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GLOBAL POSITIONING SYSTEM STATUS

CGSIC
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Introduction

- **Like the Internet, GPS has become a critical component of the global information infrastructure**
 - **Scalable applications enabling broad new capabilities**
 - **Facilitating innovations in efficiency, safety, environmental, public safety, and science**
- **Over the past decade, GPS has grown into a global utility providing space-based positioning, navigation, and timing (PNT)**
 - **Consistent, predictable, dependable performance and policy**
 - **Augmentations improve performance even further**



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GPS: Global Services

- **Global GPS civil service performance commitment continuously met/exceeded since 1993**
- **Access to civilian GPS service is free of direct user charges**
- **Public domain documentation**
 - **Free and equal availability to all users and industry**
 - **Equal opportunity to develop user equipment and compete on the world market**
- **Owned and operated by the United States Government**
 - **Managed by the United States Department of Defense as a multi-use asset**
 - **Acquired and operated by United States Air Force**

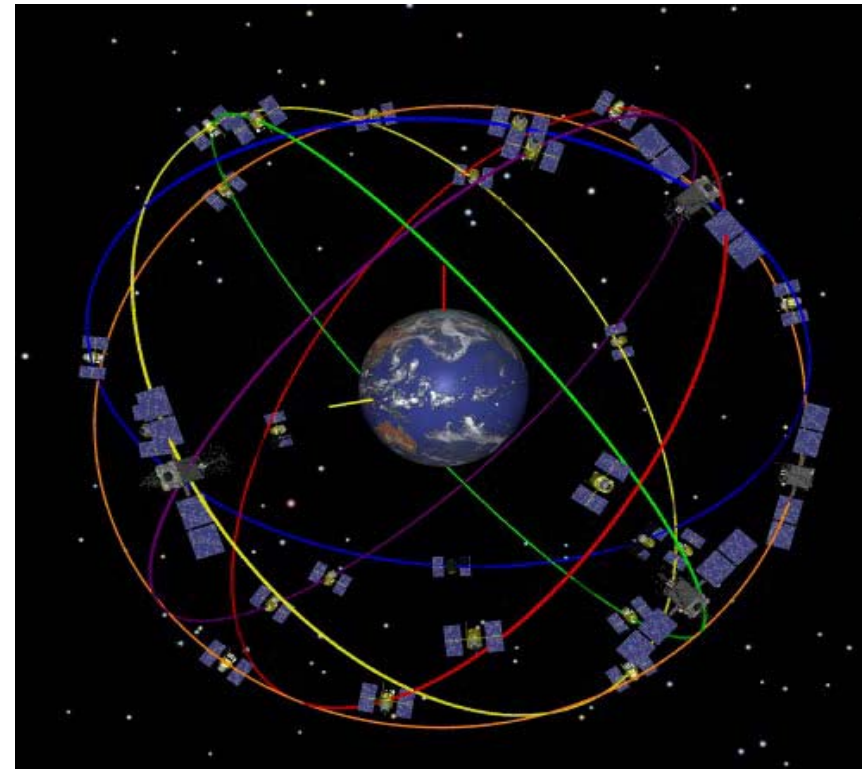
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Overview

- GPS Constellation Status
- Recent GPS Accomplishments
- Status of GPS programs
 - GPS Block IIR/IIR-M
 - GPS Block IIF
 - GPS Block III
- Summary



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The Global Positioning System

- **Baseline 24 satellite constellation in medium earth orbit**
- **Global coverage, 24 hours a day, all weather conditions**
- **Satellites broadcast precise time and orbit information on L-band radio frequencies**
- **Two types of services:**
 - **Open Access Service (free of direct user fees)**
 - **National Security Service (authorized users)**
- **Three segments:**
 - **Space Segment**
 - **Ground Segment**
 - **User Segment**

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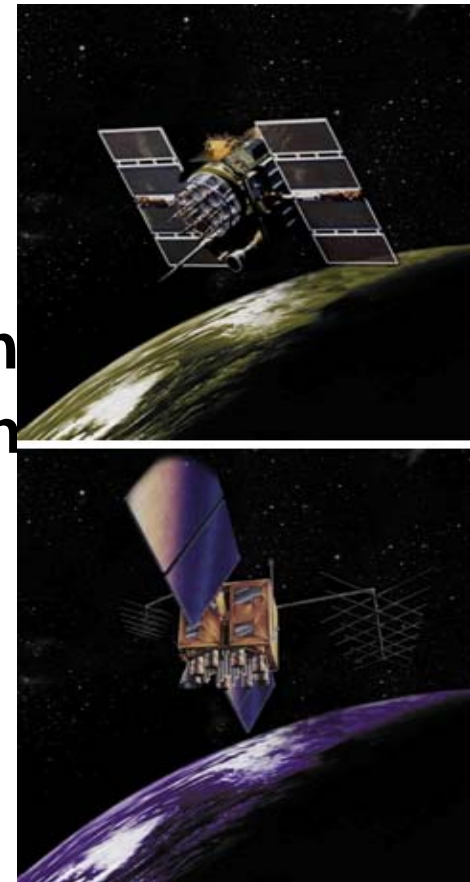


