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ESA ESTEC 26/11/2025 ESA-TECSFA-HO-2025-003528

ESA Al Strategy Plan – The genesis



- The ESA AI Strategy Plan has been prepared within an ESA-wide taskforce on AI:
 - 30+ members
 - 10 Directorates
- Present the vision and strategy
- Define the organisation
- Identify strategic objectives

• Issue 1.2 has been made available for public distribution on 2nd June 2025





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ESA AI STRATEGY PLAN

Prepared by TaskForce5-A

ESA

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→ THE EUROPEAN SPACE AGEN

ESA Al strategy plan organisation





Al@ESA strategy implementation 11/2025 06/2 CMIN25 12/24 11/24 AISSA THD 11/24 ESA AI Technology Strategy Plan Vision 2040 05/24 Competen ce Centre **ESA AI** expert TDE workplan network 06-09/25 票+GSTP Compendium 02/24 ESA TaskForce5-Al

Some activities related to System Engineering



Gravity Assist – 2 projects	 SpaceKG: A Knowledge Graph for technology trends monitoring. Virtual Assistant for TEB and multi-mission requirements
Internal Research Fellow	Natural Language Processing, LLMs and Knowledge Graphs
Trainee – Requirements engineering	LLMs and RAG to support requirement generation and quality assessment
ETD – CodexTec	LLMs based system to support software engineering processes.
ARTES-FP (CSC) - Intelligence Platform Study	System-level identification of advanced capabilities enhanced by AI and design of OBC/DH platform to support their execution.
Al4SE	 Requirement flow-down: Similarity analysis between requirements, consistency requirements-architecture: Use a Large Language Model (LLM) as a reasoning engine to verify the model System architecture: Build Knowledge Graph with past design
CHIME (EOP) – Ongoing ENVISION (SCI) – Start ing	 Support the CHIME project and CDR with LLM/RAG Support the EnVision project with LLM/RAG on requirement engineering

