

The Navigation Innovation and Support Programme (NAVISP)

The deployment, operation and evolution of the European Union's Galileo and EGNOS programmes are now funded from the EU budget. This political support secures the long-term future of these important programmes. In particular, H2020 will finance the technology development for the next evolution cycle of Galileo and EGNOS.

The challenges for satellite navigation however are going beyond Galileo and EGNOS and include the development of competitive industrial capacities, the development of complete new and innovative technologies for possible consideration under future evolution approaches, the integration of satellite navigation with other space and terrestrial application areas, etc..

This provides an important opportunity to develop a complementary programme using ESA expertise in Galileo, EGNOS and navigation to undertake innovative work and to support ESA Member States' national objectives in upstream and downstream navigation.

Since the last October Council and the November PB-NAV, the following guidelines were provided by Member States:

A) EGEP to be discontinued after its completion as the EU has allocated resources for the preparation of EGNOS and Galileo evolution from the EU budget;

B) A new GNSS programme should be conceived as a complement to the EU programs and respond to national priorities in the upstream and downstream, analysis of innovative technology in all satellite navigation areas and the integration into other application domains.

A **new ESA Satellite Navigation programme** should utilise ESA's expertise in Galileo and EGNOS, and provide a contribution to the European efforts in the navigation sector by focusing on:

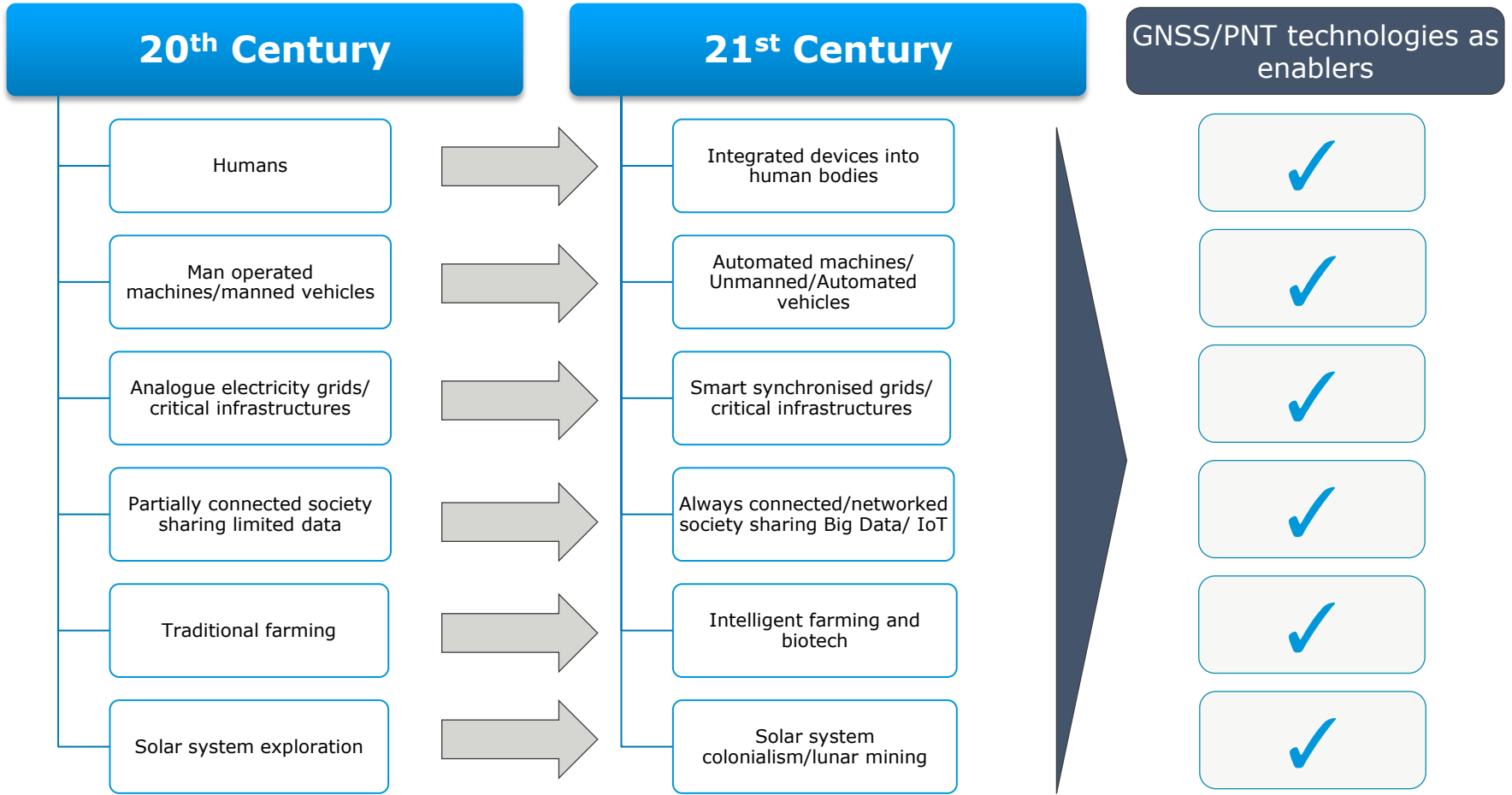
- Exploratory studies and initial trade-off analysis for new technologies or concepts in satellite navigation;
- Supporting the development of European industrial capacity and capabilities in navigation, addressing vulnerabilities in the supply chain, based on ARTES-like mechanisms;
- Supporting ESA MS national activities and programmes, test campaigns, scientific communities, and domestic industrial priorities.

