Noordwijk, 8-11 Oct. 2007

ESA Technology Programmes

6th Round Table on Micro/Nano Technologies for Space

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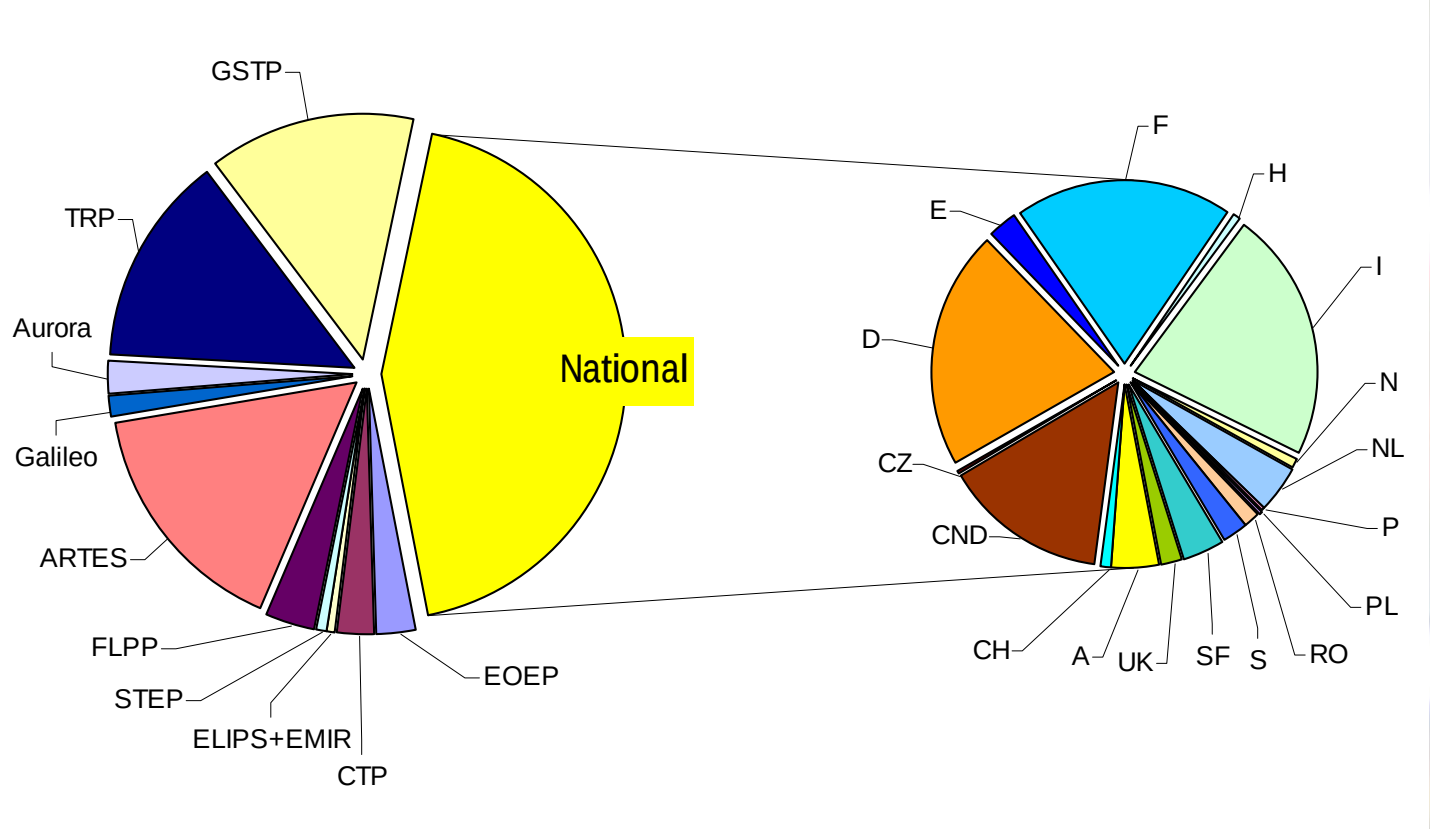
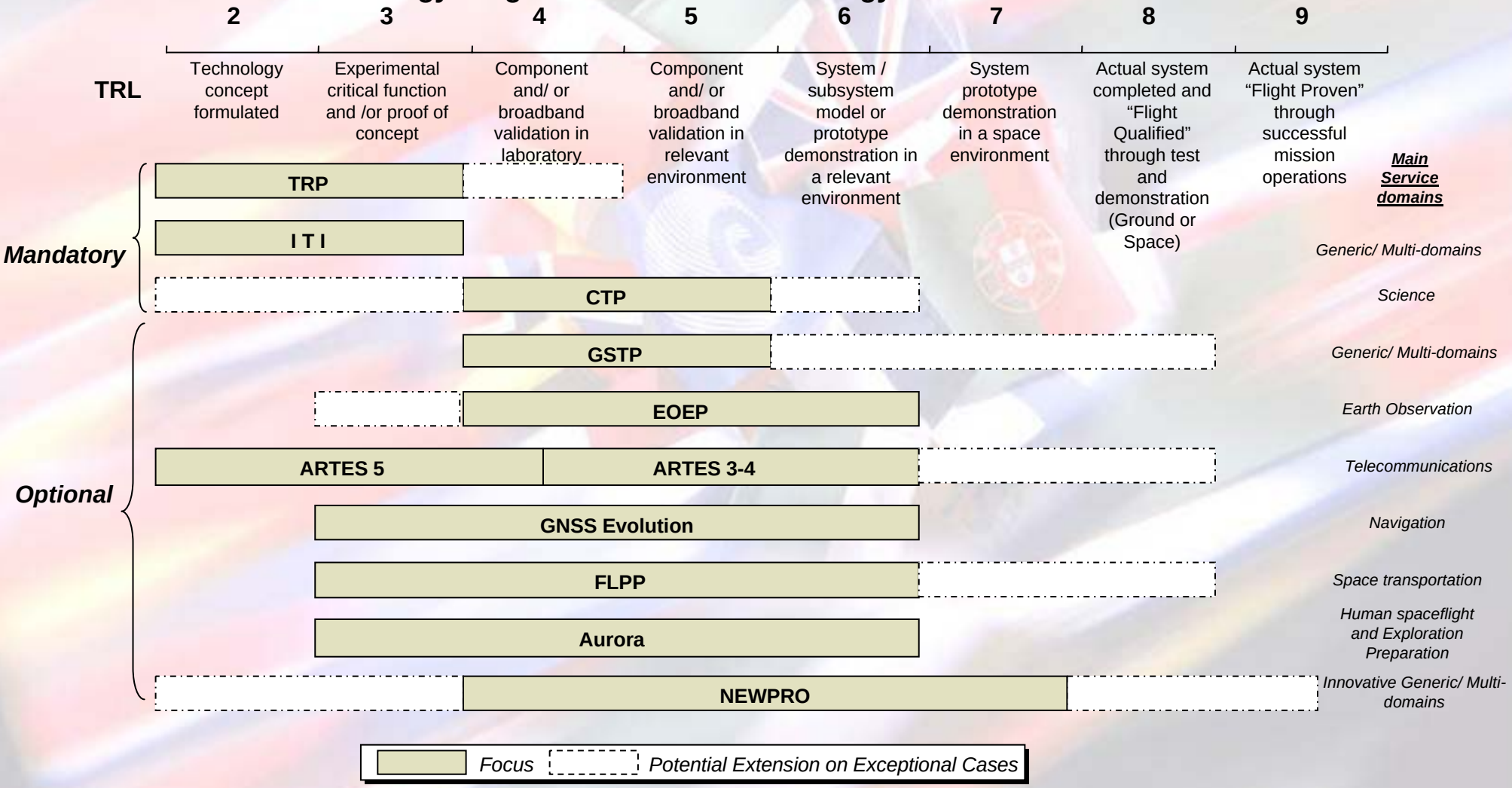
Space Technology Landscape



