

GALILEO overview



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Presentation Structure

- Galileo key features
- Program overview
- International cooperation
- Future perspectives





Galileo

Key features

1. Higher quality services globally available
2. Market oriented, designed for civil users
3. Autonomy -> security
4. Public private partnership
5. Accountability
 - *full service and performance monitoring and real-time “integrity”*








GALILEO Constellation



- **30 satellites in orbit (only 27 active)**
- **3 planes**
- **Orbit altitude: 23222 km (above GPS and GLONASS).**
- **Each satellites makes 17 orbits in 10 days.**
- **12 satellites visible from any ground location, in average.**



Galileo Services

Navigation	Open Access	Free to air; Mass market; Simple positioning and timing	
	Commercial	Encrypted; High accuracy; Guaranteed service	
	Safety of Life	Open Service + Integrity and Authentication of signal	
	Public Regulated	Encrypted; Integrity; Continuous availability	
SAR	Search and Rescue	Near real-time; Precise; Return link feasible	



GALILEO Project Status

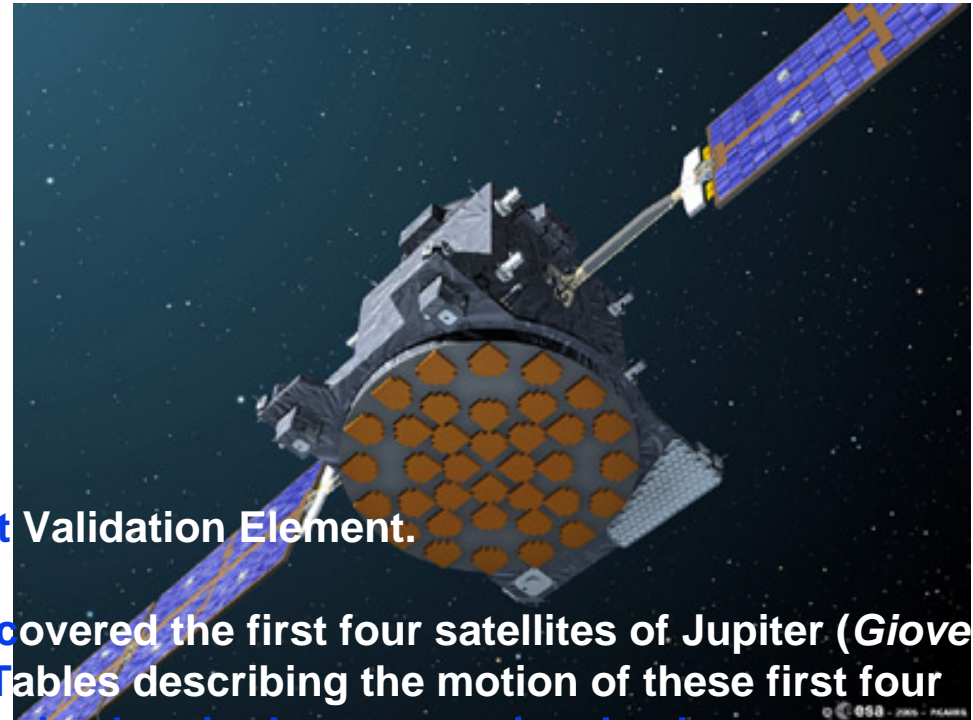


The GIOVE-A satellite under test at the ESA Technical Facilities in the Netherlands

- **Definition Phase started in 2000 and was completed in 2003.**
- **Currently in the Development and Validation phase to be completed in 2008.**
- **Critical technology developments completed (i.e. atomic clocks)**
- **First Experimental satellite (GIOVE-A) to be launched 26 December 2005.**



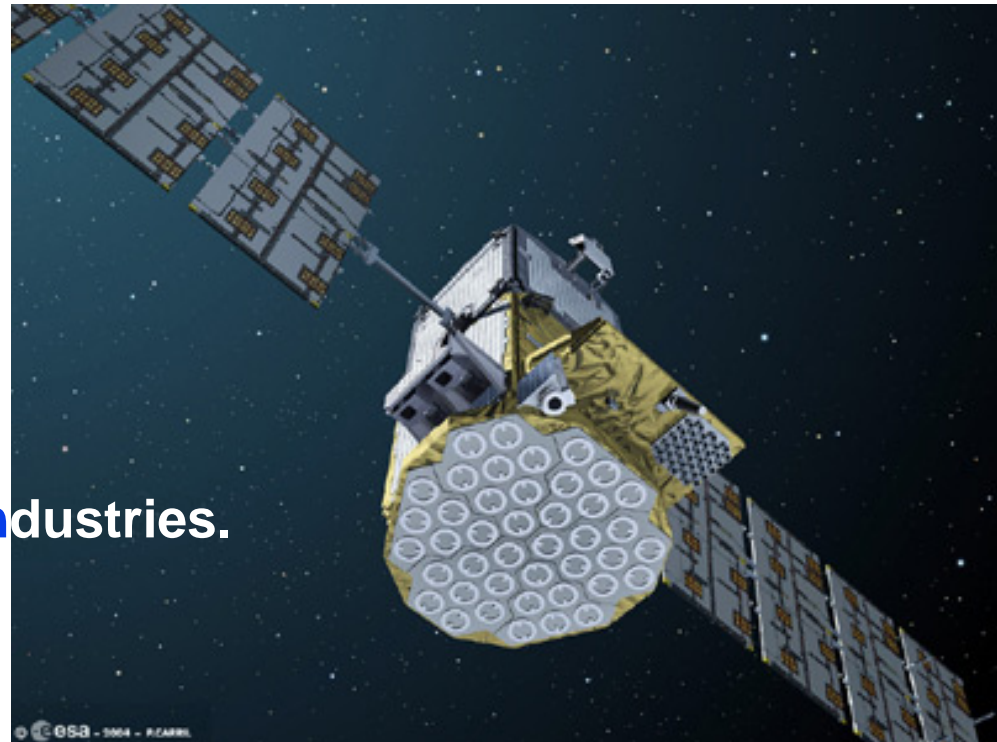
First Experimental Satellite (GIOVE-A)