GNSS needs to meet the challenges of the 21st century



20th century situation	Galileo original ambition	21 st century GNSS market reality
Monopoly of the GPS only challenged by ailing GLONASS	Need for a civil solution in Europe, open for others (China, Israel, etc.)	There will be 4 global systems, with many regional systems being developed. All these systems are undergoing substantial R&D evolution programmes
Post-cold war environment	Need for independence and "dual use system with PRS"	Still relevant, necessary to maintain sovereign dimension at political level
No worldwide Safety-of-Life (SoL) service	Requirement for a worldwide SoL service	Service abandoned because of its complexity
Limited public funding	Free utility with some commercial elements	Market for features to be explored (OS-A and CS)
Few users beyond military and car navigation	Forecast of 5€/chipset	Penny-chips, with Europe hardly present on the manufacturing market; LBS market taken by smart phone platforms
The GPS is in stable mode, with continuous innovation	Vision to think big, show the world, and be on the leading edge	Constant innovation both for the infrastructure and the receivers
Positioning sensor technology starts to be commercialized <small>Source: STP analysis</small>	Provide a European positioning service	GNSS is only one of the many positioning techniques

In this ever changing world, GNSS and/or other PNT technologies will play an instrumental role on several key trends



Key technology trends that will potentially disrupt the way industries will operate in the future



1. **Geo intelligence** – Spatial elements will allow unprecedented visualisation and augmentation, and predictive analysis for business, consumer and institutional applications.
2. **Autonomous driving and motion** – Unmanned driving, operation and surveillance will increase efficiency, safety and security.
3. **Ubiquitous connectivity, positioning, and synchronisation**
 - a. Not only people, vehicles and things, but entire supply chains will become connected, tracked and synchronised to improve efficiency, scheduling and automation;
 - b. Seamless communication, connectivity and positioning will be required to master the world's content challenge, the Internet of Things and critical infrastructure applications;
 - c. Eventually any infrastructure will require its level of robustness to increase constantly;
4. Ubiquitous connectivity and positioning will require more and more **hybrid solutions** that will increase availability exponentially.