Al Harmonisation Dossier – Strategic objectives





Al Harmonisation Dossier Roadmap Strategic objective 1



		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
R&D Line 1.3: System and subsystem verification, validation and qualification R&D Line 1.4: Smart Manufacturing, Assembly, Integration and Testing R&D Line 1.5: Autonomous robotic systems for planetary exploration and IRSU R&D Line 1.6: In-orbit servicing technologies R&D Line 1.7: Al technologies for S/C on-board autonomy R&D Line 1.8: Enable autonomous identification of mission objectives R&D Line 1.9: On-board Al learning for Autonomous Space Systems R&D Line 1.10: Al sensors Integration: Enhancing Sensor Capabilities with built-in Al		R&D Line	1.1: Enable	Al-based as	sistants for	mission des	ign, requiren	nent definiti	on and cost	estimation			
R&D Line 1.4: Smart Manufacturing, Assembly, Integration and Testing R&D Line 1.5: Autonomous robotic systems for planetary exploration and IRSU R&D Line 1.6: In-orbit servicing technologies R&D Line 1.7: Al technologies for S/C on-board autonomy R&D Line 1.8: Enable autonomous identification of mission objectives R&D Line 1.9: On-board Al learning for Autonomous Space Systems R&D Line 1.10: Al sensors Integration: Enhancing Sensor Capabilities with built-in Al													
Strategic Objective 1 R&D Line 1.5: Autonomous robotic systems for planetary exploration and IRSU R&D Line 1.6: In-orbit servicing technologies R&D Line 1.7: Al technologies for S/C on-board autonomy R&D Line 1.8: Enable autonomous identification of mission objectives R&D Line 1.9: On-board Al learning for Autonomous Space Systems R&D Line 1.10: Al sensors Integration: Enhancing Sensor Capabilities with built-in Al		R&D Line 1.3: System and subsystem verification, validation and qualification											
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R&D Line 1.8: Enable autonomous identification of mission objectives R&D Line 1.9: On-board AI learning for Autonomous Space Systems R&D Line 1.10: AI sensors Integration: Enhancing Sensor Capabilities with built-in AI	Objective 1	R&D Line	1.6: In-orbit	t servicing te	chnologies								
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R&D Line 1.10: Al sensors Integration: Enhancing Sensor Capabilities with built-in Al	ind engineering	R&D Line	1.8: Enable	autonomous	identificati	on of missio	n objectives						
		R&D Line	1.9: On-boa	ard Al learnir	ng for Auton	omous Spac	e Systems						
R&D Line 1.11: In-orbit assemble and manufacturing technologies		R&D Line	1.10: Al ser	nsors Integra	tion: Enhand	cing Sensor (Capabilities w	vith built-in v	Al				
		R&D Line	1.11: In-orb	oit assemble	and manufa	cturing tech	nologies						
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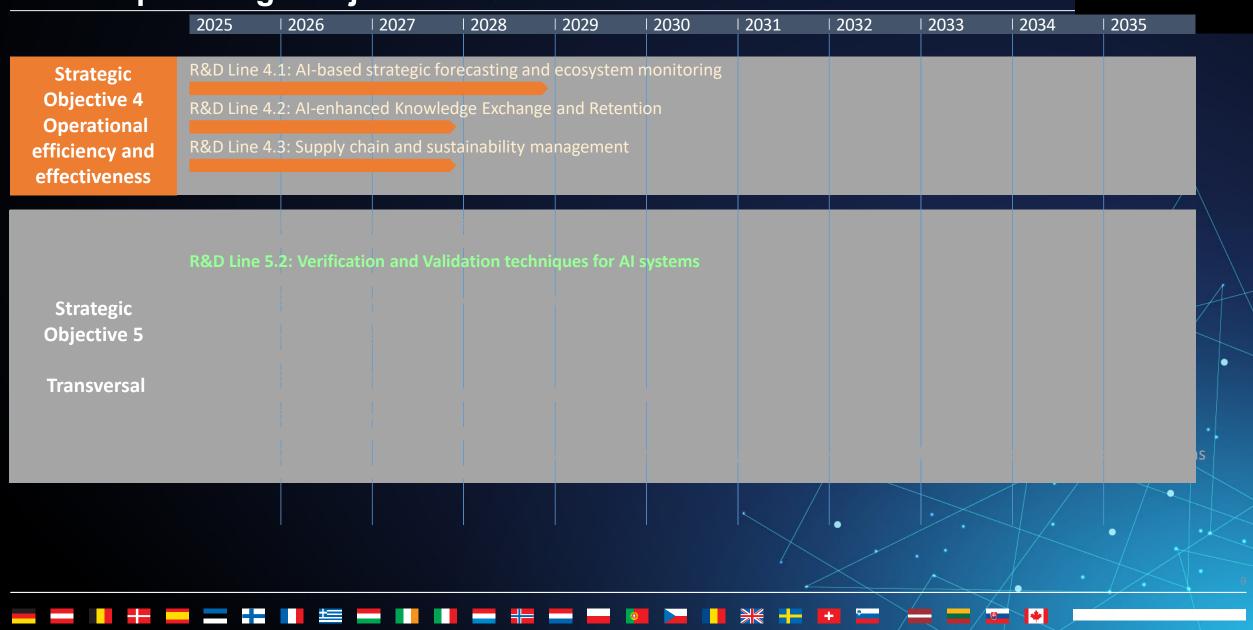
Al Harmonisation Dossier Roadmap Strategic objective 2&3



