Global Positioning Systems Wing

GPS Program Update to CGSIC 2010

21 September 2010

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GPS Wing

Overview

- **GPS Constellation**
- **Space Segment**
- **Ground Segment**
- **Modernization**
- **Expanded Constellation**
- **Performance Standards**

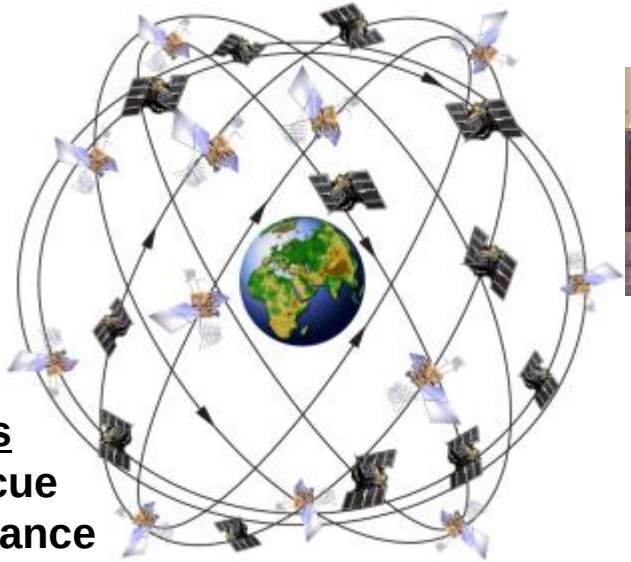
GPS Enterprise

International Cooperation

- Europe - Galileo
- China - COMPASS
- Russia - GLONASS
- India, Japan and others

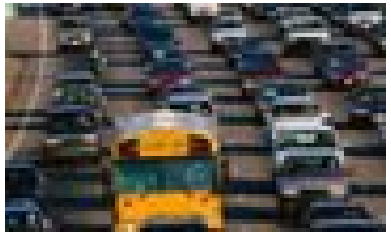
Civil Applications

- Search and rescue
- Banking and finance
- Surveying and mapping
- Aviation, trucking/shipping
- Offshore drilling
- Fishing and boating



Department of Defense

- Services (Army, Navy, AF, Marines)
- Agencies (NGA, DISA, etc.)



Department of Transportation

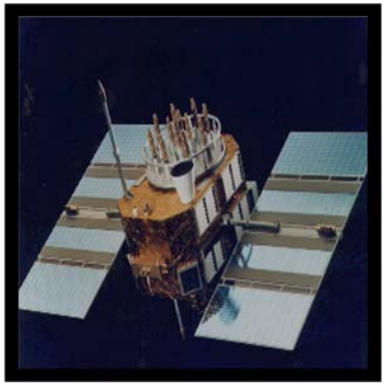
- Federal Aviation Administration

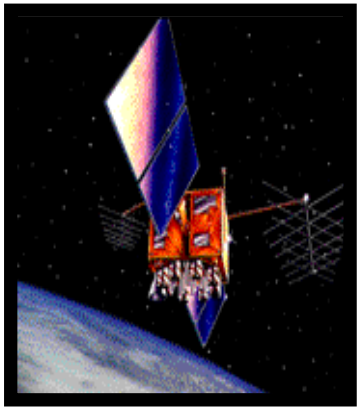
Department of Homeland Security

- U.S. Coast Guard

GPS Constellation

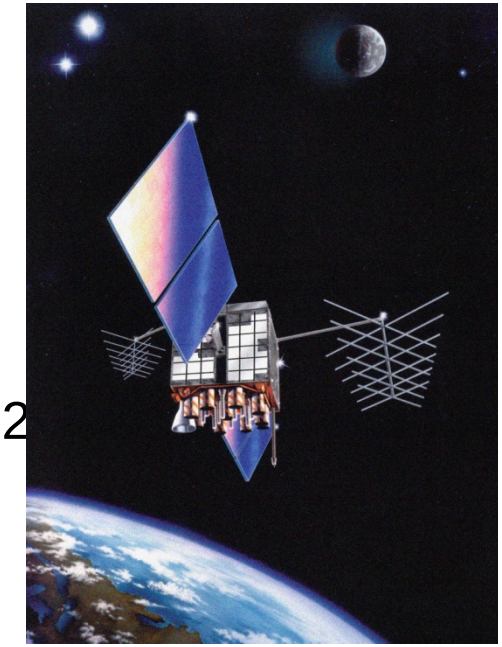
- **Very robust constellation**
  - 31 space vehicles currently in operation
    - 11 GPS IIA
    - 12 GPS IIR
    - 7 GPS IIR-M
    - 1 GPS IIF
  - 3 additional satellites in residual status
  - 1 satellite in “test” mode – SVN 49
- **Global GPS civil service performance commitment met continuously since December 1993**