The concern of the European GNSS industry

1) Market Trends are not in favour of Europe

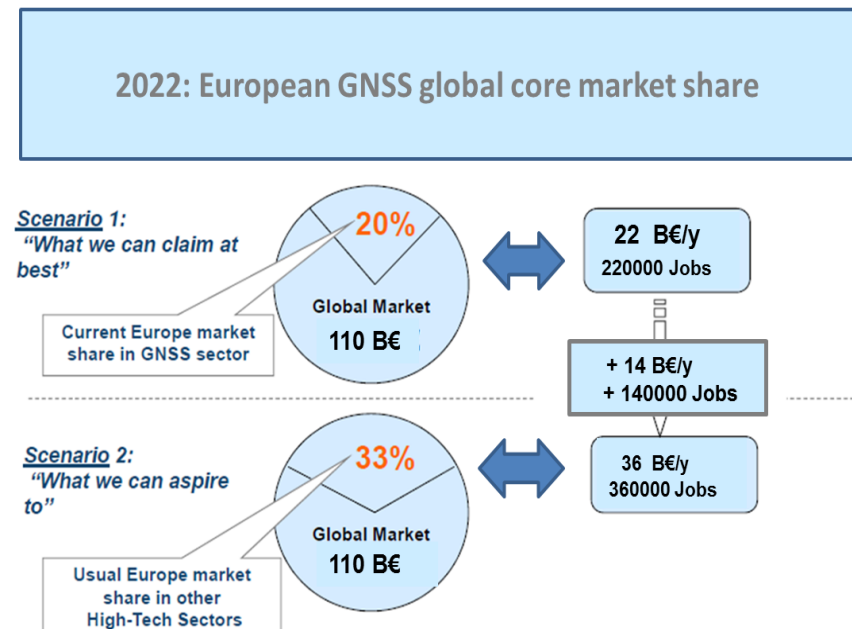
- European market share approximately around 20%, limited amount of European champions

2) Risk for sufficient and robust EU autonomy

- Dependence on GNSS increases together with the Market
- Galileo may not be used as intended (in parallel to the development and deployment, the market is evolving, see SoL)
- European Autonomy is dependent on robust performance and wide usage of Galileo, with equip/apps made in EU and full integration into the broader space and terrestrial services and applications landscape

