



EPIC Programme Support Activity

“Electric Propulsion Innovation & Competitiveness”

**ESA Coordinator
EPIC Roadmapping Workshop
Stockholm, 11th February 2015**

1. Introduction to EPIC

- In response to a request from interested ESA Member States, ESA as Coordinator submitted on 26th March 2014 a proposal under the H2020-COMPET-2014 call:
 - **EPIC: Electric Propulsion Innovation and Competitiveness**, under the "COMPET-3-2014: In-Space electrical propulsion and station keeping" topic.
- EPIC is a Programme Support Activity (**PSA**) of 5 years duration, for the future implementation of a Strategic Research Cluster (**SRC**) in Horizon 2020 Space.
- The project aims at providing advice to the Commission for their respective SRCs over a 5-year period mainly through preparing Roadmaps, drafting call texts and assessing results of the SRC operational grants.
- The R&D work for the topic will come in the SRC as a part of H2020 Calls made by the Commission, open to all EU Member States and H2020 participants, and the projects will be selected and supported through the normal Horizon 2020 grant procedures.
- EPIC Consortium:
 - ESA (coordinator), ASI, BELSPO, CDTI, CNES, DLR, UKSA, Eurospace, SME4Space.
- Project starting date: 1 October 2014

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640199. This presentation reflects only the Consortium's view. The EC/REA are not responsible for any use that may be made of the information it contains.

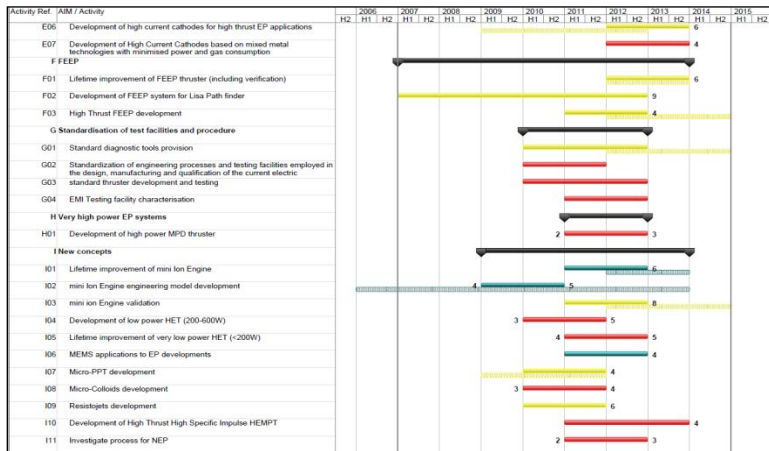
EPIC Objectives

- Electric propulsion has been identified by European actors as a **Strategic Technology** for improving the **European competitiveness in different space areas** such as in-space operations and transportation.
- The Electric Propulsion Innovation & Competitiveness (EPIC) project aims to provide a clear integrated roadmap of activities and a master plan for its coordination and implementation through a Strategic Research Cluster (SRC) on “In-space Electrical Propulsion and Station-Keeping”.
- The produced roadmap when implemented through the operational grants of the SRC and when correctly coordinated by the EPIC Programme Support Activity (PSA), will contribute to substantially increase the Technology Readiness Level (TRL) of future EP technologies.
- EPIC also intends to provide advice to the European Commission (EC) on the calls for the SRC operational grants, and to assess the evolution and results of those operational grants with respect to the overall SRC roadmap.
- **Overall objective: to contribute with the SRC to enhance the European capabilities in EP at world level within the 2020-2030 timeframe, and beyond.**

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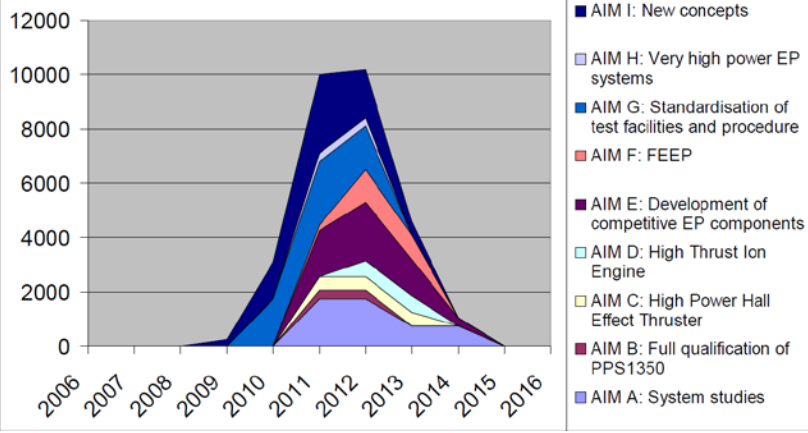
Taking benefit of the European Space Technology Harmonisation exercise 2014

- “Electric Propulsion Technologies” subject visited in 2004 and 2009 (2009 visit included EPPM)
- Revisited in 2nd Cycle 2014
- Other Electric Propulsion-related topic Harmonisations:
 - Propulsion components (including tanks), 2012
 - Power Management and Distribution, 2013