IIR/IIR-M Satellites

- **All GPS IIR and IIR-M satellites have now been launched**
  - Current backbone of the GPS constellation
- **Excellent on-orbit performance**
  - SIS URE of .50 meters - 1 Year Performance July 2
- **Excellent life expectancy**
  - Solar array capacity far exceeds specified Mean Mission Duration
  - No clock failures to date
- **Completed deployment of IIR-M**
  - L2C CNAV message type 0 capability deployed this year on IIR-M to support testing of civil UE
  - Full CNAV message with OCX



IIF Satellites

- **Launched GPS IIF SV-1 in May 10**
  - SVN62, PRN 25
  - Was set healthy 26 Aug 10
  - First operational L5
  - Excellent clock performance
- **11 more IIFs in the pipeline**
  - SVs 2-5 are in production
- **IIF SV-2 launch by June 2011**

GPS III

- **Newest block of GPS satellites**
  - First satellite to broadcast common L1C signal
  - Multiple civil and military signals; L1 C/A, L1 P(Y), L1M, L1C, L2C, L2 P(Y), L2M, L5
  - +10 dB earth coverage power increase on M-Code
  - Three Rubidium clocks
- **Completed Critical Design Review for block IIIA**
  - Two months in advance

- **Completed Delta System Requirements Review for block IIIB**
- **Conducting Analysis of Alternatives for blocks IIIB and IIIC**

Other Recent Successes: Ground Segment

Monitor Station

Master Control Stations at Schriever AFB, Colorado

Ground Antenna

- Deployed several AEP upgrades including SAASM upgrade
- Conducted flex power demo with live IIR-M SVs
- Awarded OCX Phase B to Raytheon February 2010
  - Completed Technical Baseline Review March 2010
  - Completed Independent Baseline Review August 2010
  - Currently undergoing Software Specification Review (22-25 Sep 10)
  - Preliminary Design Review planned for April 2011
  - OCX Block I deployment planned for 2015

GPS Modernization – New Civil Signals

- **Second civil signal "L2C"**
  - Designed to meet commercial needs
  - Available since 2005 without data message
  - Phased roll-out of CNAV message
  - Full capability: 24 satellites and full CNAV ~2016

- **Third civil signal "L5"**
  - Designed to meet transportation safety-of-life requirements
  - Uses Aeronautical Radio Navigation Service band
  - Available since 2010; 24 satellites and full CNAV ~2019

- **Fourth civil signal "L1C"**
  - Designed for GNSS interoperability
  - Specification developed in cooperation with industry
  - Launches with GPS III in 2014
  - Available on 24 SVs by ~ 2021