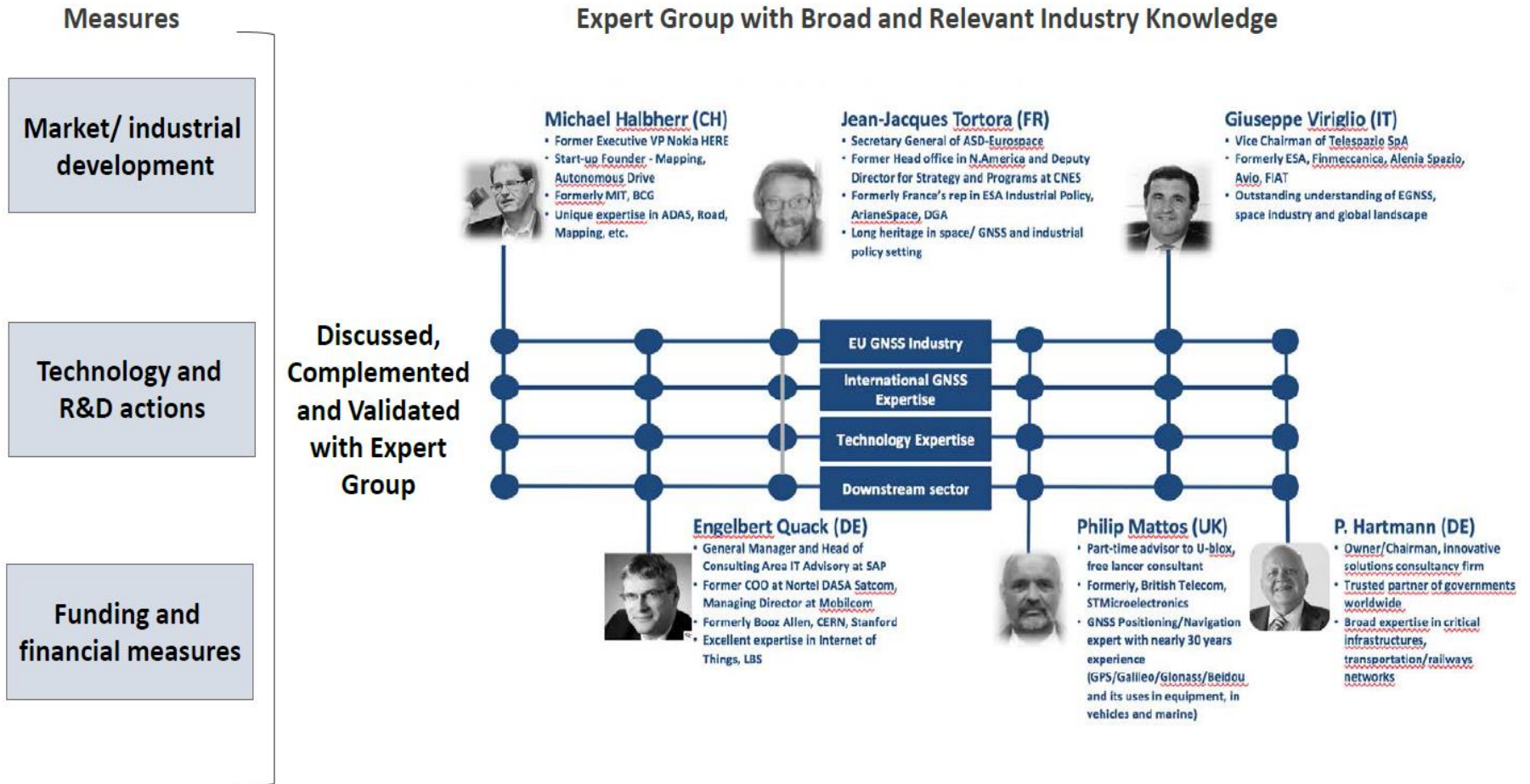
3) US, Russia, China, Japan have established national strategy/programme

- 5 times higher investment in GPS systems evolutions R&D compared to Galileo for the operational timeframe 2023-2040
- Massive funding from R&D to manufacturing capabilities
- Regulation
- Massive Public Procurement



Galileo Services

Identify institutional measures to support European GNSS



Emerging recommendations for institutional measures

Market/ industrial development

- New industries / challenges, .. EGNSS as partner of European end user industry
- Encourage applications with a strong potential for leveraging Galileo differentiators, but think beyond (**multi-GNSS, multi-sensor,...**)
- Jump onto 'leading European platforms' to address real industrial challenges
- Act at fast speed and speak the same language

Technology and R&D actions

- R&D focused to support applications where Europe can lead (close to European market owners).
- R&D instruments to bring actual products/solutions to the market
- **Think beyond 'Space' and closer to the digital world**
- But also R&D topics that will not deliver immediate financial returns but pave the way for **technological breakthroughs** (e.g. technology/system evolution and exploratory studies)

Funding and financial measures

- IP to stay with the industry
- Increase public investment in the downstream sector while avoiding duplication of efforts (e.g., ESA supporting selective R&D and application development funding to fill strategic gaps)
- Support MS national test campaigns, industrial priorities
- **Foster partnerships with space and non-space actors and cross-fertilisation among NAV/COM/EO**

General objective

to support innovation and the competitiveness of the industry of participating countries in the satellite navigation market and to support national satellite navigation priorities

