

The Emergence of a Fusion Propulsion Capability this Century and Implications for Exploration and Settlement Strategies

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Abstract

In recent years many companies have emerged with the goal of producing fusion based propulsion systems for space exploration. That is using the same energy generation mechanism that powers the Sun. A particular highlight has been the recent achievement of thermonuclear ignition at the National Ignition Facility [1] which uses the method of laser driven inertial confinement fusion [2, 3]. This brings the possibility of applying such technology to space applications closer to fruition and concepts using this technology have been considered by NASA for missions to Mars, the outer solar system and further [4, 5]. Robotic missions to the outer heliosphere and beyond the Voyager probes will be possible within decades [6, 7]. Missions to the outer planets Jupiter and Saturn carrying a human crew may be possible in the second half of this century [8, 9]. Robotic flyby missions on an interstellar trajectory will be possible by the turn of the next century [10, 11]. These missions bring new knowledge in terms of scientific discoveries but also form the basis of an economic benefit to large scale industrialisation in space and the creation of an independent off-world economy such as based on helium-3. They also make the world ship possible [12, 13]. In this paper we discuss some of the concepts developed by the author consistent with these mission architectures and the broader implications for exploration roadmaps and settlement strategies of the Solar System through interplanetary flight and beyond to interstellar flight [14, 15].

Speaker

Kelvin F Long is the Director of the *Interstellar Research Centre*, a division of Stellar Engines Ltd. He has a Bachelor's degree in Aerospace Engineering, a Master's Degree in Astrophysics and a Ph.D in Physics and is a Chartered Physicist. He is the author of several books and over 100 technical physics papers in the peer reviewed academic literature and the defence industry. His main research interest is in the field of interstellar studies, which seeks to send spacecraft to other stars, with a particular focus on advanced propulsion and spacecraft concept design. He has presented at all of the NASA laboratories in the United States and has also worked closely with national laboratories LANL and LLNL among others.

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