European Space Technology R&D Average yearly budget~380M€

ESA Technology R&D programmes

Technology Programmes versus Technology Readiness Levels



ESA Technology R&D programmes

Technology Research Programme (TRP)

Objective: The **Technology Research Programme** is the only ESA technology programme supporting all of ESA's fields of activity, providing the technological nucleus for most future developments. As such it represents the backbone of ESAs innovative efforts. In particular, the TRP is used to:

- Assess innovative/prospective technologies incorporating high development risks but also a high potential pay-off and to demonstrate their usefulness for space applications, providing ESA with a long- term technological capability to define new space missions and applications.
- Enable ESA space missions by demonstrating the feasibility of technologies required for these missions.
- Demonstrate the feasibility of technologies of general interest to all ESA projects and programmes.

TRL Targeted: from 2 to 3
Procurement policy: Open Competitive (DN possible)
Funding rule: 100%
Cycle: 3 Year Work Plan with yearly procurement plans
Call for ideas: Internal
Invitation to tender: Continuously throughout the year on EMITS, beginning few months after programme approval

ESA Technology R&D programmes

Innovation Triangle Initiative (ITI)

Objective: The objective of ITI is to create a dynamic environment where innovations can be easily validated, developed and put to use in industry. ITI aims specifically absolute novelty or novelty in space. Preference is given to non-space technologies used to address space problems. The main characteristics of ITI are:

1) Continuous call for ideas with a standing TEB meeting periodically
2) Proposals are submitted on-line using templates on a dedicated WEB site (https://iti.esa.int/)
3) Short "time to contract"
   - simple templates for the proposal submission
   - standard, predefined contract (Fast Track procedure)
4) Three types of contract:
   - Proof of concept (for INVENTORS): fast validation of new ideas and demonstration of its advantages (<= 50 KEURO)
   - Demonstration of Feasibility and Use (for DEVELOPERS): component and/or breadboard development up to validation in the laboratory or in a relevant environment (<= 150KEURO)
   - Technology adoption (for CUSTOMERS): Support to the industrial adoption of a novel technology, product or process (TBC funds, not currently implemented)

TRL Targeted: from 2 to 3
Procurement policy: Open Competitive
Funding rule: 100% for A and B, 50% for C
Call for proposals: Continuously throughout the year
Cycle: Yearly ITT on EMITS
Key dates: Proposals are evaluated periodically 3 to 4 times per year

ESA Technology R&D programmes

Core Technology Programme (CTP)

Objective: The main objective of the Science Technology Programme is to ensure an effective preparation of ESA's future scientific missions by the early development of critical technologies. The demonstration of the feasibility of these critical technologies is an essential prerequisite to enable implementation of the planned missions at an acceptable level of risk in terms of cost and schedule. Initial technology developments, leading to an experimental feasibility verification of critical functions or to a validation at breadboard level in laboratory environment, are pursued with funding of ESA's Basic Technological Research Programme (TRP).

The **Core Technology Programme** focuses on reaching a higher level of technology maturity by developing engineering models, tested in the relevant environment, before the start of the definition phase of a scientific project. Finally, all mission preparatory activities will address the adaptation of mature technologies to specific mission requirements.

TRL Targeted: from 4 to 5

Procurement policy: Open competitive (Direct negotiation possible)

Funding rule: 100%

Invitation to tender: Continuously throughout the year on EMITS

Cycle: 3 Year Work Plan

ESA Technology R&D programmes

General Support Technology Programme (GSTP)

Objective: The **General Support Technology Programme** aims at increasing the efficiency of technology R&D by preparing technologies in support to programmes and European Industry's worldwide competitiveness, and at supporting the implementation of the results of coordination and harmonisation of technology R&D activities conducted both at national and Agency levels. GSTP funded activities aim at the pre-development and - if needed - the qualification of identified technologies required by future space projects, the feasibility of those technologies having been demonstrated.

The GSTP bridges the gap to user programmes, developing generic/cross-cutting technologies, elements for scientific payloads and instruments, and pilot projects, including in-orbit demonstration.

TRL Targeted: from 4 to 5

Procurement policy: Open Competitive (DN possible)

Funding rule: 100% (up to 50 % in DN also possible)

Invitation to tender: Continuously throughout the year on EMITS beginning few months after programme approval

Cycle: 3 Year Plan with yearly updates

ESA Technology R&D programmes

Earth Observation Envelope Programme (EOEP)

Objective: The Earth Observation Envelope Programme, EOEP, is an optional rolling forward programme approved in periods of five years and run by ESA D/EOP. EOEP missions are defined involving the science community and recurring to a peer-review selection process, where the scientific community proposes mission ideas and is closely involved in their further implementation into actual missions. EOEP is the backbone for implementing ESA's Living Planet Strategy.

TRL Targeted: from 2 to 6

Procurement policy: Open competitive (Direct negotiation possible)

Funding rule: 100%

Invitation to tender: Continuously throughout the year on EMITS beginning few months after programme approval

Key dates: Yearly work programme approval in November PB/EO

ESA Technology R&D programmes

Advanced Research In Telecommunication Systems (ARTES 3)

Objective: Promote Multimedia Telecommunication applications and systems

ARTES 3 is divided in 4 Programme Lines:

- Line 1: Development of the Multimedia Market (Applications/Services)
- Line 2: Development of Satcom System Elements (Equipment & Products)
- Line 3: Pioneering Novel Systems
- Line 4: Advanced Mobile Systems

Proposals particularities:

- Strong emphasis on Strategic Plan / Business Plan
- Market ready product, EQM

TRL Targeted: from 4 to 6
Procurement policy: Industry driven
Funding rule: 50%
Call for proposals: 2 calls one in February, the other in September

ESA Technology R&D programmes

Advanced Research In Telecommunication Systems (ARTES 4)

Objective: Research, develop & demonstrate state of the art technologies and services with clear applications potential. Flexible Industry driven Programme Element.

