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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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INTERDISCIPLINARY ROADMAP FOR ENABLING AN INTERSTELLAR WORLDSHIP MISSION

Abstract

This paper addresses interstellar travel using a slower-than-light, self-sustaining worldship to carry humans over many generations to other star systems and, in particular, the preparations needed to launch such a ship in a nominal 100-year timeframe. This means that current or near-current technologies must be leveraged in new and creative ways. Where technologies do not exist, a critical path of precursor missions and projects has been identified. This outlines the steps necessary for their development and to this end, an interdisciplinary roadmap has been created.

Drawing on information from past studies of interstellar missions, a preferred concept for the worldship is identified. This allows key technologies to be selected and considers the feasibility of their advancement in time for a launch in the next century. Strategies are outlined for the necessary development and follow a logical progression of enabling missions and projects. An interdisciplinary approach considers the technological and societal challenges leading up to the launch of a worldship as well as operating it over hundreds to thousands of years. Some of the major topics include onboard infrastructure such as living spaces, biomes, transportation systems, a life support system, and the required facilities such as medical and scientific. Other topics cover operational concepts such as shielding from radiation and collisions, onboard manufacturing and recycling, redundancy in systems, and research and development. The necessary ship subsystems under consideration include power, propulsion, communication, and navigation systems. In addition, issues concerning onboard society looks at topics relating to life on board including education, law, culture, economy, and ethics. Finally, a look at mission planning takes into account the conditions for enabling the construction of a worldship including political considerations, cultural changes, financing, and international partnership.

The end result is an interdisciplinary roadmap for the launch of a slower-than light, multi-generational worldship for interstellar travel. This roadmap addresses issues both leading up to the launch and on board such a worldship. Future research needs are identified for both technical and non-technical challenges. The methods and timeline required to complete this research are then incorporated into specific missions and projects. These provide an outline and lay the framework to achieve interstellar travel in the near future with an approach that is financially feasible, technically capable, and culturally desirable.

keywords: interstellar, worldship, roadmap, interdisciplinary, precursor