



GPS

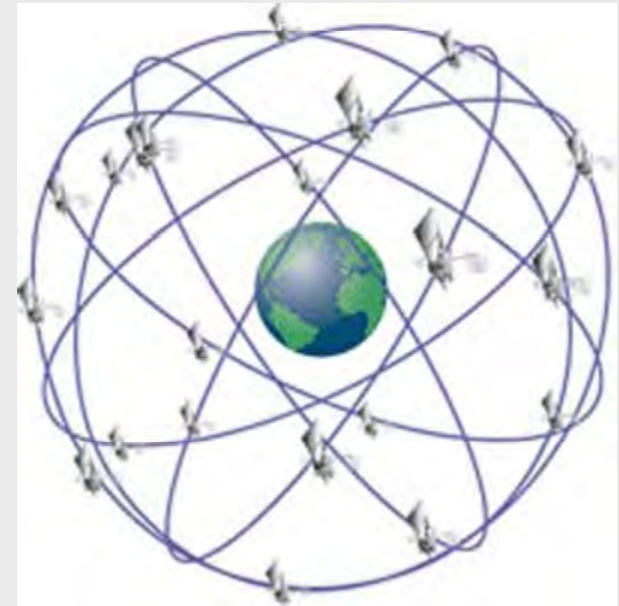
Myths vs. Facts

Minnesota Land Survey Conference
January 28, 2010
Steve Richter – Frontier Precision, Inc.



Agenda

- GPS Today
- GPS Life Expectancy
- GPS Update
- GPS vs. GNSS
- GNSS Update
- Surveying with GNSS Going Forward
- How is this impacting the Surveyor





GPS Today

- US DOD Funded System
- Today's Satellites
 - Block II Satellites (decommissioned 07)
 - Replacement for original Block 1.
 - Newer design
 - Block IIA Satellites (12 in Orbit)
 - Newer design.
 - 7.5 year expectancy.
 - 180 day non-contact





GPS Today

- US DOD Funded System
- Today's Satellites
 - Block IIR (12 in Orbit)
 - Replenishment SV's.
 - Longer Life expectancy (10 years).
 - Block IIR-M Satellites (6 in Orbit)
 - Longer life expectancy (10 years).
 - L2C signal.





GPS Update

- Satellites expectancy anywhere from 7-10 years.
- Fear of GPS Brownouts
- High PDOP warnings from NAVCEN (fear factor)
- High Precision Users not fully understood
- Managing the Constellation for today's needs
- How does this affect the GPS Surveyor?
 - Downtime
 - Higher Costs



GPS Update

- GPS Brownouts
 - Garnered National Attention in 2009
 - DOD issues precautionary report (May 2009)
 - Air Force Space Command “GPS will not go down”
 - Some risk exists based on a delay of new Satellite launching
 - Has more of an affect on GPS Surveyors



