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

Number of Satellites

08:00 10:00 12:00 14:00 16:00 18:00
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)

Visibility

Number of Satellites

GPS + Glonass
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