

# **Recommendations Towards the Development of a European Union Radionavigation Plan**

**S Basker & A Ives - Helios Technology Ltd, UK**

**S Baumann & W Lechner - Telematica e.K., Germany**

**M Fairbanks & N Ward - General Lighthouse Authorities, UK**

**A Urech - INECO-TIFSA, Spain**

**F von der Dunk - University of Leiden, The Netherlands**

**J Kreher - European Commission DG TREN, Belgium**

**Helios Technology Ltd**  
Chamberlain House, High Street, Bagshot  
Surrey, GU19 5AE, United Kingdom

**Tel: +44-1276-452811**

**Fax: +44-1276-472897**

# Contents

- **Introduction**
- **Definitions**
- **Study Logic**
- **ERNP System Mix**
- **Implementation and Management**
- **The Way Ahead**

# Introduction

- **Objective**
- **Purpose**
- **Motivation**

## Objective, Purpose and Motivation

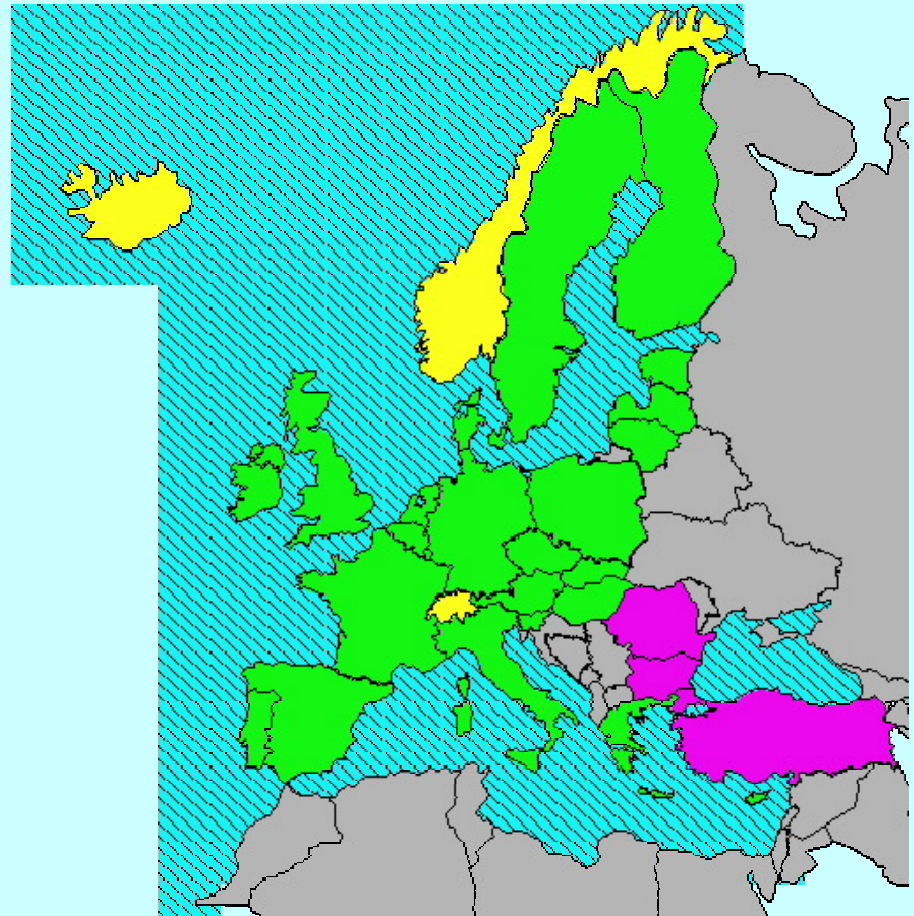
- The *objective* of this study contract is to contribute to the development of a European Union Radio-Navigation Plan (ERNP) and support European Union Radio-Navigation policy
  - Output is recommendations towards an ERNP and systems document
- The *purpose* of the ERNP is to present the EU's policies and plans for a stable and robust radio navigation environment in the European Union comprising seamless, interoperable services to support security, transport (including safety), environment and economic policy objectives in conformity with existing EC law
- The *motivation* for this ERNP includes enhancing public safety (especially in land transportation), meeting the challenges posed by the growth of trans-European and global transport and the introduction of EGNOS and Galileo

