Disruptive Technologies

EPIC

Many other types of ion and plasma thruster emerging that may potentially be 'disruptive':

Helicon Plasma Thruster
MPD
FEEP
Colloid
PPT
Ion Thruster based on Neutron Source
QCT
ECR
Ponderomotive
Electronegative GIE
HALO
others……

"A 'disruptive space technology' is an emerging technology that disrupts the status quo of the space sector by replacing the dominant technology and provides a radical improvement in performance that is perceived as valuable by a customer or part of the market, or it opens up new opportunities not possible with the incumbent technology".

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Disruptive Technologies: Evaluation

STEP 1→ STEP 2: Main list of alternative thrusters assessed against the evaluation criteria.

Costs/Feasibility	recurring costs
	non recurring costs
	Starting TRL and relevant justification
	Development Planning and Risks Analysis
	Level of dependence on Non European key technogies
	Level of dependence on Non European testing facilities, diagnostic capability
	Level of dependence on flight qualified technologies
	Critical components (PPU, FCU, etc.)
Flexibility	Versatility w.r.t. Different classes of missions (for each EP engine identify the possible classes of missions)
	Versatility w.r.t. Different applications (for each class of missions identify the possible applications)
	Versatility w.r.t. propellants (compatibility whith different propellant)
	Throttability, controllability (i.e. fine thrust regulation, modularity)
	Commonalities w.r.t. other EP building blocks
	Scalability
Competitiveness	Expected competitive position in the european and non european market (specify if short/medium or long term scenario) taking into consideration future missions
	Valorization of competencies/technologies already developed at european level in other national and international project
	Performances gain due to disruptive technology advancement
	Potential Spin off for cross related fields
	Possible integration in launch systems worldwide
Impact on the host - system	Expected saving on the host-system (weight, power etc.)
	Interface compatibility between the EP and the host system
	Expected host-System delta performance (Mission benefits)

Relatively small variance across the scores for the different thrusters, except for:

- ion thruster based on neutron source technology

- low score as thruster proposed at conceptual level only, therefore difficult to ascertain performance attributes.

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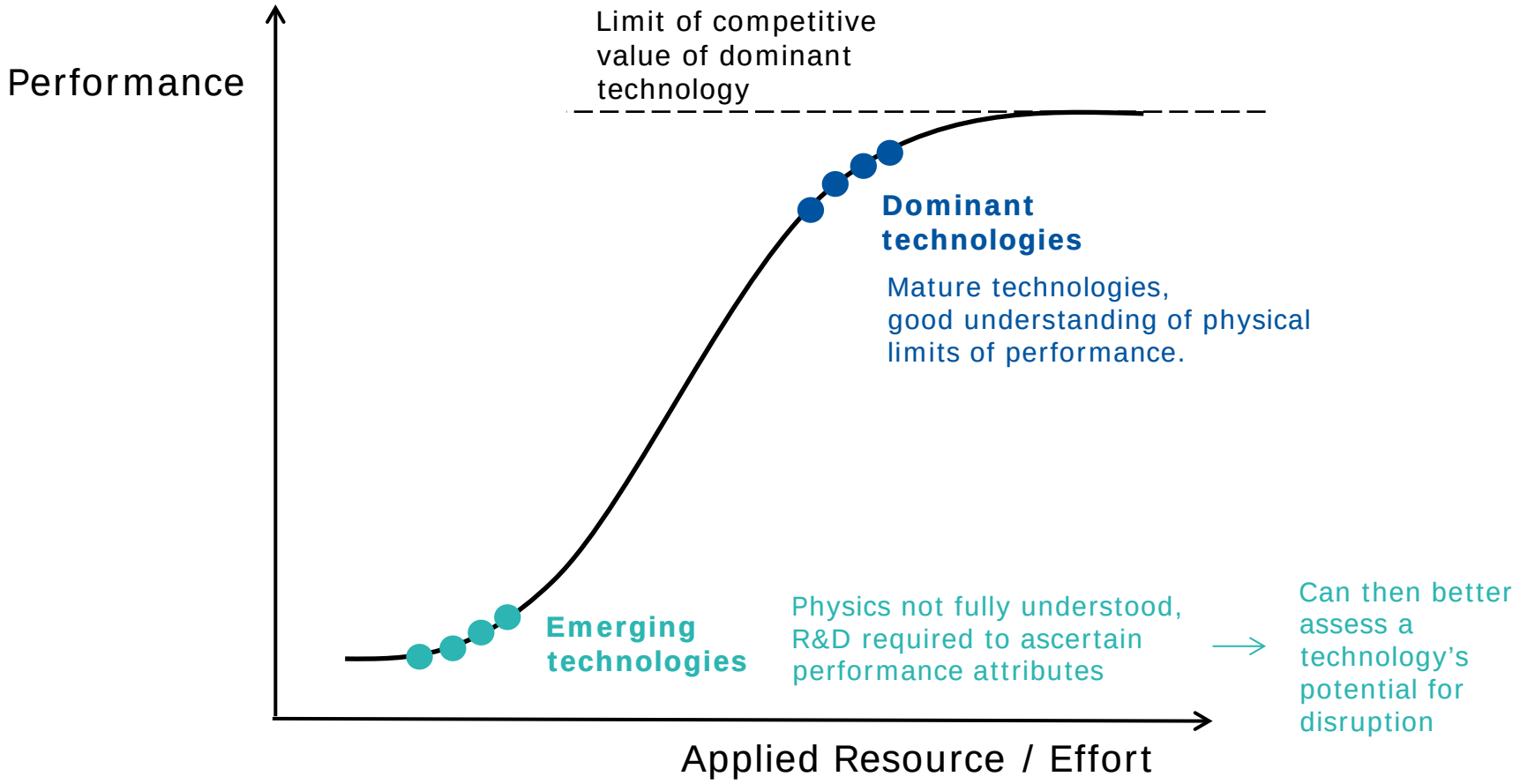
Disruptive Technologies