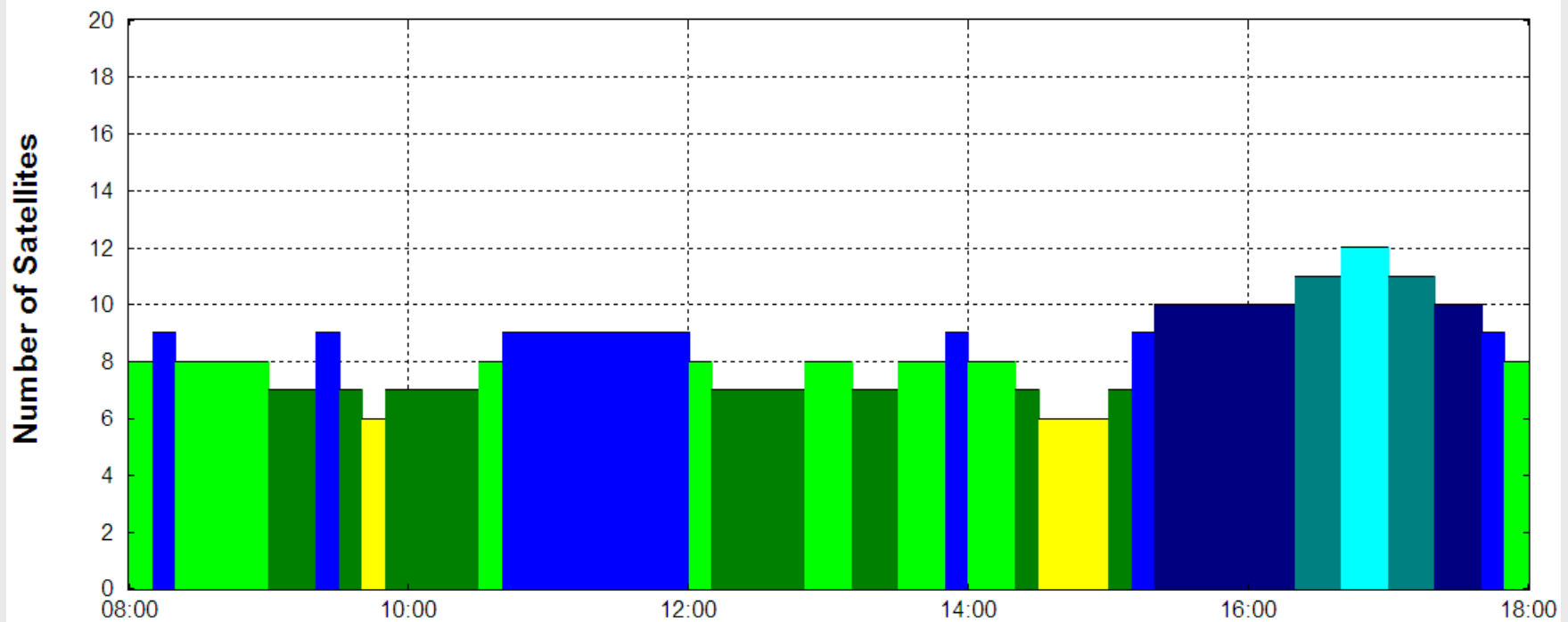
GPS and the GPS Surveyor

- Remember 24 SV's is full constellation
- GPS currently 28 SV's operating (was 30)
- Current Monitoring Segment = 30/31 SV's
- Improved Constellation Management
- Expensive to launch/DOD has limited budget
- Does this cause loss of survey productivity?
- GNSS may be the future



GPS and the GPS Surveyor

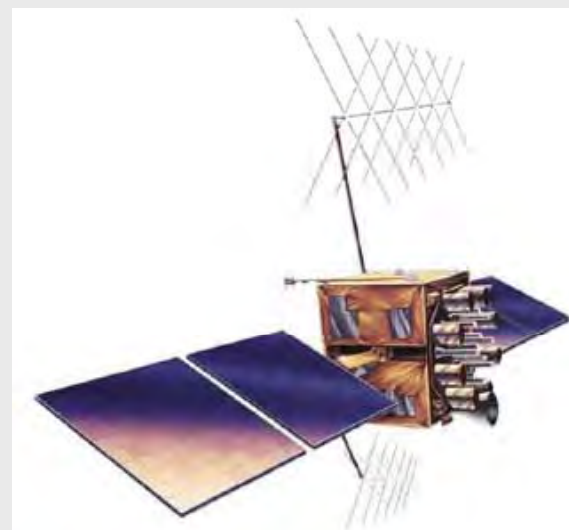
Visibility





GPS Future - GNSS

- New Satellites (GPS)
 - Block IIF
 - First Launch 2010
 - 15 year life expectancy
 - Stronger Signal Power
 - L5 Civil Frequency (SV49)
- GNSS Receivers
 - Multi-constellation tracking





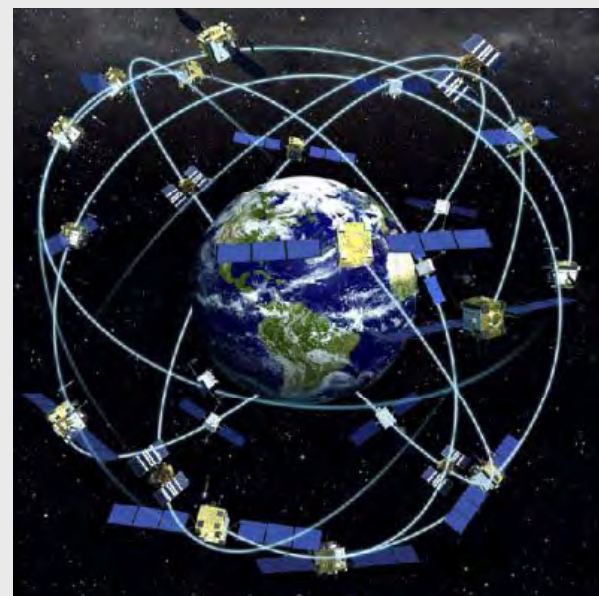
GPS vs GNSS - Augmentation

- GNSS Today
 - GPS + Glonass
- GPS Tomorrow
 - 3 Civilian frequencies with addition of L5
 - Longer life SV's
 - Augmented by other SV systems (Glonass, Galileo, etc.)
- GNSS Tomorrow (GPS tomorrow + ...)
 - Enhanced GPS + other Satellite Constellations