## Definitions

- **ERNP Coverage Area**
- **Radionavigation**
- **Services**
- **Radionavigation Service Environment**

# **ERNP coverage is the current EU25 Member States and EMCA together with EU neighbour countries relevant to a coherent ERNP**

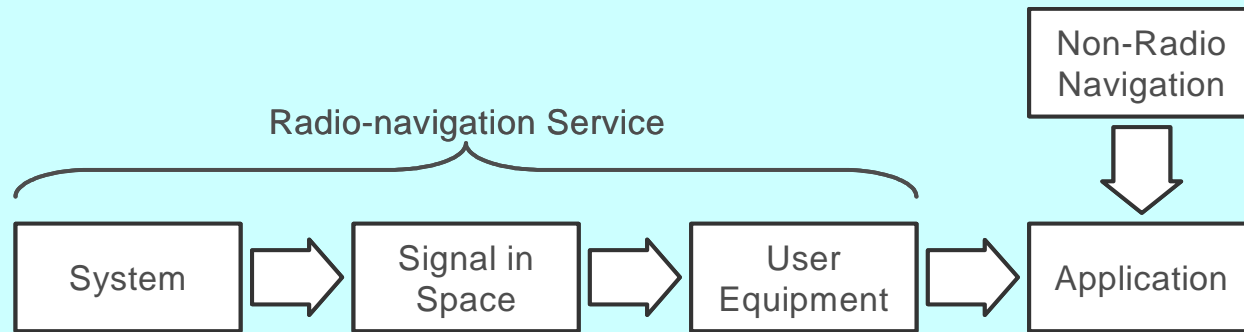
- The ERNP is applicable in the European Union (EU) Member States and the European Maritime Core Area (EMCA)
- It is the result of a process that has considered neighbouring countries to the EU relevant to a coherent ERNP as well as developments in the United States of America (US) and the Russian Federation (RF)



## **The ERNP study is assuming a very specific definition for radio-navigation**

- Services provided by radio navigation systems allow users to determine their position, velocity and time from knowledge of the propagation of electromagnetic radio waves. All radio navigation systems are underpinned by precise timing (used to generate the radio waves) and precise co-ordinates
- Within the ERNP, systems are classified as stand-alone radio-navigation systems, regional or local augmentations and non-radio-navigation systems

# Services are *defined* at three different levels: plan, performance and access



## ➤ Plan

- The purpose of the plan is to address policy, consider operational issues, present a service description and identify future developments (including rationalisation). It may include a summary of user requirements

## ➤ Performance

- This defines the levels of performance that the system owner commits to providing. It may take the form of a service level agreement

## ➤ Access

- A technical signal-in-space interface control document (ICD) that defines the service SIS so that it may be accessed by user equipment