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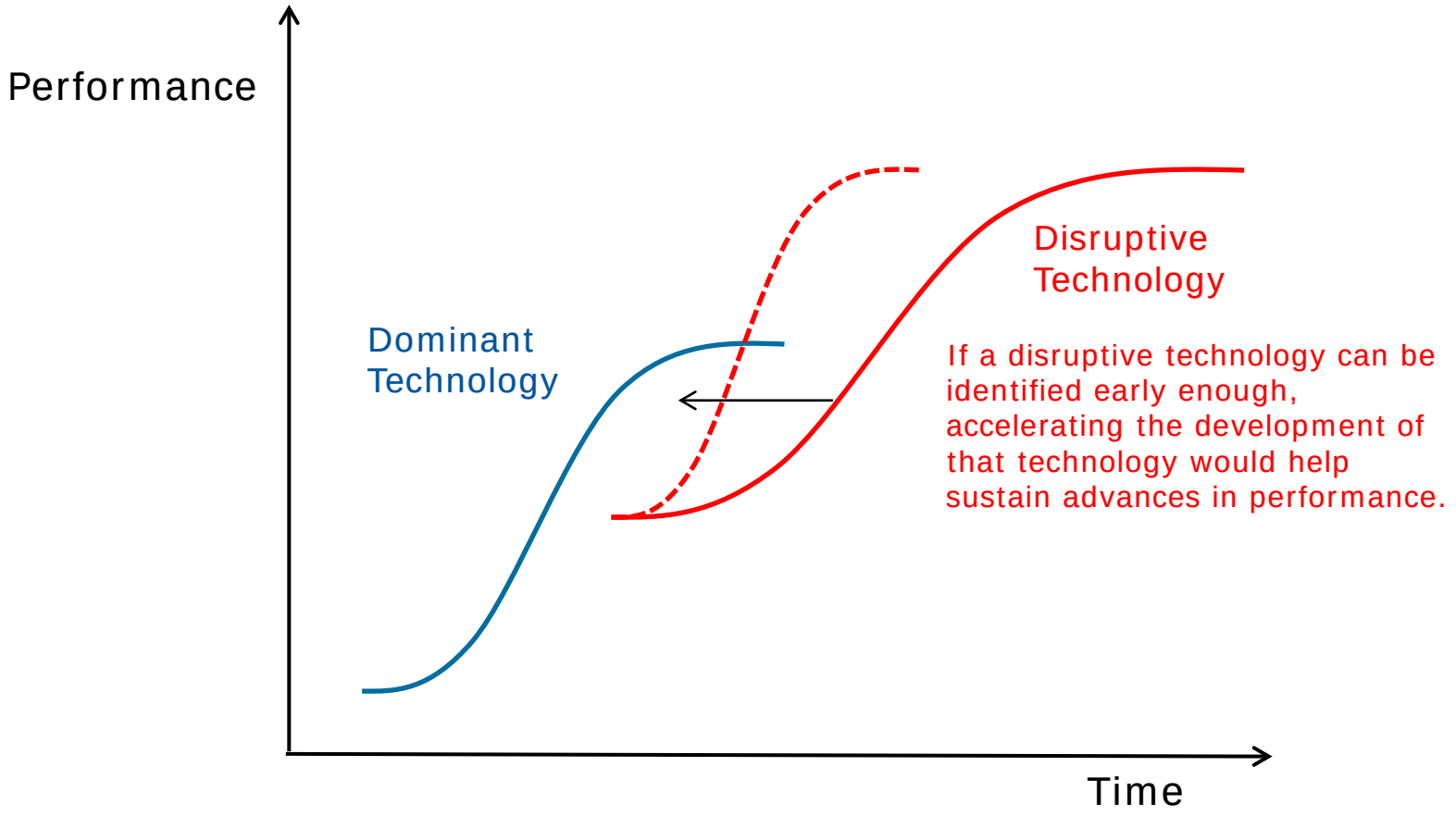
Disruptive Technologies