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The Global Positioning System

31 Operational Satellites
(Baseline Constellation: 24)

- 12 Block IIA satellites operational
- 12 Block IIR satellites operational
- 7 Block IIR-M satellites operational
- U.S. Government continuously assessing constellation health to determine launch need
 - Newest IIR-M satellites launched
 - IIR-20 (M) 24 March 2009
 - IIR-21 (M) 17 August 2009
 - Next launch: IIF ~ June 2010



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Recent GPS Accomplishments

■ **Second civil signal “L2C”**

- **Designed to meet commercial needs**
- **Higher accuracy through ionospheric correction**
- **IIR-20(M) is broadcasting signal now!!!**



■ **Third civil signal “L5”**

- **Designed to meet demanding requirements for transportation safety-of-life**
- **Uses highly protected Aeronautical Radio Navigation Service (ARNS) band**
- **Available to all users**
- **IIR-20(M) is broadcasting L5 Demo now!!!**



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GPS Block IIR/IIR-M Status

- **21-satellite procurement: 13 IIRs, 8 IIR-Ms**
 - **12 IIRs operational: 1st launch, 22 July 1997**
 - **7 IIR-Ms operational: 1st IIR-M launch, 25 September 2005**
 - **Includes M-Code capability**
 - **Broadcasting new civil signal (L2C)**
 - **Without Navigation Message**
 - **Help provide improved accuracy for civil users with second signal**
 - **IIR-20(M) is broadcasting an L5 demo signal**
 - **Flex power for signal assurance**





GPS Block IIF Status & Capabilities

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- **12-satellite procurement**
 - **Increases number of satellites broadcasting L2C**
 - **Increases number of satellites broadcasting M-code**
 - **Adds third civil signal – L5**
 - **Flex power for signal assurance**

- **First IIF launch is planned for no earlier than January 2010**





GPS Block III Satellite Capabilities

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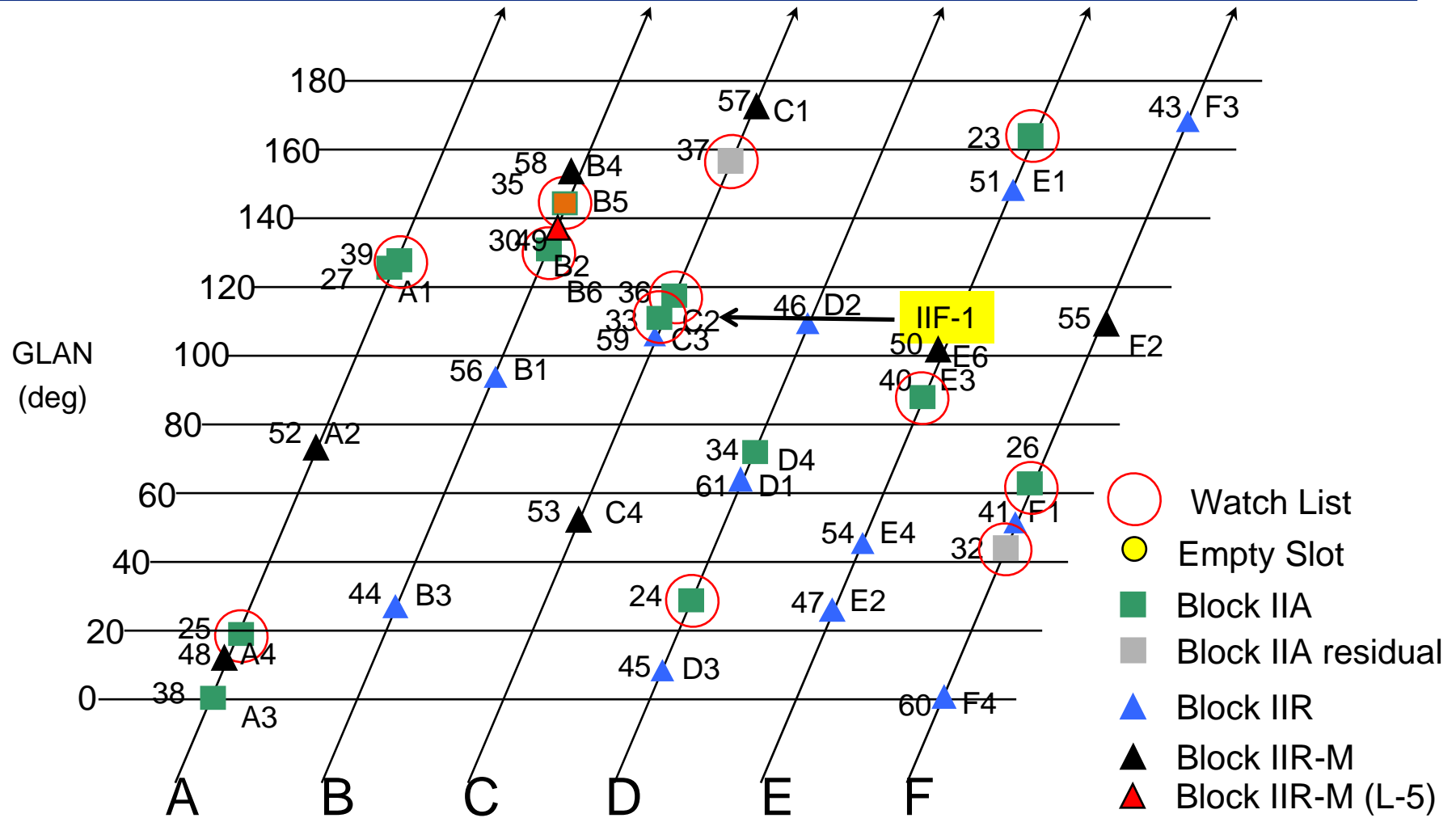
- **32-satellite procurement**
 - Provides operational capability for L2C and L5
 - 4th Civil Signal – L1C
 - L1C compatible with Galileo and Quasi-Zenith Satellite System
 - Increased anti-jam capability, security, accuracy
 - System survivability
 - Navigation surety
 - Backward Compatibility