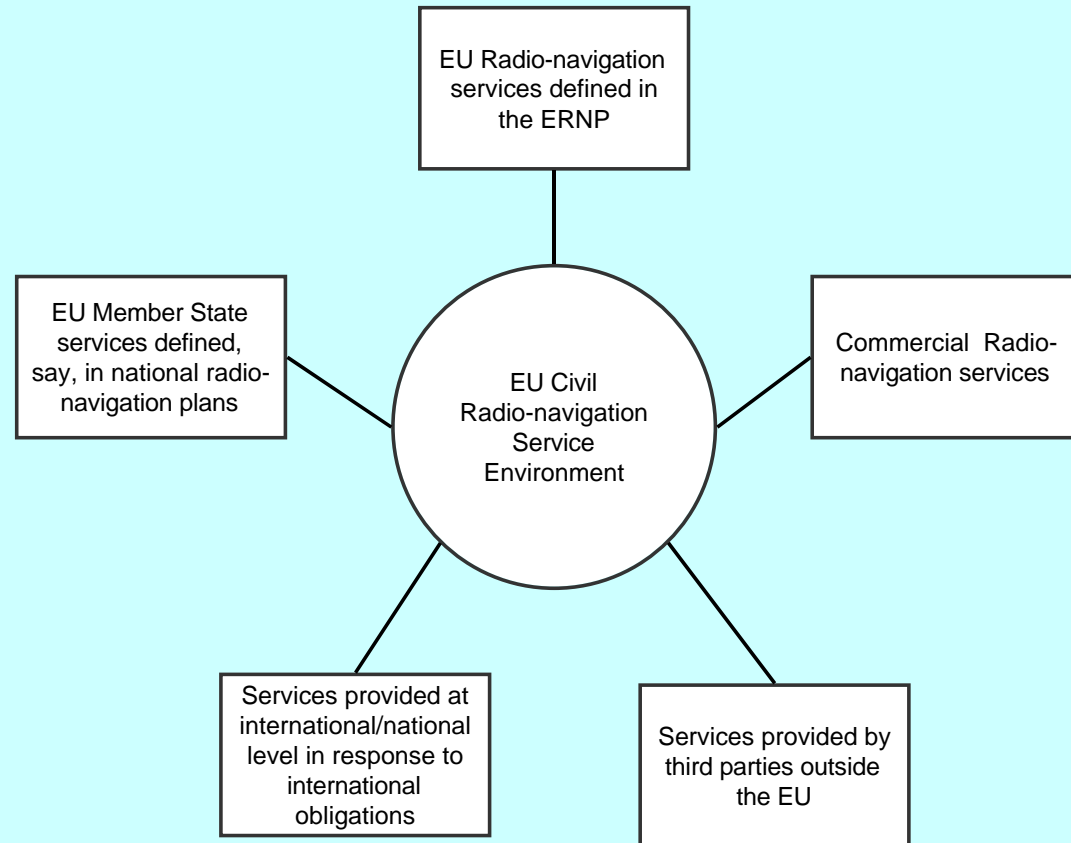
## **All services for which the EU has a role are ERNP services and a subset of these are “core” ERNP services that are defined and resourced at EU-level**

- All services for which the EU has a role (definition, standardisation, harmonisation or influence) through the ERNP are ERNP services and included in the ERNP
- There is a need to concentrate EU level resources, in terms of investment and maintenance, on those core navigation aids common to multi-modal applications<sup>1</sup>
  - This statement differentiates clearly between those services that are resourced at EU level (described as core) and other services in the ERNP
- Only one organisation has the competency to define a service and only the organisation with the competency for service definition can rationalise its services

1 European Commission. *Tender specifications attached to the invitation to tender*. Invitation to tender No. TREN/E4/16/2003 concerning Development of the European Radio-Navigation Plan (ERNP)

# The SOW envisages a future EU civil radio-navigation service *environment* that comprises a wide range of public and private radio-navigation services

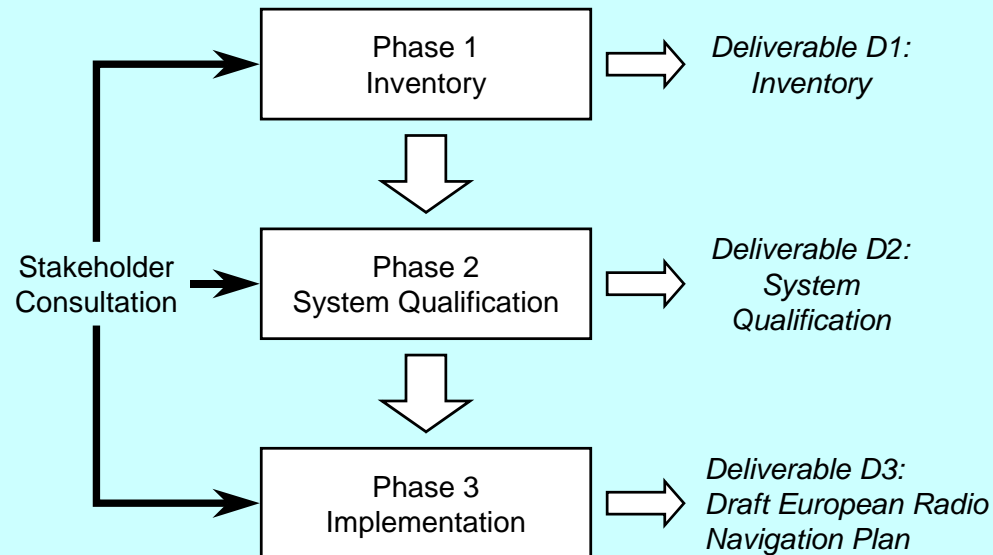
- The ERNP radionavigation service environment will comprise a subset of these services and will provide a basic level of service for European users
- Users may need to augment this with other radionavigation services and non radionavigation systems or sensors to meet their application requirements