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Disruptive Technologies Evaluation

EPIC

STEP 3

Technologies
HPT
MPD
FEEP
Colloids
PPTs
Neutron Sources
QCT
ECR
Ponderomotive
Electronegative GIE
HALO

Missions
Telecom
Space transportation
LEO/MEO missions
Exploration/Interplanetary/Science

Gaps
Cost reduction (recurring, to be distinguished between LEO;MEO)
Alternative propellents
Mass saving
High total impulse
Higher efficiency
low noise
lower system complexity (nanosat)
multiple mode operation
Alternative clustering configuration
High thrust controllabillity (precise FF)

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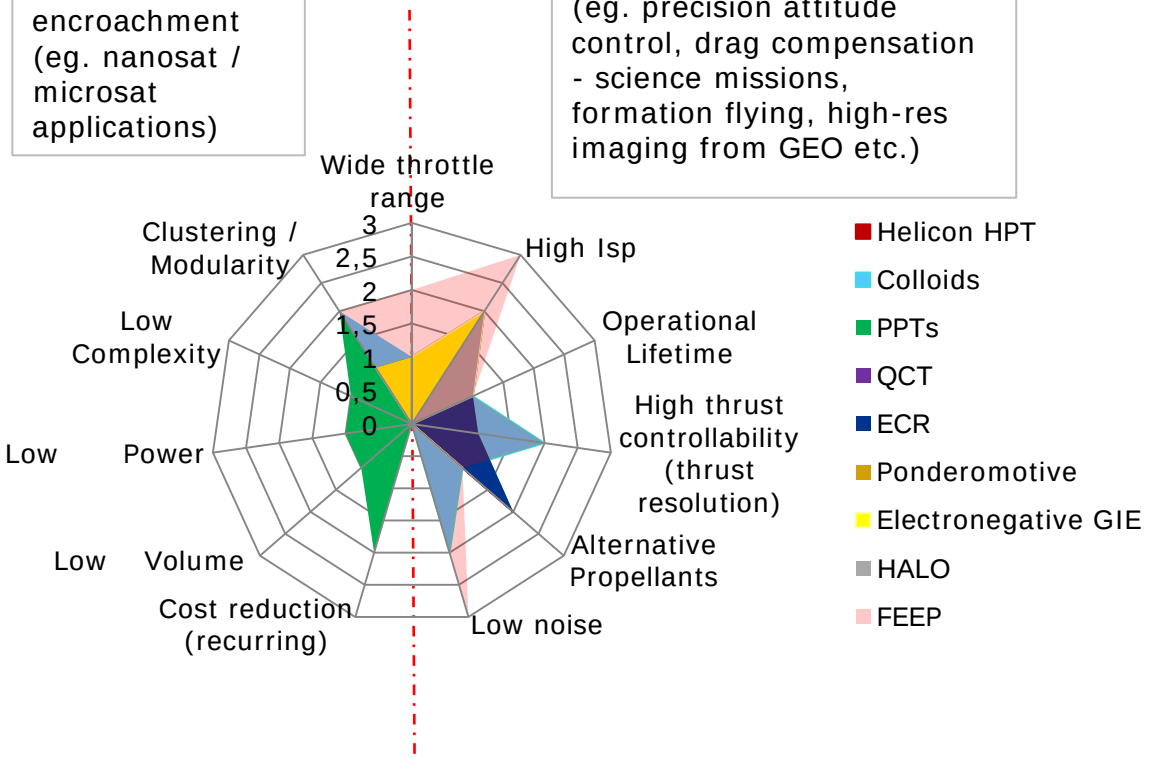
STEP 3: Micropropulsion technologies