GNSS Update

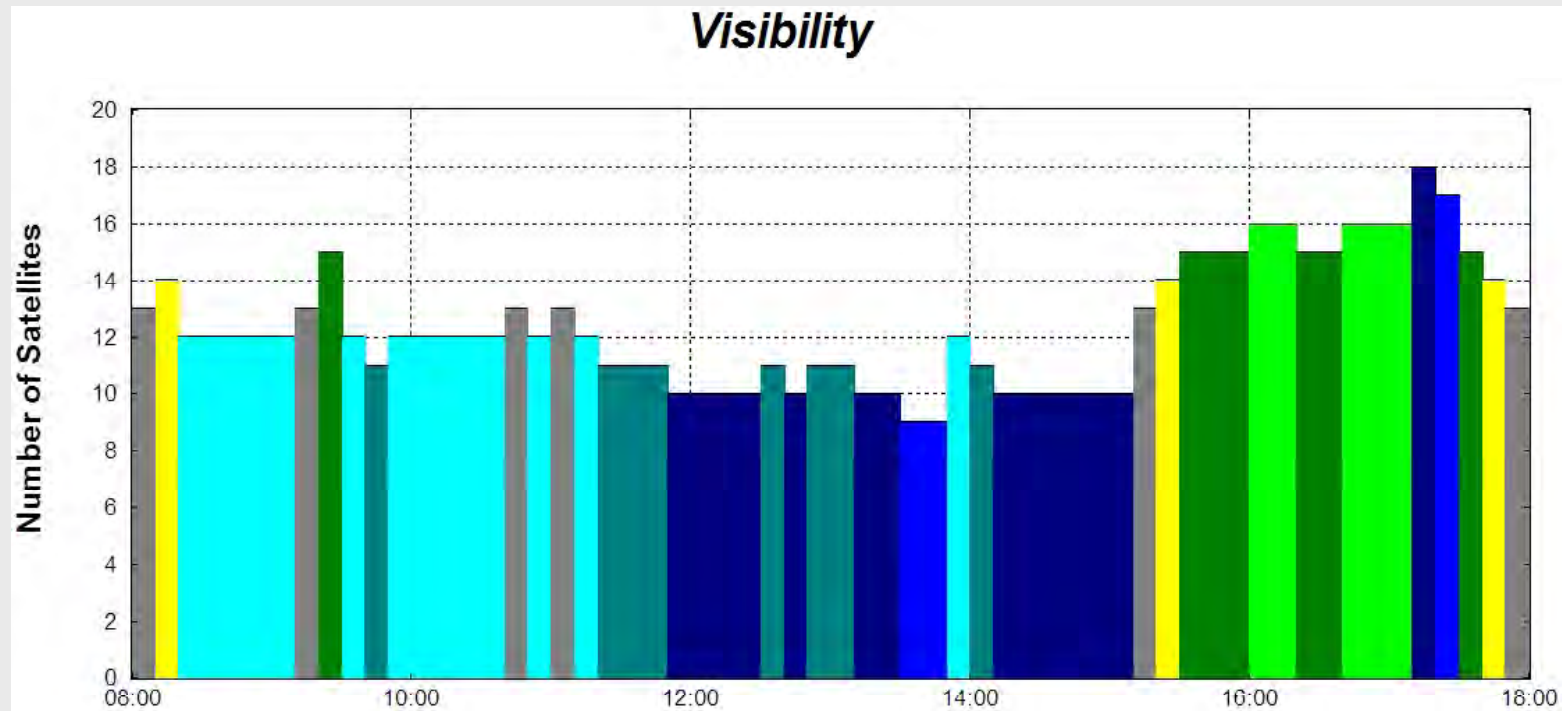
- GPS
 - 28 working SV's
 - New SV's, Block IIF
- Glonass SV System
 - 22 Satellites (December 2009)
 - 16 Operational
- Galileo SV System
 - Current Status: 2 Test SV's
 - Galileo Implementation Regulation Approved: April 2008
 - First SV Launch 2010. First Ground Station 2010





GNSS and the GNSS Surveyor

- Planning Constellation for Central Minnesota (1/30/10)





Surveying Impact - GNSS

- More Channels required on Receiver
- Better Telemetry Required
 - Faster Throughput Radios
 - 3g Type Cellular Coverage
 - CMRx Protocol Messages
- RTK Initializations
 - Faster
 - More Reliable





Surveying Impact

- Satellite Planning
- Traditional GPS changing to GNSS
- Real-Time Networks GNSS Capable
- Manufacturers
 - GPS Only Receivers
 - GNSS Receivers
 - More options





GPS Myths vs. Facts

- GPS Enhancement is slower than in the past
- GPS taking some scrutiny, but all is not lost
- GPS Only may require more planning
- Future may be GNSS
- GNSS can make Surveyors more productive



Questions

Credits

Gpsworld.com

[American Surveyor](#)

Wikipedia.com

[US Coast Guard website](#)