NAVISP Programme Structure



	ELEMENT 1 [Innovation in Satellite Navigation]	ELEMENT 2 [Competitiveness]	ELEMENT 3 [Support to Member States]
Content	Analyses and developments linked to new and emerging design and operational concepts, techniques and technologies related to satellite navigation systems	Ad hoc technological & product developments and pre-operational activities along the whole satellite navigation value chain in support of the competitiveness of the industrial sector in the participating Member States	Support to MS national Programmes & Activities in satellite navigation and along the whole value chain
General principles for implementation of the activities	Competitive tender, 100% ESA funding on the basis of yearly work-plan adopted by PB NAV	Continuous open call, unsolicited proposals, ESA co-funding, MS support letter	On request by MS, ad-hoc mechanism to be established on a case-by-case basis that ensures ESA's full costs are met
Lead for the definition of the activities	ESA	Industry	Member States

Innovation in Satellite Navigation

- Studies linked to innovative and/or disruptive GNSS system or services capabilities. In the case of Galileo and EGNOS, these would be beyond the perimeter of the activities funded by H2020 and complementary in terms of their content;
- Characterisation of potential new local augmentation infrastructure such as Assisted-GNSS server, hybridization with other sensors, seamless integration of indoor / outdoor navigation technologies, multi-GNSS concepts, non European GNSS work, support international endeavours for enabling multi-sensor standardisation and certification processes;
- Studies fostering PTA approaches (Protect, Toughen, Augment) in PNT wide terms at consumer and professional levels for any satellite navigation system;
- Feasibility analysis of disruptive technology for multi-sensor receiver (access to “raw” measurements to allow for powerful new data processing options; development of custom data processing engine; differential processing for higher accuracy and tighter integration with other sensors);
- Studies linked to emerging opportunity such as hosted payload, GNSS science and relevant spin off.

Support to Industrial Competitiveness in MS

- R&T in support of infrastructure-related products developments;
- R&T in support of applications developments;
- R&T in support of user-equipment developments;
- Demonstrations projects focusing on the implementation of satellite navigation solutions, particularly those closely linked to real-life user needs (involving all actors in the value chain).

Support to National Activities in MS

Portfolio of ESA Services to Members States on request:

- System & technical assistance for the management & implementation of national programmes or activities on satellite navigation;
- Field-test technical assistance (in particular linked to test campaigns);
- Exploitation support using ESA labs, test beds & technical facilities including for strategic related domains;
- Hands-on training of MS technical experts and national operators;
- Technical assistance for the development, operation and exploitation of national labs and technical facilities (e.g. system, subsystems, or user demo tests beds);
- Technical assistance for the setting-up and operation of PNT business incubators;
- Hosting, and combined maintenance & operation of national technical facilities;
- Support for certification process for critical applications;
- Support to development of national standards;
- Facilitate and federate certain institutional procurements.

The programme will be composed of three elements, each of an optional nature:

1) An innovation element in Satellite Navigation:

- Analysis, early innovative concepts and exploratory developments linked to new systems/techniques/technologies related to satellite navigation, defined yearly on the basis of an ESA proposed workplan to be adopted at PB-NAV;
- The workplan will be composed of competitive tenders for fully funded activities. A mechanism will allow MS to indicate priorities and a Georeturn adjustment could be envisaged.

2) An industrial competitiveness element:

- Carry out ad hoc technological developments, product developments and pre-operational activities with operating entities and industry of participating countries along the whole navigation value chain to support technology readiness and industry competitiveness;
- For this specific element, ESA will issue a continuous open call capable of stimulating unsolicited proposals, the eligibility of which will be indicated by the relevant MS (i.e. support letter). The pre-commercial nature of this programme element will call for a co-funding approach to be envisaged (50%);
- It targets to achieve as broad and competitive an industrial base at all supply levels, in addition to the technology development undertaken by H2020 contractors.

A competitiveness element will:

- Address the end-to-end Navigation value chain to support MS efforts to develop national competitive products and services with a view to enhancing MS industrial capabilities in satellite navigation and stimulating jobs and growth in the space sector;
- Support national industry to strengthen the technology readiness of the relevant product portfolio;
- Contemplate an approach similar to ARTES to support product retirement risk.

