Table 5: GNSS systems compared

	Galileo	GPS II (current version)	GLONASS
Number of satellites in orbit	27 (+ 3 spares) in three orbital planes	24 in six orbital planes	24 in three orbital planes
Position accuracy	hor. = 4 metres ver. = 7 metres	hor. = 22 metres ver. = 27.7 metres	hor. = 57-70 metres ver. = 70 metres
Timing accuracy	30 ns (nanosecond)	100 ns	1000 ns
Development start date	2001	1970s	1970s
First satellite launch date	2005	1978	1982
First operational date	2008	1994	1993

interrupted in an emergency situation. Its signal is more robust and protected against jamming and spoofing. The planned PRS has caused concerns among US government and military officials because it will operate on the same frequency as some GPS III signals.

- **Search and Rescue Service (SAR):** This service is being designed in cooperation with the existing international COSPAS-SARSAT rescue satellite system. It aims to make use of Galileo facilities to dramatically improve rescue response times and alert location precision.

Frequency allocation

The frequencies allotted to Galileo after difficult negotiations at the 2000 World Radio Conference in Istanbul will be lost if the first operational satellites are not launched by 13 February 2006.

Meeting this timetable would of course also improve Galileo's chances of beating GPS III to market.

Of the 10 signals transmitted, six will mainly serve open and safety-of-life services, two will be used for commercial services and two for public regulated service.

Interoperability with the competition

Galileo planners have always envisaged an interoperable system using receivers that process data from several sources including GPS. In its March decision, the Council of European Transport Ministers reaffirmed that Galileo was to be a civil programme under civil control, but also interoperable with existing military GNSS constellations. The ministers want an EU–US agreement to be negotiated on the matter as soon as possible. This will prove difficult, because US government and military officials have

Table 6: Miscellaneous definitions

Community Research and Development Information Service (CORDIS)	EU research information service. The CORDIS website (www.cordis.lu) contains EU research and general news, official documents, as well as guidelines for firms wanting to participate in EU-sponsored research initiatives and tenders. The site features a powerful search engine.
5th and 6th Framework Research Programmes (FRPs)	Official EU research, technological development and demonstration (RTD) programmes. The current Galileo pilot programmes POLARIS, GADEROS, NAUPLIOS and INSTANT as well as the GALILEI study (see table 2) were launched under the now expiring 5th Framework Research Programme, which covered 1998–2002 on a budget of €15 billion. The 6th Framework Research Programme will span the 2003–2006 period on a budget of €17.5 billion.
EGNOS (European Geostationary Navigation Overlay System)	EGNOS is a European GPS enhancement service scheduled to become fully operational in 2004. A joint project of the EC, ESA and European air safety organisation Eurocontrol, EGNOS consists of three geostationary satellites and 40 ground installations (30 monitoring stations, four control centres and six uplink stations). The system will augment GPS precision from 20 to five metres. Along with WAAS (US) and MSAS (Japan), EGNOS is one of the three regional GPS augmentation services. EGNOS is considered Galileo's predecessor and will be fully integrated into the Galileo service after 2008 (see also ESTB definition below and table 2 for current applications).
EGNOS System Test Bed (ESTB)	In the run-up to the EGNOS service launch date in 2004, a test signal broadcast by two geostationary Inmarsat satellites that allows potential users to acquaint themselves with the EGNOS facility. The two satellites, positioned respectively over the eastern part of the Atlantic and the Indian Ocean, will also be used for the fully operational system. The third EGNOS, ESA Artemis, was launched last year and positioned over Africa at a different altitude from that of the Inmarsat crafts. Artemis carries both communications and navigation transponder. ESTB is used in the pilot projects listed in table 2.
Galileo System Simulation Facility (GSSF)	A simulation facility designed to support ESA in developing Galileo. Allows user-defined models to be plugged into the overall GSSF models.
Galileo System Test Bed (GSTB)	A validation phase testing programme designed to limit risks by assessing the system's viability. In the first stage of GSTB, GPS data will be used for various Galileo simulations. After 2004, data will be collected from launched Galileo test satellites.
High Level Definition Document (HLD)	High level document whose main purpose is to expose the mission to non-technical decision-makers such as Member States representatives.
Mission Requirements Document (MRD)	High level internal document which describes Galileo mission requirements in technical detail.
System Requirements Document (SRD)	High level technical document to be released to the industries for the development of compatible applications.