

“Extending the Performance Capabilities of Electrostatic Ion Engines”

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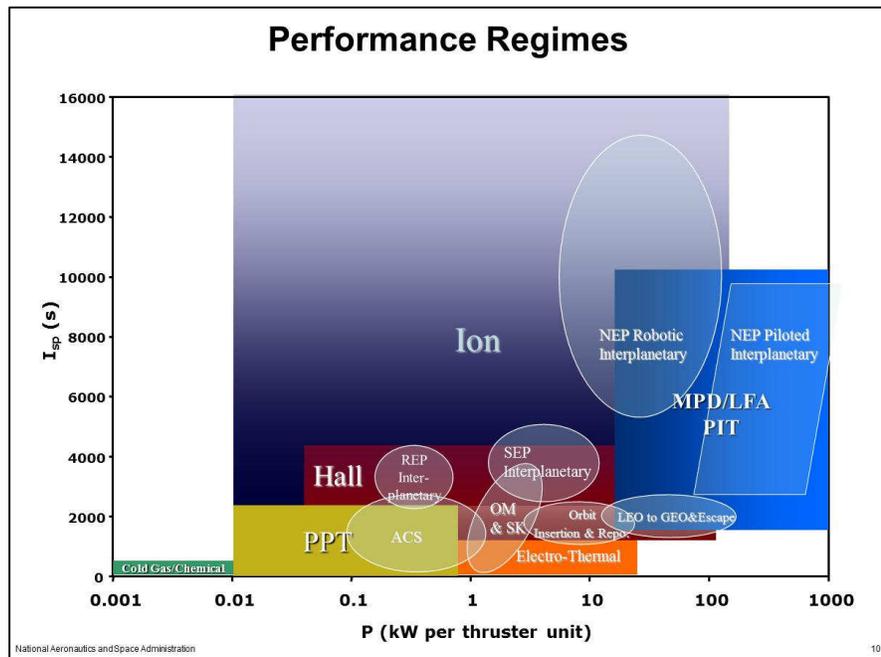
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A Next-Generation Electric Propulsion Thruster (NGEPT) is under development at NASA GRC which has as its design basis an Annular-Geometry Ion Engine (AGI-Engine). This AGI-Engine is anticipated to be a key to rapid development of very high-power electric thrusters which have the potential to operate at higher power and thrust densities than State-of-the-Art (SOA) thrusters, with increased performance and life times. It does so by providing a pathway to extend the application space of electrostatic ion thruster technology to high power operation at modest levels of specific impulse.

This primary advantage of the NGEPT approach – *to extend the application space of electrostatic ion thrusters* – is not fully recognized because the present limitations of ion thrusters and other technologies are not universally understood or agreed upon. Lack of clarity with respect to nominal performance regimes is promulgated and reinforced by illustrations such as the attached Figure (typical of that used to describe EP concepts), which are neither quantitative nor particularly accurate with respect to the *actual-and-demonstrated* operational envelope of ion thrusters or other EP devices. In this presentation:



demonstrated operational envelope of ion thrusters or other EP devices. In this presentation:

- The historical and SOA performance capabilities of electrostatic ion thruster technology are documented (specific impulse, power, thrust ranges) in a quantitative manner, with emphasis on definition of the operational boundaries and associated limitations.
- The potential extension of these operational boundaries by implementing alternative engineering approaches to ion engine design – in particular, the NGEPT/Annular-Geometry Ion Engine approach – are then documented and discussed. Practical engineering (manufacturing, and the like) and theoretical limitations are superimposed to define reasonable expectations relative to the ultimate performance capabilities of this technology. These performance capability-estimates can then be applied as a basis for comparison to other EP technologies going forward.
- The status of NGEPT development is also summarized.