Examples of typical risks to a company that the programme could seek to mitigate:

Technology risks: Related to the technology readiness, ability to deliver the targeted performance and/or expected QoS (Quality of Service), long-term ability to compete/complement with non-space technologies;

Market and business risks: related to the uncertainty of commercial success of the developed technology, and to the development and implementation of new business models with considerable high-risk/high-potential returns;

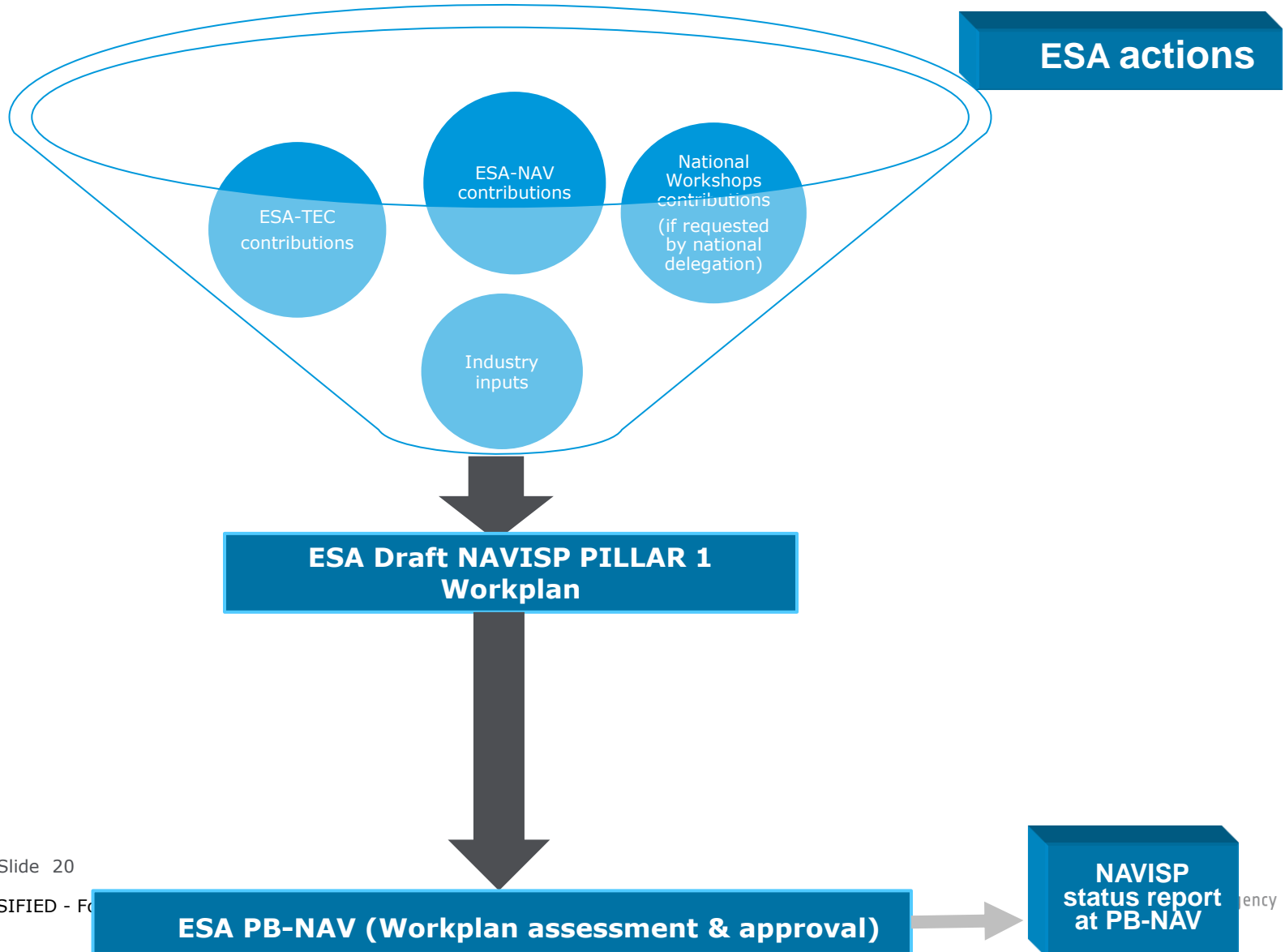
Regulatory risks: Difficulty in developing products or services by market regulatory barriers or dominant position of incumbent suppliers.

