise new issues in space exploration. Maintaining crew well-being and performance is critical for the success of these missions. In addition to physiological effects (e.g. due to microgravity or radiation), experiments have demonstrated that in adjusting to the extreme change of environment, long-term spaceflight can have adverse psychological and sociological effects on crew.

The Space Exploration Working Group of the 2<sup>nd</sup> European - Space Generation Workshop (E-SGW) organised by the SGAC at ESA Headquarters in Paris, France in March of 2017 addressed the following issues: 1) Identify physiological and psychosocial risks for long-duration manned missions 2) Propose mitigation measures against these negative effects and impacts 3) Adapt the astronaut selection process and training to the needs of future missions.

Physiological risks are dominated by the effects of radiation and microgravity causing a myriad of potential health issues for astronauts on both short and long-term. It is clear that not only do physiological issues associated with spaceflight need to be addressed technically via mitigation methods but also that team composition and training will be crucial to overcome the medical challenges supported by a suite of medical equipment.

Potential psychological disorders involve a wide range of mental health problems (for example chronic stress, sleep disorders, anxiety, psychosis, psychosomatic illness, mood disorders) that leads to reduce productivity. Interpersonal challenges involve the tendency to avoid social contact, tension and conflicts within the team, which increases with the duration of the mission and as distance from Earth grows and crew feels more isolated. These issues and their interactions present serious threats to crew psychosocial health and performance. The breadth of psychological problems also identified a number of parallel actions needed to address the stress-inducing environment. We believe that Acceptance and Commitment Therapy (ACT) and mindfulness meditation, underpinned by over two decades of empirical research, is well placed to improve the psychological and behavioural skills needed for such demanding missions (1).

Further, a range of potential changes to current selection and training techniques for long-term missions are discussed focusing on selection for a good interpersonal mix within teams and training to support both physical and psychological endurance for long-term space travel. Linking these fields is a clear need to identify a practical and pragmatic approach to enabling spaceflight, balancing risk acceptance vs. risk mitigation.

## 2. References

[1] Bond, W.F. in Robert D. Zettle, Steven C. Hayes, Dermot Barnes-Holmes, Anthony Biglan (2016) The Wiley Handbook of Contextual Behavioral Science, Wiley-Blackwell.

## **Short Summary**

Discussing and addressing key human factors affecting long-duration manned missions. Further, a range of potential changes to current selection and training techniques for long-term missions are discussed focusing psychological factors.