- Science missions
- LEO/MEO missions

Low-end encroachment (eg. nanosat / microsat applications)

High-end encroachment (eg. precision attitude control, drag compensation - science missions, formation flying, high-res imaging from GEO etc.)



The score is between 0 and 3 (integer), the higher the better.
Score relative to cold gas/chemical micropropulsion:
0 = worse than cg/cp,
1 = similar to cg/cp,
2 = small - medium performance gain over cg/cp,
3 = significant improvement over cg/cp

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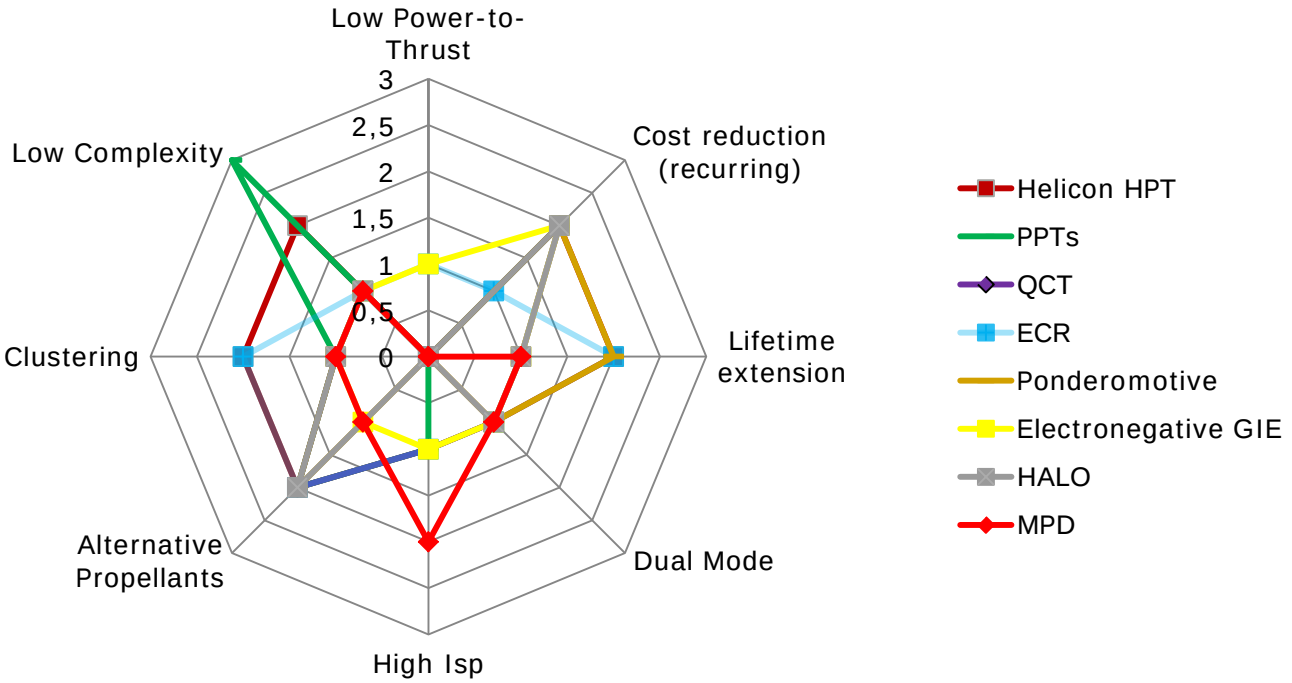
STEP 3: Intermediate Thrust, Power

