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EXPLORATORY MISSION TO HELIOPAUSE AND BEYOND FOR PRECURSOR TO INTERSTELLAR SPACE TRAVEL

Abstract

When Stanley Kubrick filmed his masterpiece of 2001: Space Odyssey written by Arthur C. Clarke, he imagined a high level of space technological capability by 2001, where humans could establish space hotels, travel easily to the moon and have human space exploration capability to Jupiter and beyond. Unfortunately, as we are in year 2022, almost none of these predictions have come true and it can be said that human civilization has slowed down in its space achievements. However, in retrospect, 2021 was a year where more flights were conducted into space than any other year. Now, humankind can send probes to moon and Mars easily as it has been demonstrated many times. Also with the Voyager missions, it has bene possible to reach the far reaches of our solar system and with the exit of Voyager 2 from our solar system a new era has started. The future of space exploration lies at the edge of the solar system where heliopause is located as the shock termination of solar particles occur there and theoretically interstellar space starts beyond that region. Thus, its essential to plan and execute missions to the region of Heliopause and to the start of interstellar space to help pave the way for missions beyond our solar system. While many technological breakthroughs are awaited, advanced nuclear propulsion technologies such as gaseous core propulsion and fusion propulsion are the likely candidates for such missions within acceptable time frames. Since waiting 30 years or more for a deep space probe to leave the solar system is unacceptable by today's standards, these novel techniques must be developed by spacefaring nations to pave the way for even more advanced missions in the 21st century. Achieving these goals can also make it possible to create human crewed missions to Jupiter and beyond as it was imagined for the year 2001. All of these are technically possible with the existing space technology of 2022 and can be implemented with focused RD programs and budgets from governments and the private sector. This paper demonstrates a deep space probe with nuclear power and propulsion which can achieve such a mission within a relatively short mission span. A case study is presented with existing but adapted technology which shows the necessary parameters required for such a mission including specific impulse, thrust capability and mission timings. Reasonable goals are set for this case study mission and the importance of achieving these objectives are highlighted to pave the way for similar research and missions in the very near future.