## **Study Logic**

- **Overview**
- **System and Policy Inventory**
- **System Qualification**
- **Implementation and Management**

# Consultation with stakeholders underpins our sound and achievable approach



## ➤ Three Phases

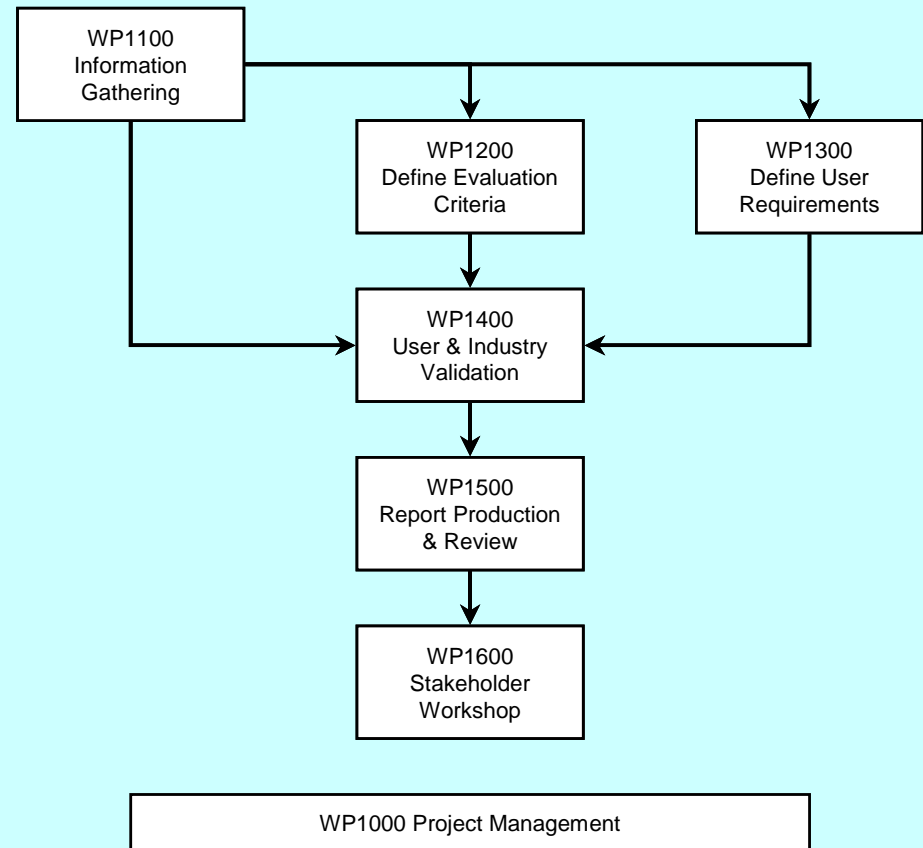
- each three months
- each producing one of the three required output deliverables

## ➤ Consultation with Stakeholders

- the EC owns key decisions
- there is constant Member State, industry and user validation
- that there is buy-in from key stakeholders along the way (including Eurocontrol)

## Phase 1 established a system and policy inventory

- The inventory of existing RNPs has drawn on source documents from many countries/organisations
- The service environment has considered a wide range of stand-alone, augmentation and non-radionavigation services
- The application environment has been addressed both at the market sector level and at the application level (9 different sectors with 137 applications)
- The European Community would have the competency to regulate radio navigation and the ERNP if needed



