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SPACE PROPULSION SYMPOSIUM (C4)
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INERTIAL FRAMES AND BREAKTHROUGH PROPULSION PHYSICS

Abstract

To assess the prospects for achieving the breakthrough of a propellantless space drive, where gravitational or inertial effects are used for propulsion, further advances in physics are required. To determine the relevant physics questions, this investigation compared prior space drive concepts with known physics. Next-step research questions were then identified for each. One of the questions selected for closer examination is the nature of inertial frames. Inertial frames are the reference frames upon which the laws of motion and the conservation laws are defined, yet it is still unknown what causes inertial frames to exist and if they have any deeper properties that might prove useful. Relevant topics include Mach's Principle, where its premise is that that an inertial frame, here, is created by the surrounding distribution of mass, out there. There are several variants of Mach's Principle, some of which have been dismissed, but its final viability and the origin of inertial frames remains unknown. Another area of study addresses the different formalities of General Relativity, determining which versions might be more appropriate for investigating propulsion questions. For example, the predominant formalism of Riemannian Geometry, which is the basis for traversable wormhole and warp drive theories, has been found to be unable to address conservation of momentum for transport based on those methods. This investigation is one step in a process to seek spaceflight physics breakthroughs, rather than to posit a specific propulsion device. A list of relevant physics questions and approaches are provided. It is unknown if any of these lines of inquiry will be fruitful. Regardless, by revisiting unsolved physics from a propulsion point of view, it is hoped that insights will be gained that otherwise would have been overlooked.

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