- Telecom
- LEO/MEO missions
- Science missions



The score is between 0 and 3 (integer), the higher the better.
Score relative to incremental EP thrusters:
0 = worse than,
1 = similar to,
2 = small - medium performance gain
3 = significant improvement over incremental thrusters

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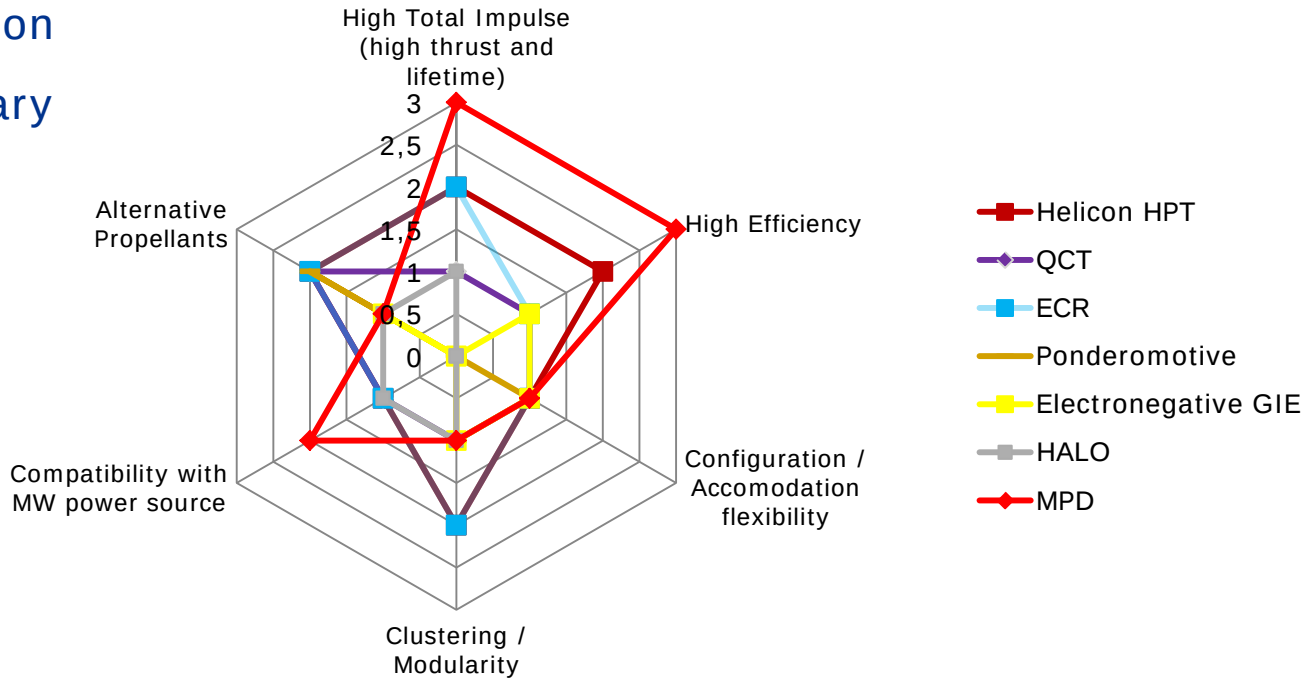
STEP 3: High Power, High Thrust

- Space Transportation
- Interplanetary
- Exploration



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Disruptive Technologies - Summary

The main list of alternative thrusters have been assessed against the evaluation criteria and the identified gaps/needs for each application/market segment:

- some showing early potential to be disruptive in the propulsion sector;
- however, prioritizing emerging technologies is problematic due to difficulty in ascertaining ultimate performance attributes of low maturity technologies.

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