## **The second system qualification phase has undertaken a technical assessment ...**

- The technical assessment has examined the EU's role through the ERNP towards each of the Phase 1 services, considered vulnerability and addressed the spectrum environment
  - There is currently a strong reliance on GPS and fewer than 40 of the 137 applications analysed would remain operational following the loss of GPS and its augmentations
  - The stability and robustness of the current EU radio-navigation service environment would be improved by the availability of Galileo, EGNOS and Loran-C services
  - The existing and planned radio-navigation spectrum environment is stable and robust although satellite navigation services are vulnerable to interference
  - Critical infrastructure applications (e.g. telecommunications and other utilities) should implement diverse services to mitigate vulnerability and ensure continuity of service

## Financial assessment ...

- System costs for the period from 2005 to 2020 have been assessed for five radio-navigation services that have the potential to be core ERNP services
  - EGNOS, Galileo, Loran-C, EuroFix and Radiobeacon DGNSS
- The study has proposed eight principles to guide rationalisation and their impact has been considered across the market sectors at the user level
  - There is potential for rationalisation in the EU radionavigation service environment.
- Cost-recovery is one way for establishing continuity of funding that is linked to long-term service credibility and service take-up
  - Charging based on marginal social costs is the preferred approach in the EC White Paper on infrastructure charging
  - An initial charging concept for the ERNP based on marginal social costs has been proposed.

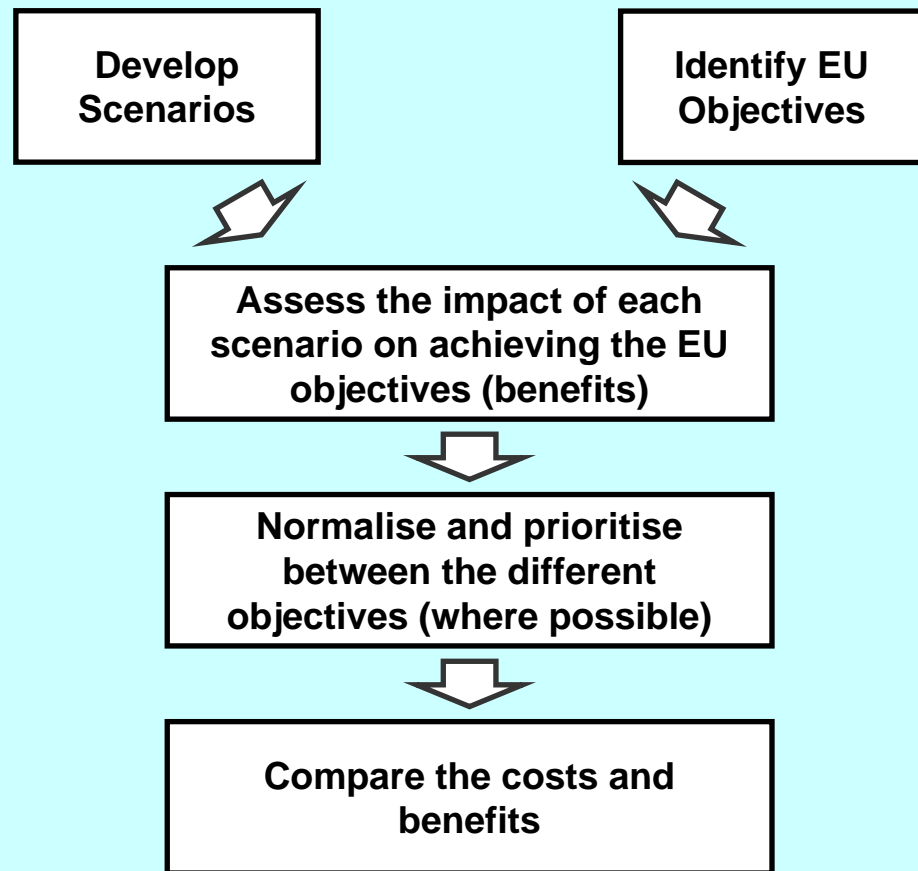
## **Institutional and cost-benefit assessment**