Urban Canyons

Improved performance in challenged environments

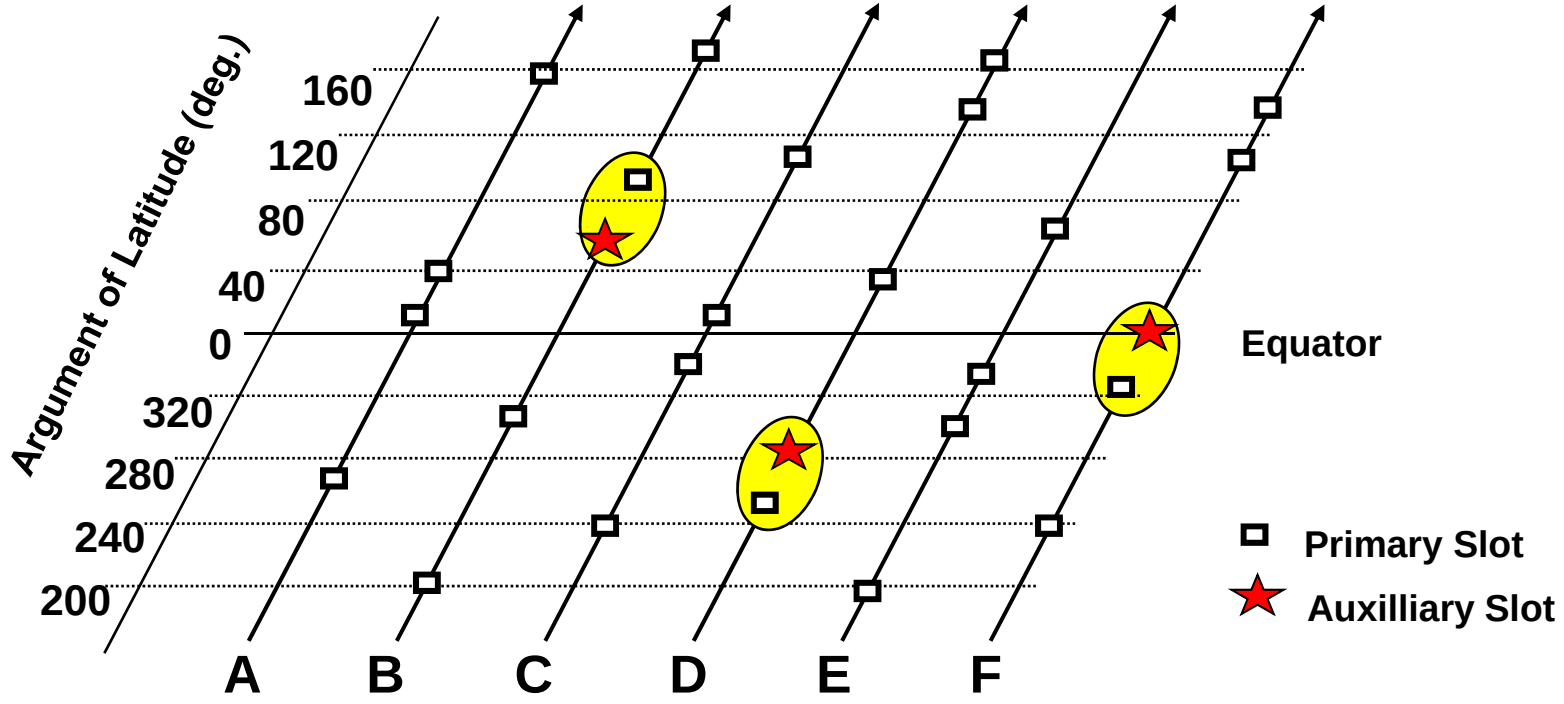
GPS Modernization

Modernization is on track across the enterprise

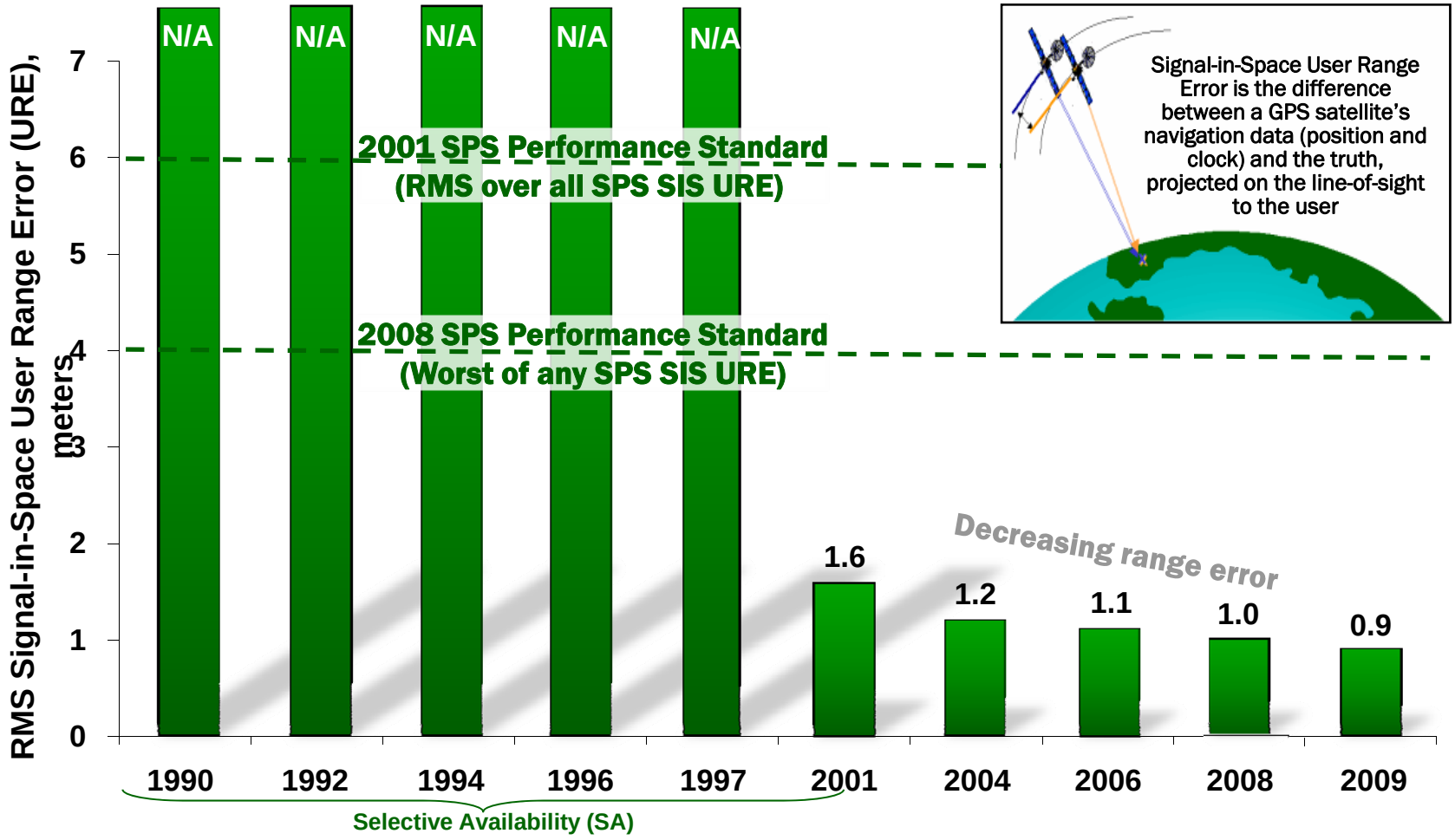
- Space Segment starting with IIRM (L2C), IIF (L5) and III (L1C)
- Ground Segment in OCX blocks 2 and 3/4
- User Segment in MGUE

Expanded 24 SV Constellation

- Current procurement strategy leads to more SVs on-orbit
  - 24 primary slots and other auxilliary slots
- Move 3 auxilliary slots to expanded primary slots = Expanded 24
- Improves performance in robustness to failures, integrity and accuracy
- Can fall back to 24 SVs if SV/booster shortage

