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BRINGING GRAVITY TO SPACE

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This panel will present NASA's plans for ongoing and future research to define the requirements for Artificial Gravity (AG) as a countermeasure against the negative health effects of long-duration weightlessness. AG could mitigate the gravity-sensitive effects of spaceflight across a host of physiological systems. Bringing gravity to space could mitigate the sensorimotor and neuro-vestibular disturbances induced by G-transitions upon reaching a planetary body, and the cardiovascular deconditioning and musculoskeletal weakness induced by weightlessness. Of particular interest for AG during deep-space missions is mitigation of the Visual Impairment Intracranial Pressure (VIIP) syndrome that the majority of astronauts exhibit in space to varying degrees, and which presumably is associated with weightlessness-induced fluid shift from lower to upper body segments. AG could be very effective for reversing the fluid shift and thus help prevent VIIP. The first presentation by Dr. Charles will summarize some of the ground-based and (very little) space-based research that has been conducted on AG by the various space programs. Dr. Paloski will address the use of AG during deep-space exploration-class missions and describe the different AG scenarios such as intra-vehicular, part-of-vehicle, or whole-vehicle centrifugations. Dr. Clement will discuss currently planned NASA research as well as how to coordinate future activities among NASA's international partners. Dr. Barr will describe some possible future plans for using space- and ground-based partial-G analogs to define the relationship between physiological responses and G levels between 0 and 1. Finally, Dr. Stenger will summarize how the human cardiovascular system could benefit from intermittent short-radius centrifugations during long-duration missions.