	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
	R&D Line 2	2.1: Al-Enha	anced Health	Monitoring a	and Control (Capabilities						
Stratogic	R&D Line 2	2.2: Al-Enha	anced Decisi	on Recomme	ndation and	 Planning Ca _l						
Strategic Objective 2	R&D Line 2	2.3: Al-Enha	anced Model	ling and Simu	lation (M&S							
B.O.L.	R&D Line 2	2.4: Al-auto	mated conte	ent generation	n and Al-enh			vith data				<u> </u>
Mission operations	R&D Line 2	2.5: Al-Enha	anced Crew S	Support Syste	ms for Space	Operations						
			pace Safety									\
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Stratogia		3.1: Enablin	g scientific d	iscoveries wit								71
Strategic Objective 3												
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Insights from											centralized	
mission data		tworks										
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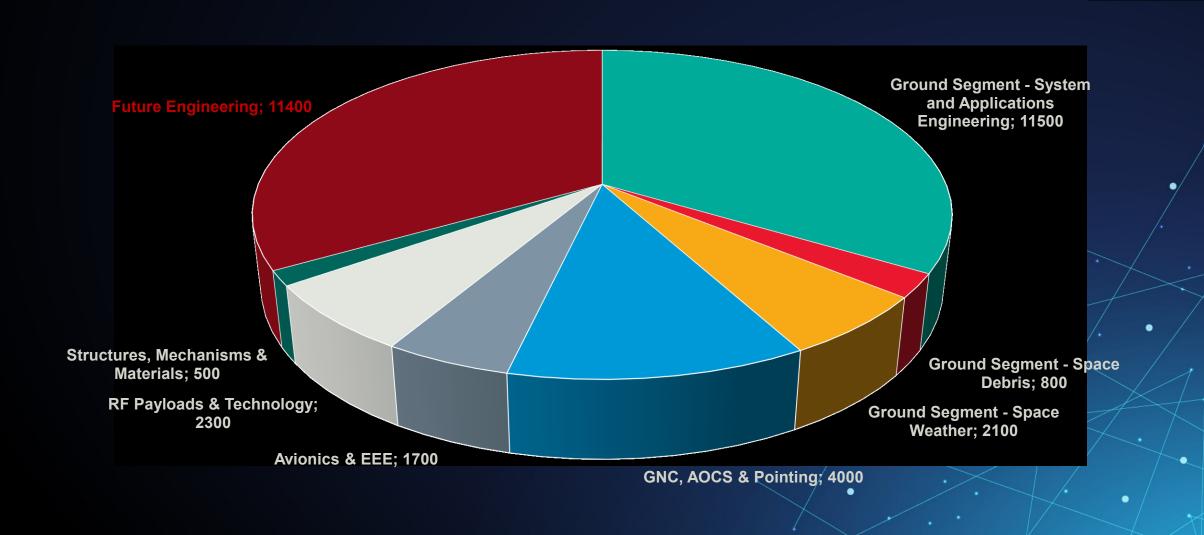
Al Harmonisation Dossier Roadmap Strategic objective 4&5





GSTP Compendium on Al/Digitalisation





GSTP 2026-2028 related to System Engineering



GT1I-819SF – Al accelerate ontology generation

Budget: 600 k€ - **Duration**: 18 months - **Current / Targeted TRL:** 3 / 5 - **TD** 26

Objective: To accelerate the development of the Space Systems Ontology leveraging Agentic Workflows, Natural Language Processing and Large Language Models.

GT1I-821SF – Generative design for early design phases

Budget: 900 k€ - **Duration**: 24 months - **Current / Targeted TRL:** 3 / 5 - **TD** 26

Objective: To use generative design and Al-based language tools to automate and accelerate early space mission design, enabling engineers to efficiently explore and evaluate a wider range of innovative solutions.

GSTP 2026-2028 related to System Engineering



GT1I-828SF – Intelligent assistant for MBSE and simulation model generation, setting and evolution for mission preparation

Budget: 1800 k€ - Duration: 18 months - Current / Targeted TRL: 3 / 6 - TD 8

Objective: To develop an intelligent system to assist in the generation of system designs (with MBSE) and system simulators for space missions; and mission preparation, including data system and simulator configuration and procedures preparation.

GT1I-830SF – Al-powered assistant for SysML v2: enhancing MBSE

Budget: 600 k€ - Duration: 12 months - Current / Targeted TRL: 4 / 7 - TD 8

Objective: To enable automation and efficiency increase in MBSE processes by developing an integrated and interoperable environment leveraging SysMLv2 textual notation and Large Language Models.

And ...



You can always contact ESA to propose other GSTP activities

Through the ESA's Open Space Innovation Platform (OSIP), you can:

- Propose innovative ideas to be funded through three types of activity:
 - Co-funded research
 - Study
 - Early Technology Development
 - As part of a campaign or an open channel
- Propose activities on ARTES, NAVISP, GSTP R&D programmes

Contact the Al Competence Centre for all aspects related to the use of Al in Space



https://ideas.esa.int/



ai@esa.int

What next?



AI-STAR - https://atpi.eventsair.com/ai-star-2025





SPAICE 2026 – October 2026 at ESTEC



https://spaice.esa.int/2026/