3) An ad hoc national support element:

Support Member State's activities along the whole value chain, (e.g. test campaigns with final end users/specific sectorial industries, specific support to scientific communities, training of MS experts and national operators, etc.).

For this specific element, on request by MS, ad-hoc specific mechanism shall be established on a case-by-case basis ensuring 100% of ESA's cost will be covered. The institutional nature of this programme element will call for a fully funded approach.

Coordination mechanism with EC/GSA (Pillar 1): approval of activities

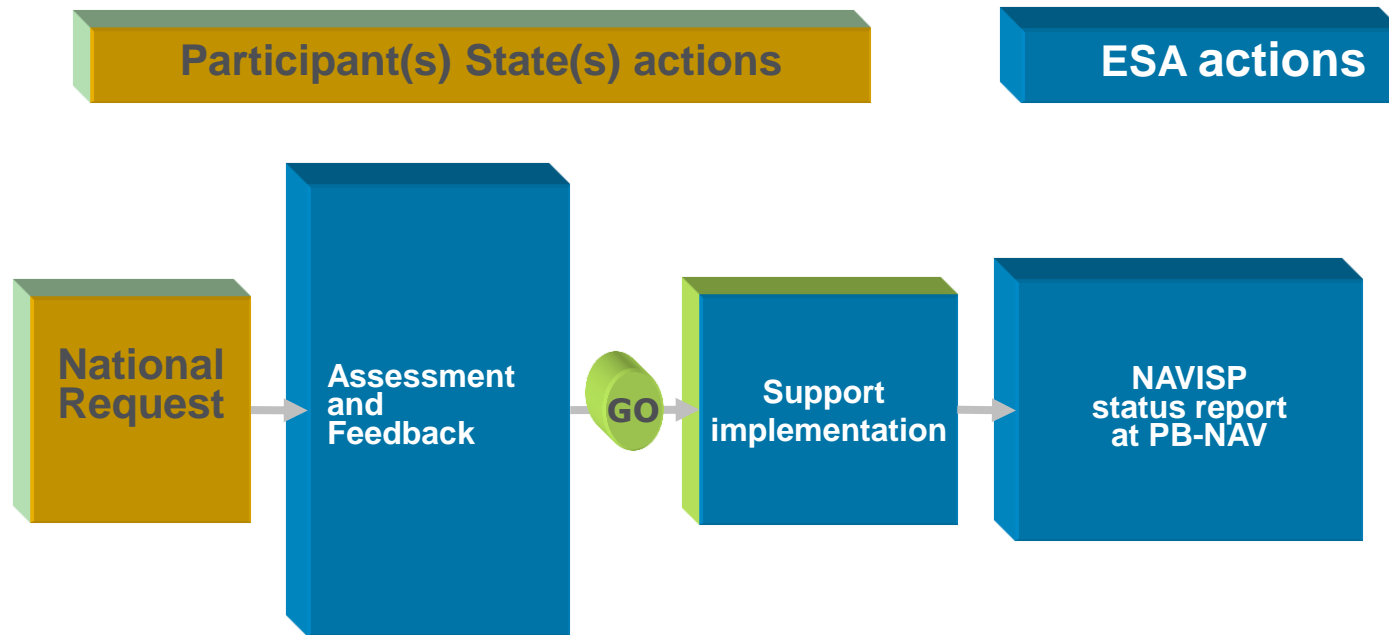


Coordination mechanism with EC/GSA (Pillar 2): approval of activities



Goal: 4 months for the end-to-end process

Coordination mechanism with EC/GSA (Pillar 3): approval of activities



COORDINATION
WITH EC/GSA

1. **Full coordination with EC/GSA is foreseen so as to avoid any duplication and reinforce synergy with other institutional actions, in full respect of respective responsibilities;** relevant results to be available to the EC/GSA/ESA partnership to allow the institutional actors to undertake their responsibilities on the Galileo and EGNOS programmes.
2. Participating Member States will have the freedom to transfer their funding participation in any of the three programme elements once a year so as to support full geo-return;
3. The programme can be adapted and expanded if the participating Member States agree by unanimity;
4. Participating Member States retain control over the programme:
 - 1) Participating Member States collectively approve:
Annual work-plan for Element 1 by simple majority (Article XI 6.d ESA Convention);
 - 2) Participating Member States individually approve:
Each industrial involvement, by letter of support (Element 2);
 - 3) Participating Member States individually provide request of support action (Element 3).

Key implementation goals (2/2)



- For the competitiveness element 2, a continuous open call, with short time-to-contract procedures shall be envisaged (goal: max 4 months from proposal reception to contract signature in line with EXPRO/EXPRO+ ESA procurement evolution);
- IPR will clearly be under the control of the proposer. This will require a clear statement on IPR ownership at the outset (the proposer team must decide ex-ante where the ownership resides and clarify in particular IPR intentions, status and ownership plans);
- In the case that a specific activity would eventually be exploited later on in the frame of EGNSS programmes, ad hoc IPR's arrangements will have to be envisaged;