- GIOVE-A is the first Galileo In-Orbit Validation Element.
- Named in tribute to Galileo who discovered the first four satellites of Jupiter (*Giove* in the native language of Galileo). Tables describing the motion of these first four Jovian satellites were used to determine longitude at sea and on land.
- GIOVE-A has been built by Surrey Satellite Technology Limited.
- GIOVE-A will validate the frequencies and other key technologies of Galileo.
- Lift-off mass: 600 Kg, Power demand: 700 Watts, Stowed Dimensions: 1.3 m, 1.8 m x 1.6 m



Second Experimental Satellite (GIOVE-B)



- **GIOVE-B built by Galileo Industries.**
- **Back-Up of GIOVE-A.**
- **Ready for launch in 2006.**
- **Incorporates additional key technologies such as the H-maser atomic clock (the more precise clock ever flown yet in space).**



Galileo In-Orbit Validation and Full Deployment



- Constellation of four satellites to be deployed by 2008 complemented with a global ground segment of reference and up-link stations to communicate with the satellites.
- Four satellites is the minimum to guarantee exact position and time at test locations.
- The In-Orbit Validation will be followed by the deployment of the complete system (remaining 26 satellites) by 2010.



EGNOS

Update



- EGNOS operations started in July 2005.
- Declaration of Open Service availability planned for early 2006.
- Coverage extensions taking place:
 - South Mediterranean and North Africa: 4 additional stations.
 - Whole of Africa: Workshop of potential investors, Cairo, 14-15 February 2006.
 - Several demonstrations in Africa during 2005 using test-bed signals



Galileo

concession status

- **Oct. 2003: Concession Call**
- **Dec. 2003: 4 candidates**
- **Feb. 2004: 3 shortlisted**
- **Competitive negotiation**
- **Sept. 2004: 2 bids**
- **June 2005: 1 merged bid**



PPP

Risk sharing

risk

Technology

Market

Time

cost

€1.100 Million

€2.100 Million

€200 Million/year

Development

Deployment

Exploitation



Objectives

international co-operation

- **Seek interoperability with existing systems**
- **Reduce risks (technical, market, regulatory..)**
- **Raise awareness**
- **Promote access to GNSS/Galileo**
- > **Make Galileo inclusive from outset**



Activities

international co-operation



- **Bilateral agreements**
- **Research and technological development**
- **Training, information days, Galileo centers**
- **Industrial co-operation, EGNOS South**
- **Certification, standardisation**
- **Co-operation in international forums -> IGC**



Interoperability

Galileo-GPS

- *Agreement signed on June 26th 2004 on the provision and promotion of Galileo and GPS services*

- Full interoperability and compatibility Galileo and GPS
- Common baseline signals + optimisation under study
- Joint broadcasting of GPS/Galileo time offsets
- Galileo and GPS will share some frequency bands
- Galileo+GPS = world standard for civil GNSS free of charge to end users



Galileo-GPS

Next steps



Expert groups on:

- a) **frequency compatibility and interoperability**
- b) **trade and civil applications**
- c) **design and development of next generation civil satellite navigation systems**
- d) **security issues**



Interoperability Galileo-GLONASS

- **Contacts underway (ex: ESA-Roscosmos on EGNOS and GLONASS augmentations)**
- **Different challenges (technical standards etc)**

- **Opportunities: bridge GPS, GLONASS, GALILEO**

-> ICG as forum



Galileo

International

Perspective:

- Worldwide Markets
- Local-Regional Infrastructures
- Global Standards
- Products Certification
- Financing

	Signed	Draft	Nego.	Talks
U.S.A.	✓			
China	✓			
Israel	✓			
India		✓		
Ukraine	(✓)	✓		
Morocco			✓	
Norway			✓	
Argentina			✓	
Russia			✓	
S. Korea			✓	
Canada				✓
Brazil, Chile, Mexico				✓
Malaysia, KSA				✓



Galileo Cooperation Centers

- Asia Region: Beijing, 2003
- Africa Region: Cairo, 2004
- Latin American Region: Sao Jose dos Campos.
 - hosted by UN CRECTEALC center
 - to be opened in December 2005.
- Centers can be a useful tool for the ICG.



Future perspectives

- Moore's law (computing devices)
 - cost decrease
 - capacity increase
- Synergy with other technologies
 - telecommunication
 - earth observation
- Interoperability needs increase
- Internationalisation/democratisation
- Liability questions

