Glonass: Dawn, Decline and Revival

GPS and GLONASS: two operational Global Navigation Satellite Systems (GNSS), one owned by US and the other by Russia - I know they give me positions; I know they enable me to navigate. But why is GPS flourishing whilst GLONASS recovers from decline?

The two GNSS systems currently available for civilian use are NAVSTAR (NAVigation Satellite Time and Ranging) and GLONASS (GLObalÂ´naya NAvigatsionnaya Sputnikovaya Sistema: Global Navigational Satellite System). Development of NAVSTAR, owned by the US and managed by its Department of Defense, got underway in 1973. Nearly ten years later its continuation became a critical issue as US Congress expressed doubts about the usefulness of the system. However, the trouncing of a civilian Korean airplane (Flight 007) in 1983 over Russian ground changed minds and Congress decided to increase funding for NAVSTAR and allow its civilian use. Loss of the space shuttle Challenger in 1986 caused further disruption to system plans because these vehicles were designed to carry GPS satellites; delta rockets eventually replaced the shuttle as carrier.

GLONASS, presently owned by the Russian government and managed by the Russian Space Forces, was developed by the former USSR at the same time that the US was building GPS. Launch of the first GLONASS satellites took place on 12th October 1982. The constellation originally consisted of twelve satellites, but by decree of 7th March 1995 the Russian Government opened, GLONASS for free-of-charge civil use and the number of twelve satellites was increased to 24. This constellation was completed in 1997. Since then GLONASS has been designated a â€˜dual systemâ€™, available to both civil and defence users. Civil users worldwide are able to make use of the Standard Precision (SP) signal mode, whilst the High Precision (HP) signal mode is reserved for government or military use.

Lack of economic impetus jeopardised continuation of the programme, and by the start of the new millennium Russia had to rely on US GPS signals. By April 2002 only eight satellites were in operation, far too few to act as a global navigation utility. Presidential and governmental decrees issued in 1999 and 2001 were necessary to reverse the downward spiral. An ensuing Federal Target Programme for the ten years 2002-2011 was to revive the system. Currently in orbit are twelve GLONASS satellites with expected lifetime of three years, and four GLONASS M satellites with an expected seven-year lifetime. By April 2006 the probability of receiving four or more satellites was 76%, whilst the positioning gap fell from 13.7 hours in 2001 to 2.6 hours in 2006. In December 2006, three more GLONASS M satellites will be put into orbit. The constellation will be further improved by the launch of GLONASS-K satellites. By 2008, these satellites of reduced weight and increased operational lifetime of ten to twelve years will have been added. According to the goals set by a Presidential Directive of 18th January 2006, eighteen satellites should be in orbit by the end of 2007, giving the constellation a total of 24 satellites after two years.

The aim is to make GLONASS performance comparable by 2010 with GPS and Galileo. The main goal of the Russian policy is to bring GLONASS to the mass-market. This should be achieved by enabling developers of equipment and applications guaranteed access to the GLONASS civil signal structure by promoting within Russia the combined used of GPS/GLONASS receivers and maintaining GLONASS compatibility and interoperability with GPS and the future Galileo. GLONASS is gaining increasing international attention from partners and users in India, EU, the US and other nations. For example, in December 2004 the US and Russia agreed to shelve any idea of direct user fees for civil GLONASS and GPS services. India and Russia are willing to co-operate on GNSS infrastructure development.

GPS and GLONASS are very similar, but some differences are significant. Most noticeable is that GLONASS has neither the degradation of precision nor the cryptography of GPS.