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

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CASE STUDY OF A MISSION TO EPSILON ERIDANI: UNMANNED INTERSTELLAR PROBE
USING GAS CORE NUCLEAR REACTORS WITH EARLY 21ST CENTURY TECHNOLOGY

Abstract

Le Rêve d'Étoiles or the Dream of Stars has been a common dynamo for mankind since the dawn of the civilization. Since mankind has looked upon the stars, he has felt the compulsion to reach out there. However, mostly this has remained a dream rather than a reality due to limitations in current space technology. When it comes to manned missions, the farthest location that we have been able to reach is the Moon. Going to a nearby planet such as Mars with a manned mission still seems to be at least a decade away with the present technology. In addition, transportation of unmanned probes for deep space missions also has not really advanced too much as compared to the technologies of the Voyager missions era. Current technology allows for decades to pass before it can even be possible to reach heliopause with a new probe. However, regardless of these above conditions, it is essential to explore options for interstellar missions. Consequently in the present, the dream of stars compels many scientists to work on interstellar missions even though it may not be possible to initiate such a mission with current technology. This paper discusses the possibility of an interstellar mission to Epsilon Eridani. Epsilon Eridani is chosen is due to the fact that it is at the 10 light years boundary of the near interstellar space around our solar system. This star is at an approximate distance of 10.5 light years with an apparent magnitude of 3.73. It is a young sun with an age less than a billion years and hence harbors a lot of potential for further research. Consequently, it has been a focal point in many science fiction novels and it has been a target for SETI research as well. Thus, Epsilon Eridani presents a good destination for interstellar travel. Hence, this paper will present a case study analysis of interstellar travel to Epsilon Eridani by comparing different modes of propulsion and plotting the distance, time and specific impulse for gas core nuclear propulsion system which promises to reach in a reasonable amount of time. The challenges of such a mission will be presented in detail and the effects of semi relativistic speeds will be considered along with the corresponding mass expansion and time dilation. This paper will present this case study to become a reference point for similar unmanned interstellar missions in the future.