Proposals particularities:

- Strong emphasis on Strategic Plan / Business Plan
- Products ready for the market
- Proposal with letter of support from delegation

TRL Targeted: from 4 to 6

Procurement policy: Industry driven

Funding rule: 50%

Call for proposals: Always opened (ITT on EMITS)

ESA Technology R&D programmes

Advanced Research In Telecommunication Systems (ARTES 5)

Objective: Prepare the long-term technological basis for European and Canadian industry in the area of satellite communication. The ITTs contain SOW and technical specifications.

Proposals particularities:

- Strong emphasis on Strategic Plan / Business Plan
- Proposal with letter of support from delegation

TRL Targeted: from 2 to 4
Procurement policy: Open competition
Funding rule: 100%
Invitation to tender: Issued on EMITS throughout the year
Cycle: Yearly work plan

ESA Technology R&D programmes

European GNSS Evolution Programme (EGEP)

Objective: The objectives of the GNSS Evolution Programme are to undertake technology research development and verification related to Global Navigation Satellite System (GNSS) and to accompany the introduction of GNSS operational systems, with a view to supporting the maintenance of the scientific, technical and industrial expertise necessary for Europe. The programme covers two lines of activities:

1. GNSS Technology Research, Development and Verification:
   - To maintain competitiveness and innovation capabilities
   - To pave the way for the gradual evolution of EGNOS and Galileo
   - To pave the way for advanced exploitation of European GNSS
2. Accompaniment to Operational Systems
   - To provide support for EGNOS and Galileo

TRL Targeted: from 3 to 6
Procurement policy: Open competition
Funding rule: 100%
Invitation to tender: Issued on EMITS throughout the year
Cycle: next cycle (period 2) 3 years

ESA Technology R&D programmes

Future Launchers Preparatory Programme (FLPP)

Objective: The Future Launchers Preparatory Programme aims at developing technological and industrial capabilities needed for deciding and developing either a new launcher for the medium term based on mature technologies or the Next Generation Launcher (NGL) for the long Term and to foster innovative technologies for the current European expendable launchers. FLPP work will be mainly guided by an overarching objective and the reduction of launch service cost while ensuring satisfactory reliability, flexibility and availability of service.

TRL Targeted: from 3 to 6

Procurement policy: Direct negotiation at Prime level, open competition at subcontractor level

Funding rule: 100%

Key dates: Work Plan in 2006 and 2008

ESA Technology R&D programmes

AURORA

Objective: The Aurora programme aims to pave the way for human exploration of the Moon and Mars with a range of developments aimed at supporting both near and medium term robotic exploration missions, and also preparing for future human exploration activity. The range of technologies in which Europe is involved in preparation for future contributions to space exploration are diverse, and include:

Soft-precision landing, autonomous navigation and hazard avoidance; Autonomous rendezvous and capture/docking; Bio-sealing and monitoring technologies; Planetary protection aspects; Robotics / specific mechanisms; Power and propulsion systems; Life support and recycling systems; Long-term habitability module design, psychological effects; Radiation protection, countermeasures against prolonged exposure to micro-gravity effects, health monitoring;

TRL Targeted: from 4 to 6

Procurement policy: Open competitive (Direct negotiation also possible)

Funding rule: 100%

Key dates: Work Plan in 2006 and 2008

ESA Technology R&D programmes

NEWPRO

Objective: NEWPRO is conceived as a technology programme to address new needs and emerging applications. An interim period of NEWPRO within GSTP has been initiated following three areas of technologies:

- Non-Dependence: to ensure the supply of key components, which are essential to support space based solutions to European Policies
- Multiple Use: to support the spin-in of industrial technologies that could provide a breakthrough for some of the currently most limited space systems, e.g. fuel cells for power systems or embedded systems to drastically increase performance
- Security for Citizens: to evaluate end-to-end architectures and demonstration of functionalities, characterisation of technologies to provide for security for citizens and space assets.

TRL Targeted: up to 7, in specific cases in-orbit demonstration may be considered

Procurement policy: Open competition (DN possible)

Funding rule: 100%

Invitation to tender: Issued on EMITS throughout the year

Cycle: 3 Year Work Plan with regular updates

CONCLUSION

- ESA supports several R&D programmes each oriented toward specific needs and/or specific technology maturity levels
- All invitations to tender (ITT) are published in EMITS
- We are at your disposal for further support and clarifications