GPS getting an upgrade - for $8 billion

May 25 2010, by Lin Edwards

(PhysOrg.com) -- GPS is getting an upgrade costing $8 billion (US), which aims to increase the system's accuracy, improve its reliability, and make the technology even more widespread.

The Global Positioning System (GPS) is almost everywhere these days, not just as navigational aids in vehicles and mobile phones but in many everyday industrial and commercial applications. GPS enables courier companies to track their shipments, for example, and it enables ATMs and financial institutions to time-stamp transactions. It is used in emergency hospital paging systems, and helps firefighters to find fires. Colonel David B. Goldstein, chief engineer for the upgrade said they know the world relies on GPS, but the ever increasing number of devices

using GPS also increases the strain on the system.

GPS uses a “constellation” of 24 satellites orbiting approximately 11,000 miles above the surface of the Earth, and the orbits are arranged so that at any time there are always at least a half dozen or so satellites above. GPS receivers pinpoint their location by working out exactly how far they are away from at least three or four of the GPS satellites by analyzing the radio-frequency signals transmitted continuously by the satellites. They receive extremely accurate information on the time from atomic clocks in the satellites.

As part of the $8 billion upgrade the satellites will be replaced one by one to minimize the chance of disruption. Boeing Co’s Space and Intelligence Systems and Lockheed Martin are constructing 30 new satellites between them, which will allow for six spare satellites to be available if needed. The new satellites will eventually triple the signals available for commercial use. The equipment on the satellites will include even more accurate atomic clocks able to keep time to a fraction of a billionth of a second.

The upgraded system will significantly increase the accuracy, allowing a location to be pinpointed to within just a couple of feet instead of the current +/-20 feet margin of error. It will also make the system faster, and there will be provision to prevent disruptions such as accidental jamming of GPS, which in the recent past have caused disruption to emergency services and mobile phone services, as well as causing power outages.

GPS was originally developed by the Pentagon over 30 years ago at the Los Angeles Air Force base in El Segundo. Until GPS was developed vessels such as nuclear submarines, submerged for months at a time, had no precise way of knowing exactly where they were, and this meant the accuracy of any missiles fired would have been diminished. When the

system was proposed by Air Force Colonel Bradford W. Parkinson three decades ago he was told it would be useless, and it had no future.

An El Segundo team of scientists and engineers is among those working on the upgrade, which is expected to take around a decade. Senior space analyst for research company Teal Group, Marco Caceres, said the upgraded system will be able to deliver capabilities we have not seen before.

The satellites used globally for GPS are controlled by the Pentagon in the U.S., but the European Union, China and Russia are all attempting to build their own GPS to reduce their reliance on U.S. military technology.