

DUAL-USE ACTIVITIES FUNDED THROUGH ESA

PORTUGAL (2019-2024)

This analysis compiles a list of activities supported by the Portuguese Space Agency under the category of “dual use”. An activity is considered dual use when, although designed for a civil purpose, can also be used for defence.

Space technology is inherently dual use. However, this analysis focuses on activities that more clearly align with this concept. For this reason, the presented list predominantly comprises projects related to Space Transportation, Telecommunications (SatCom), Navigation, and Space Situational Awareness (SSA), as well as technologies vital for the development of Space Systems.

Although numerous Earth Observation data applications supported by the Portuguese Space Agency are intended for civil users, they were not included in this analysis, as they would need to be adapted to meet Defence requirements. Nevertheless, many of these applications may also have dual-use potential, particularly as relevant intelligence sources.

The following table details the dual-use activities supported by the Portuguese Space Agency through the European Space Agency (ESA), specifying the technological domain, funding amount, and the entities involved. Only activities that were initiated in 2019 or later, or that received supplementary funding during this timeframe, were considered. The funding amount represents the total committed investment from the inception of the activity to the present day. In total, over 65 activities were identified, with an overall funding of approximately 40 million euros, equating to an average investment of 6.5 million euros per year.

The activities have been categorised based on their dual-use potential and the strategic applications they may support.

Potential for Dual Use	Activities	Funding
High	29	€ 14,252,000.00
Medium	15	€ 16,432,000.00
Low	23	€ 9,573,000.00
TOTAL	67	€ 40,257,000.00

Activity Title	Domain	Entities	Dual Use Potential	Dual Use Application
Enabling space technologies: PMLS system and subsystem studies	Propulsion, Space Transportation	Omnidea; CEIIA	High	Missiles
Assessment and accommodation studies for TFO - PMLS Phase 0	Propulsion, Space Transportation	Omnidea; ISQ; Armilar; Tekever; CEIIA	High	Missiles
Fault tolerant control of clustered rocket engines	Space Transportation	GMV PT	High	Missiles
Smart Launcher - Autonomous MVM and monitoring systems for safe and adaptable launcher GNC systems	Space Transportation	Deimos Engenharia	High	Missiles
GNSS signal quality monitoring solution for new integrity applications	Navigation - Integrity	GMV PT; IT	High	Navigation
G3PSTAR	Navigation - Receiver	Deimos Engenharia	High	Navigation
Multipath and spoofing mitigation in handheld devices with diversity algorithms	Navigation - Antispoofing	GMV PT	High	Navigation
SDXPAND (SDX Expansion: GNSS software defined simulator)	Navigation - Signal Generator	GMV PT	High	Navigation
LEO-PNT end-to-end In-Orbit Demonstration	Navigation - Evolution SatNav EU	GMV PT; Deimos Engenharia	High	Navigation
LEO PNT engineering support tools	Navigation - Signal Generator	GMV PT	High	Navigation
High Altitude Platforms	HAPS	TBC	High	Recognition

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SPACE4ATLANTIC	Study EO System (HR & VHR)	Omnidea; Deimos Engenharia; Aircentre; OHB PT; Thales PT	High	Recognition
Preparation of enabling space technologies and building blocks - Tech4EO	EO Technologies	Geosat	High	Recognition
Automated avoidance manoeuvre decisions and design	SSA	Neuraspace	High	SSA
Development and test of late commanding paths and operations concepts	SSA	GMV PT	High	SSA
SST core software requirements and framework finalisation	SSA	Deimos Engenharia	High	SSA
Augmented Reality for concurrent engineering activities	AR Technologies	Lusospace; Critical Software	High	Technology
Augmented Reality for telecom spacecraft AIT	AR Technologies	Lusospace	High	Technology
Artificial Intelligence for Augmented Reality in satcom assembly, integration and test	AR Technologies	IST; Lusospace	High	Technology
Optical Ground Stations	Satcom - OGS	TBC	High	Telecommunications
Transportable agnostic quantum station	SATCOM - QKD	N10gled, IA	High	Telecommunications
Low-profile optical head for airborne optical communication terminals	Satcom – Optical Terminal	IST; Lusospace; Sevenair Avionics	High	Telecommunications
N10gled Satcom QKD	Satcom - QKD	N10gled	High	Telecommunications

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ATON - Atlantic Observation Network	VDES System Study	IH; Lusospace; GMV PT; AIR Centre	High	Telecommunications
Inter Satellite Link system for deep space constellations	Spatial Subsystem - ISL	Tekever	High	Telecommunications
GOVSATCOM Precursor PPP - PACIS 1	Govsatcom	Tekever	High	Telecommunications
Photonic assisted multibeam phased array antenna - PHOAM	SatCom – Flat Panel Antenna	Sinuta; IT; PicAdvanced	High	Telecommunications
TECH2CONNECT	Satcom – 5G IoT	Connected; IT	High	Telecommunications
5G Nanosatellite	Satcom – 5G Space Terminal	Altice Labs; IST	High	Telecommunications
InOrbit NOW responsive microlauncher service	Space Transportation	ASC, Ilex, D-Orbit, Optimal	Medium	Access to Space
Multifunctional System	Propulsion, Fuel Cells	Omnidea	Medium	BB for HAPs
Electrochemical O2 pumping technologies for regenerative fuel cell, other uses	Technology - Fuel Cell	Omnidea	Medium	BB for HAPs
Large deployment arm for Earth Observation applications	Spatial Subsystem - Structures	INEGI; FHP	Medium	BB to Satellites
Weldless aluminium liner for Xe storage COPVS employed in satellite gas storage systems	Propulsion	Omnidea	Medium	BB to Satellites