- Establishing an ERNP at EU-level is a logical conclusion
  - The EU, together with the Commission, should take the lead role in any ERNP
  - Giving the EC the lead policy/planning role for the EU radio-navigation environment is a logical extension of its current involvement in associated areas (telecommunications, satellite communications and Galileo)
- High-level benefits and beneficiaries have been considered and long-term operational costs have then been linked to the benefits
- These have been augmented further in Phase 3 to include transport policy objectives detailed in the EC's 2001 White Paper and the delivery of wider socio-economic benefits detailed in the Lisbon Strategy



## In the third implementation phase the study has addressed service mix determination ...

- A multi-criteria decision analysis has been used to assess five scenarios based on the existing service mix and the potential core ERNP services
- Delivering 78% of the policy benefits provides a compelling justification for selecting EGNOS and Galileo as core ERNP services
- The benefit/cost ratio of Loran-C/EuroFix is compelling but the EU's role is standardisation given the changing institutional environment and EU-level funding may be appropriate to secure policy benefits



**The final system mix is presented later**

## **Considered standardisation and certification and proposed a management strategy**

- The study has proposed possible frameworks for a harmonised EC approach to ERNP standardisation and certification based on the formal approaches adopted by the European Commission for the European Single Sky
- The study has covered the critical issues of funding, institutional arrangements, the regulatory process and maintenance

**The management strategy is presented later**

## ERNP System Mix

# EU role through the ERNP for different radio-navigation services

		EU Role Through the ERNP			
		Define	Standardise	Harmonise	Influence
Services	Fully Operational		Loran-C*	NDB	GPS
				VOR/DME	GLONASS
				ILS/MLS	Chayka
				Nat'l DGNSS	WAAS
				Radiobeacon DGNSS**	
	Non Fully Operational	Galileo	EuroFix	GBAS	
		EGNOS			

\* For those chains under (predominantly) EU Member State ownership. While Loran-C is fully operational, full European coverage is currently incomplete

\*\* The standardisation of Radiobeacon DGNSS refers to complete land coverage as the coastal system is already defined and standardised by IALA and the marine aids to navigation providers

## **It provides a basic level of service**

- The ERNP radionavigation service environment comprising these services will provide a basic level of service
- The services are detailed in a European Union Radionavigation Services (ERNS) document
- Users may need to augment these services with other public or private radionavigation services and non radionavigation systems or sensors to meet their application requirements