- **First GPS III launch is planned for 2014**



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GPS Location





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Interference Reporting

- **2d Space Operation Squadron is responsible for processing all United States Department of Defense interference reports and works with the United States Coast Guard Navigation Center (USCG NAVCEN) to resolve civil interference when asked**
- **The USCG NAVCEN is the focal point for reporting all civil interference incidents, other than aviation incidents**
- **Please report problems via the NAVCEN GPS Problem Report Page**

<http://www.navcen.uscg.gov>

<http://www.navcenter.org>

- **After a GPS user completes these forms, they are sent to a database for tracking, analysis, and resolution**
- **Reports may also be received via phone/fax**

Phone: +1 703 313 5900

Fax: +1 703 313 5920



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Interference Reporting

- **User contacted for additional information, if necessary**
- **If the report is aviation related it will be directed to the United States Government Federal Aviation Administration for tracking, analysis, and resolution**
- **Maritime and terrestrial related reports will be processed simultaneously by the United States Coast Guard GPS Liaison to the GPS Operation Center at Schriever Air Force Base and Maritime Information Operations Center personnel for resolution**
- **Check for constellation events during reported outage period by using Notice Advisory to NAVSTAR Users (NANU)**
 - **Register to receive NANU information at:
<http://www.schriever.af.mil/gps/nanusubscription.asp>**



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Resent GPS News

- **GPS IIR-20, SVN-49 (PRN 01)**
 - Carries an L5 Demonstration Payload
- **2SOPS and Aerospace reported “out of family” elevation angle dependent Pseudo Range Residuals (PRR) from the monitor stations**
 - The demonstration payload made use of an Auxiliary Payload port on the spacecraft
 - No impact on the L1 and L2 signals was intended or expected
- **“Out of family” measurements also seen by other GNSS users world-wide**

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Resent GPS News

- **Root cause established**
 - **Caused by signals reflecting off L5 filter and transmitted through satellite antenna**
 - **Effects most prominent on portion of antenna whose influence is greatest at high elevation angles**
- **Overall effect characterized as a permanent, static multipath signal being generated within the satellite**
- **Signal distortion is user elevation angle dependent, with little or no distortion at low elevation angles**

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Resent GPS News

- **SVN-49 anomaly resolution proceeding**
 - **Personal interviews with user base have been extremely useful**
 - **Recent ION Panel provided Industry forum**
 - **Path forward to include additional testing opportunities**
- **Openness is key to building effective solutions and gaining trust**
 - **Additional input by world-wide user base highly desired**
- **SVN-49 will not be set healthy until “it’s time”**

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Delivering the Best Space-based PNT

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- ***Sustaining*** capabilities for civil and military users worldwide
 - Maintain ground systems/on-orbit satellites, launch new satellites
 - Fielding GPS enhancements
- ***Modernizing*** constellation with new signals and capabilities
 - New civil and military GPS signals and control capabilities
 - Continuing work with international GNSS community
- ***Managing*** GPS systems and supporting stakeholders

The United States is committed to responsible stewardship of GPS as a global utility

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