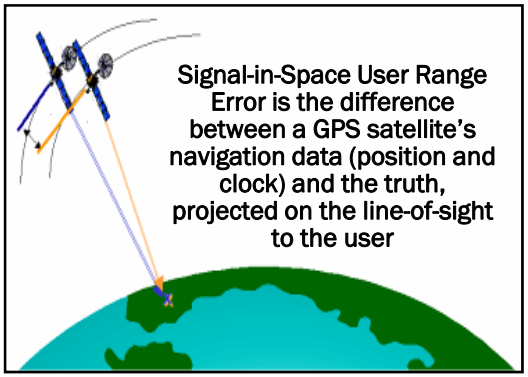


SPS Signal in Space Performance



System accuracy exceeds published standard

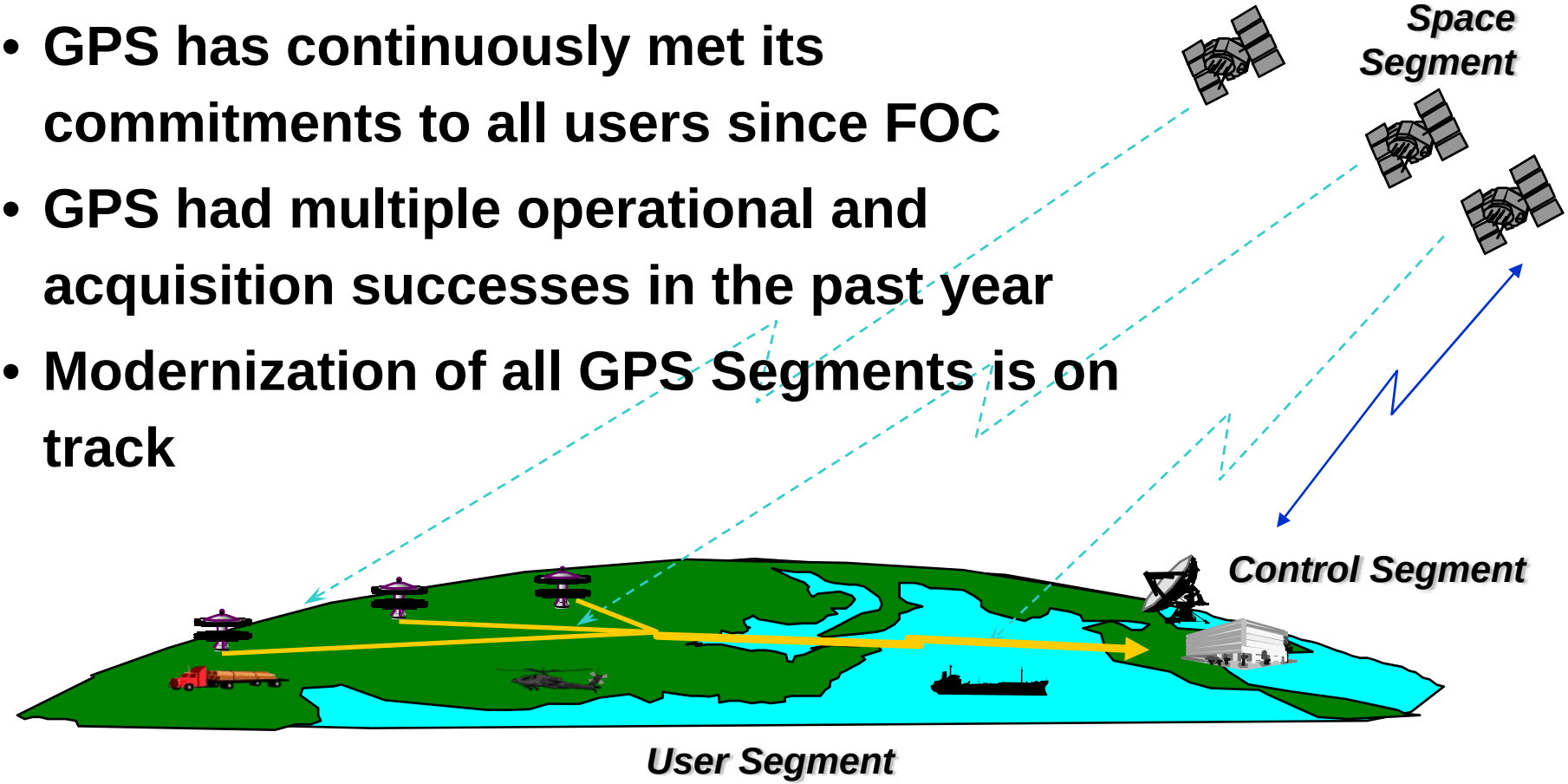
PPS Signal in Space Performance



System accuracy exceeds published standard

Summary

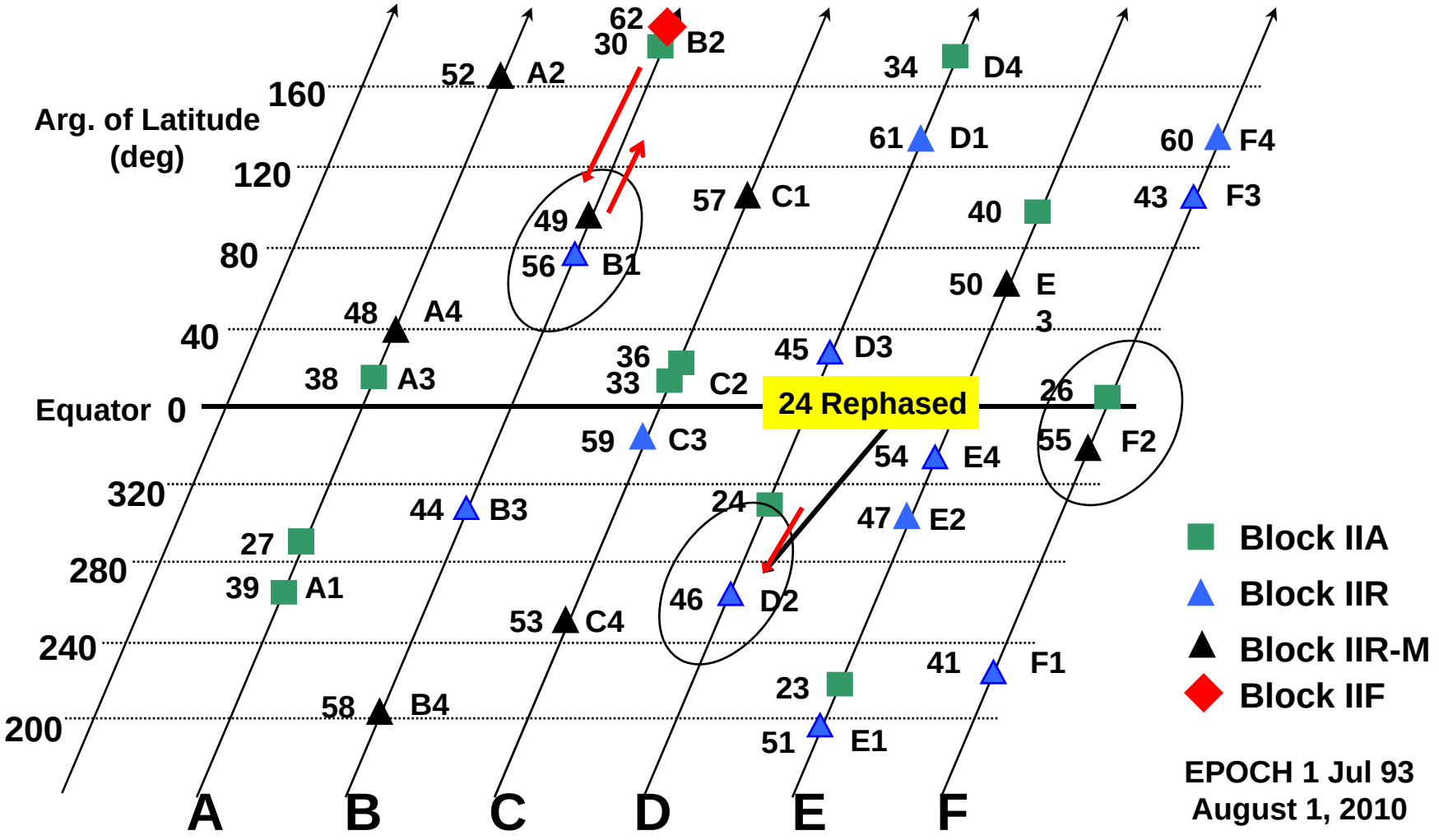
- GPS has continuously met its commitments to all users since FOC
- GPS had multiple operational and acquisition successes in the past year
- Modernization of all GPS Segments is on track



Maintaining And Improving GPS Services For All Users Is Job #1

Back-Ups

Current Satellite Positions



Expanded Constellation will be fully achieved by June 2011