Proposed Development approach : Cost

Activity	Budget (kEuro)		Approv. Prog.	Prop. Prog.	Proc. Policy Type	Company	Remark	TRL level		Date	ND	BB	
	Urg. Ctr.	Approv. Add.						Curr.	Targ.				Start
AIM C: High Power Hall Effect Thruster													
C1 High thrust high power (up to 10kW) Hall Effect thruster development	L	L	1500		GSTP	OC		3	4	2011	2013	Y	N
AIM D: High Thrust Ion Engine													
D1 Development of Td for Brasilsat				Other	OC	OrbitalQ		6	9	2009	2014	N	N
D2 Cathode-Cathode Grid for future missions	M	M	400		GSTP	OC	explorations, science	3	4	2012	2013	N	N
D3 High Thrust High Specific Impulse Ion Engine	L	L	800		GSTP	OC	explorations, science	3	4	2012	2013	N	N
AIM E: Development of competitive EP components													
E1 Development and ground qualification of very high power Hall effect components (> 150 kW MDP)	M	M	1200		GSTP	OC		3	6	2011	2014	Y	Y
E2 Ground qualification of proportional valve based electronic pressure regulator systems	M	M	900		ARTES	OC		4	6	2011	2012	Y	Y
E3 Development of integrated Xenon Feeding system for autonomous EP systems (mini HET, mini Ion, very low flow rate)	M	M	400		GSTP	OC		4	6	2011	2011	Y	Y
E4 Development of European components valves, pressure transducers, flow meter							telecommunication						
E5 Development of low current cathode for power EP systems (mini HET, mini Ion)													
E6 Development of high current cathodes for EP applications													
E7 Development of High Current Cathodes on mini HET technologies with minimum power and gas consumption													



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2. Work Logic

WP1

Project Management

- T1.1 Finance, Audits and Reporting
- T1.2 Harmonisation with other key players (Advisory Board and THAG)
- T1.3 PSA Quality Assurance, Risk Assessment and Contingency
- T1.4 Technical Coordination

WP2

Technology Mapping & Application Requirements

- T2.1 Survey of available EP technologies and TRL
- T2.2 Collection of Requirements from commercial and institutional actors, European Primes and Agencies
- T2.3 Studies and Gap Analysis of requirements vs. Application Domains
 - T2.3.1 Satcom
 - T2.3.2 LEO, MEO
 - T2.3.3 Interplanetary
 - T2.3.4 Space Transportation

WP3

Activity Definition & Master Planning

- T3.1 Prioritisation Technology vs. Domains (*Incremental Advances*)
- T3.2 Prioritisation Technology vs. Domains (*Disruptive RTD*)
- T3.3 Activity Descriptions for Prioritised Developments and IOD/IOV
- T3.4 Roadmaps and Master Plan preparation

WP4

Direct Support to EU

- T4.1 Drafting Call Texts for Operational Grants
- T4.2 Review and Analysis of SRC Progress
- T4.3 SRC Risk Assessment and Contingency Analysis
- T4.4 Plan for the Exploitation and Potential Use of SRC expected Outputs
- T4.5 IPR & Legal Matters
- T4.6: Assistance for Briefing of Applicants, Independent Evaluators, at negotiation and/or monitoring phases

WP5

Dissemination, Education and Outreach

- T5.1 Dissemination
- T5.2 Education & Outreach

Work Logic: current status (1/3)

WP2

Technology Mapping & Application Requirements

T2.1 Survey of available EP technologies and TRL

T2.2 Collection of Requirements from commercial and institutional actors, European Primes and Agencies

T2.3 Studies and Gap Analysis of requirements vs. Application Domains

- T2.3.1 Satcom
- T2.3.2 LEO, MEO
- T2.3.3 Interplanetary
- T2.3.4 Space Transportation

- WP leader: CNES
- Tasks supported by:
 - the EP Harmonisation process 2014 and consultation to the THAG.
 - A technology/product survey performed by Eurospace.
 - the EPIC Workshop in Brussels November 2014.
 - The EPIC Advisory Board.
- All 3 tasks finished, deliverables in refining phase:
 - D2.1: Survey of available EP technologies and TRL
 - D2.2: Collection of requirements from commercial and institutional actors, European primes and Agencies
 - D2.3: EPIC Brussels Workshop report
 - D2.4: Studies and Gap Analysis of requirements vs. applications domains.
- Delivery of D2.1-D2.4 to EC/REA due in February 2015
- Update of WP2 deliverables will be done through the 5-year PSA period as deemed necessary (landscape/market changes, etc.)

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Work Logic: current status (2/3)

EPIC

WP3

Activity Definition & Master Planning

T3.1 Prioritisation Technology vs. Domains (*Incremental Advances*)

T3.2 Prioritisation Technology vs. Domains (*Disruptive RTD*)

T3.3 Activity Descriptions for Prioritised Developments and IOD/IOV

T3.4 Roadmaps and Master Plan preparation

- WP leader: ASI
- Tasks being supported by:
 - The EP Harmonisation process 2014 and consultation to THAG
 - **The EPIC Workshop in Stockholm, February 2015**
 - The EPIC Advisory Board
- T3.1 and T3.2 finished, deliverables in refining phase
- T3.3 and T3.4 undergoing: **Draft roadmap to be shared for the first time today at our EPIC Workshop.**
- Draft deliverables to EC/REA due in February 2015
- Periodic update of the SRC Roadmap and Masterplan through the years, as necessary, depending on the results of the selection in the upcoming 2016 call and the progress of the activities.

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Work Logic: current status (3/3)

EPIC

WP4 Direct Support to EU

T4.1 Drafting Call Texts for
Operational Grants

T4.2 Review and Analysis of
SRC Progress

T4.3 SRC Risk Assessment and
Contingency Analysis

T4.4 Plan for the Exploitation
and Potential Use of SRC
expected Outputs

T4.5 IPR & Legal Matters

T4.6: Assistance for Briefing of
Applicants, Independent
Evaluators, at negotiation
and/or monitoring phases

- WP leader: CDTI
- T4.1 on-going
- T4.3, T4.5 (Collaboration Agreement) and T4.6 starting soon
- **1st draft D4.1 (2016 draft call text) due at the end of February 2015 + iterative refining process until the H2020 Space 2016 Work Programme is consolidated.**

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