- Foster the creation of globally competitive European players in satellite navigation, both upstream and downstream (European champions);
- Support to the SME satellite navigation sector in participating MS, both upstream and downstream;
- Facilitating partnerships of the satellite navigation sector with terrestrial telecom operators, content providers, infrastructure operators, specific sectorial industries, and final end users for improved competitive positioning and access to major global markets (but political and strategic leadership for market development work for Galileo and EGNOS remains with the GSA/EC);
- Promoting industrial cooperation with companies from newly-acceding ESA countries, and supporting assistance from experienced European suppliers in the development of local markets.

1. The creation of a innovation pole with satellite navigation as a core, embedded and integrated in the broader services and applications domain;
2. Targeting industrial innovation and competitiveness across Europe at all industrial levels and all industrial sizes, and driving growth and jobs.
3. The programme is flexible, allowing MS to target investments to support national objectives, under MS control;
4. Uses best practice in terms of responsiveness and fast contracting procedures;
5. Uses ESA expertise on satellite navigation technology services and applications for MS benefit and for the benefit of the Galileo and EGNOS programmes;
6. Designed to avoid any duplication with work funded by the EU (H2020);
7. Enables ESA MS to invest to develop industrial capacity along the whole value chain, for example to compete in future for EU GNSS contracts (can support development of new entrants to the market).

Potential Participant and PB NAV meetings :

- a. First Potential Participant meeting scheduled on 7 March 2016: outcome of the bilateral discussions, first elements for establishing a draft programme Proposal;
- b. PB-NAV 8 March 2016: wrap up of the first Potential Participant meeting;
- c. Second Potential Participant meeting on 13 of April 2016: presentation of the preliminary Programme Proposal and of the draft Enabling Resolution;
- d. PB-NAV 11 May 2016: Endorsement of the Programme Proposal and preliminary discussion of the draft Declaration and Implementing Rules;
- e. **Council 15 June 2016: Enabling resolution for the new Programme;**
- f. Special PB-NAV 1st of July: Follow up of preliminary discussion of the draft Declaration and Implementing Rules;
- g. PB-NAV on 16 September 2016: Finalisation of the Declaration and Implementing Rules in preparation of the Council at ministerial level.