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Clearspace - 1	GNC/AOCS, OBSW	Deimos Engenharia, Critical Software	Medium	ISOS
Prototyping of bearings-only guidance for rendezvous in NRO	Spatial Subsystem - GNC	GMV PT	Medium	ISOS
RFA One launch service development support	Space Transportation	RFA PT; CEIIA	Medium	Missiles
Preparation of enabling space technologies and Building Blocks - Portugal Phase 2	Propulsion, Space Transportation	Omnidea; CEIIA; Active Space Technologies; ISQ; Deimos Engenharia; Tekever; Thales PT	Medium	Missiles
Basic GNSS S/W and data sets for the AGGA-4 IP Core	Navigation – Space Receiver	Deimos Engenharia	Medium	Navigation
Smart - Connect	Surveillance (Forest Fires, Maritime)	INOV, Geosat, PJ	Medium	Surveillance / Recognition
NEXTGEN STM - End-to-End automated solution for a more sustainable space	SSA	Neuraspace	Medium	SSA
SWE products for southern Europe	SSA	Univ. Coimbra; GMV PT	Medium	SSA
Development, test and qualification of demisable magnetorquer - Phase 1	Spatial Subsystem - Actuador	Lusospace	Medium	Technology
Sensing element replacement and magnetometer requalification	Spatial Subsystem - Sensor	Lusospace	Medium	Technology
Space Forest launch service support	Space Transportation	ASC	Low	Access to Space
Skylora XL launch service development support	Space Transportation	ASC	Low	Access to Space

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RTEMS Edisoft for arm cortex R5 with asymmetrical multiprocessing	Spatial Subsystem - OBSW	Thales PT	Low	BB to Satellites
RTEMS Edisoft LEON3 Update	Spatial Subsystem - Structures	Thales PT	Low	BB to Satellites
Inflatable deorbit device IOD	SSA - IOD	SPACEO	Low	BB to Satellites
Artificial Intelligence techniques in on-board avionics and software	Spatial Subsystem - OBC	Deimos Engenharia	Low	BB to Satellites
TRITON-X Step 2 (Phase C)	SatCom	Thales PT	Low	BB to Satellites
SATIS Mission study for Phase A	SSA	GMV PT	Low	SSA
Space Rider Phases D/E1 and re-orientation activities (Flight Segment)	Space Transportation, OBSW, Actuators, Sensors, Structures	GMV PT; Lusospace; Spin.Works	Low	Technology
Orbital Express Launch Limited launch service development support	Space Transportation	Deimos Engenharia	Low	Technology
Large deployable reflector with advanced surface technology	Spatial Subsystem - Structure	INEGI	Low	Technology
Study of inflatable devices to employ atmospheric drag for orbital manoeuvres at planetary arrival	SSA	Eptune; Spin.Works; IST	Low	Technology
Artificial Intelligence techniques for GNC design, implementation and verification	Spatial Subsystem - GNC	Spin.Works	Low	Technology

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Antenna deployment arm with integrated elastic hinges	Spatial Subsystem - Structures	INEGI	Low	Technology
Preparation of enabling space technologies and Building Blocks: Spacepanel manufacturing process for space-graded sandwich panels (Aluminum and CFRP)	Spatial Subsystem - Structures	Optimal	Low	Technology
Artificial Intelligence techniques for GNC design, implementation and verification	Spatial Subsystem - GNC	Deimos Engenharia; INESC-ID	Low	Technology
Verification and validation of real-time optimised safety-critical GNC SW systems	Spatial Subsystem - GNC	GMV PT	Low	Technology
Fast reconfiguration technologies for recurrent space transportation flight	Space Transportation	GMV PT	Low	Technology
AI for non-mission critical on-board data processing	Spatial Subsystem - OBC	Evoleo	Low	Technology
Digital magnetometer	Spatial Subsystem - Sensor	Lusospace	Low	Technology
Guidance, Navigation and Control of in-orbit assembly of large antennas	In-Orbit-Assembly, GNC	INEGI; GMV PT	Low	Technology
Re-erection of the 15m Perth antenna at Santa Maria, Azores, Portugal, Phase 2	Earth Segment	Thales PT	Low	Telecommunications
HERA	Spatial Subsystem - ISL	Tekever	Low	Telecommunications

(*) BB: Building Block; ISOS: In-Space Operations and Services