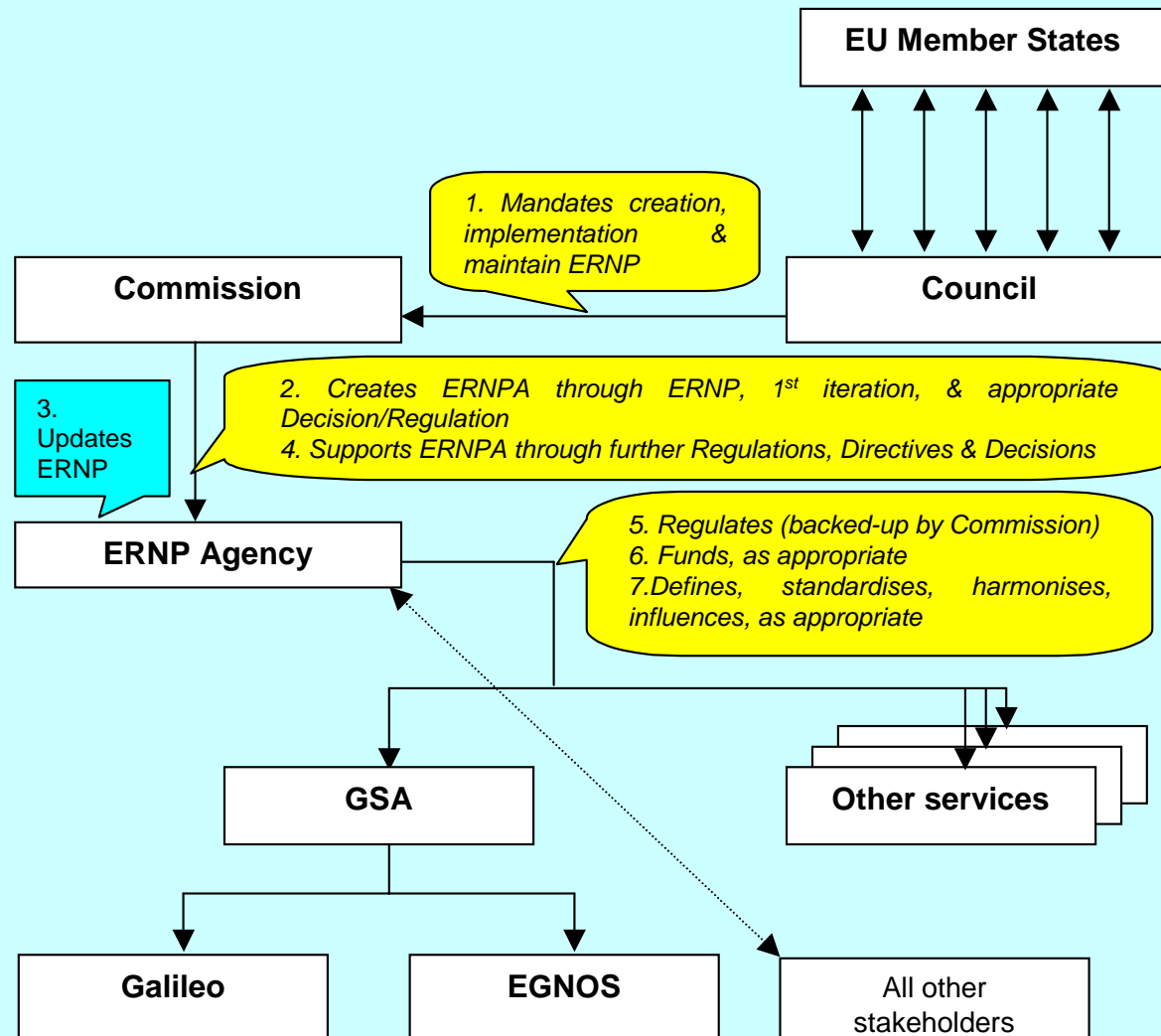
# Implementation and Management

- **Funding**
- **Institutional Arrangements**
- **Regulatory Process**
- **Maintenance**

# **The EU should build on best practice throughout the transport sector by working with public and private sector bodies to develop, build and operate components of the radio-navigation service environment**

- The EU radio-navigation service environment is a critical part of the basic transport infrastructure and securing its long-term future is paramount to ensure service take-up in many market sectors and this depends on continuity of funding
- Cost-recovery mechanisms and principles outlined in the EC's White Paper on common infrastructure charging should be applied in the radio-navigation service environment
  - This should take into account that different market sectors have different levels of maturity and the service has to be cost-beneficial to the user
- The EU is responsible for defining and ensuring the continuity of two core ERNP radio-navigation services: EGNOS and Galileo
  - EU funding is needed to cover operational costs in order both to secure both the transport and wider socio-economic benefits of its current investment

# A preliminary legal/functional model for the ERNP and its ownership and authorship





## **The study has concluded by proposing a pragmatic regulatory process and approach to maintenance**

- Implementation of the environment should start by setting out overarching objectives, principles and guidelines based on an EC Communication and associated Council Conclusions
  - These should indicate the conditions (either short-term or long-term) under which further European Community legislation might be needed
- The ERNP and ERNS documents should be updated routinely to reflect changes in user requirements, services, policies and new applications
  - The ERNS document should be reviewed and updated on a four-year cycle (and on request when required)
  - The ERNP document should be reviewed and updated on a four-year cycle
  - A formal and ongoing consultation process with stakeholders should be implemented to inform the review process

## Contacting the ERNP Team

Project Manager	Dr Sally Basker Helios Technology Ltd
Postal Address	Chamberlain House High Street Bagshot Surrey GU19 5AE UK
Telephone	+44-1276-452811
Fax	+44-1276-472897
Email	<a href="mailto:ernp@helios-tech.co.uk">ernp@helios-tech.co.uk</a>
WWW	<a href="http://www.helios-tech.co.uk/ernp">www.helios-tech.co.uk/ernp</a>