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Space Crew Composition: History of Crew Demographics in Human Spaceflight

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There are many factors that contribute to the overall success of crews during spaceflight, from engineering and operational considerations of the vehicle to how well men and women adapt physically to the microgravity environment. However, as the US and Russia focus on longer-duration missions aboard the International Space Station (ISS) and plan for human missions to Mars, interpersonal and psychological factors take on even greater importance to mission success (Flynn, 2005; Oglesby, & Salas, 2012; Stuster, 2011). In addition to coping with prolonged isolation and confinement, variable levels of workload, and extended separation from family and friends on Earth, crewmembers must live and work together effectively.

Although a host of variables affect crew interactions and performance, the first and most basic consideration is the composition of the crew. Nearly every human spaceflight over the past 53 years has involved highly trained and technically proficient crewmembers; however, what has changed from mission to mission is the specific mixture of demographic characteristics such as nationality, sex, age, education, and military background. Diversity in this mixture increased greatly in the 1980s during the US Shuttle and Russian Mir programs and continues today with 6-person crews on the International Space Station (ISS). Research on teams in space, and analogous settings like military operations, aviation, and Polar research, shows crew composition plays an important role in how the crew functions, communicates, and ultimately performs (Stuster, 2010; Kraft, Lyons, & Binder, 2003; Suedfeld, 2010). Less is known, however, about the ideal composition in terms of demographics for long-duration space missions (Holland, 2000). One of the challenges is the extremely small sample size on which to base recommendations. At the end of 2014, only 536 people had flown in space. Furthermore, only a tiny fraction of this population has been involved in behavioral research focused specifically on crew functioning and coordination. We argue a more thorough examination of crew composition in space is warranted. Although increased in-flight and Earth-based simulation research is needed, an important first step is describing the evolution of crew composition during the history of human spaceflight and establishing a baseline before moving forward. To this end, we have consolidated mission data on the demographic characteristics of every space crew for the past 53 years in terms of nationality, sex, age, education and military background and summarized these data to highlight changes in diversity and historical trends in crew composition.

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