



GPS Symposium Keynote Address



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SUPPORT THE WARFIGHTER

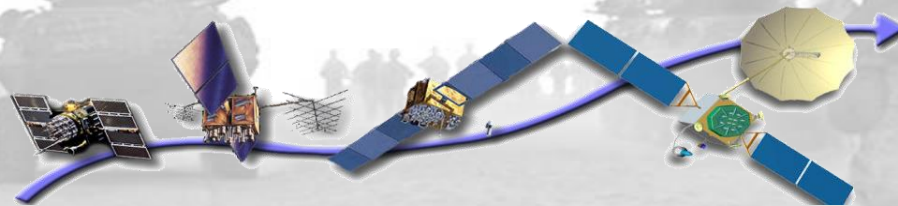
History of GPS



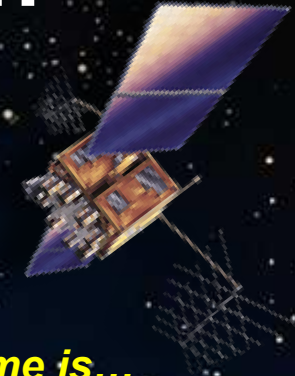
- *Transit* - Periodic, worldwide 2-D
- *Timation* - High stability clocks, time transfer, 2-D navigation
- *621B* - 3-D nav concept
- Merged into single DoD system in 1973

GPS History

- 1978 – First Block I satellite launched on the Atlas-Centaur
- 1983 – President Reagan makes GPS available for civilian use
- 1989 – Magellan Corp. introduces first handheld GPS receiver
 - First Block II satellite launched on Delta II booster
- 1995 – USAF announces GPS Full Operational Capability
- 2005 – First GPS II RM satellite launched with M-Code
- 2010 – First GPS II F satellite launched
- Jan 2016 – First GPS III satellite available for launch



GPS Constellation

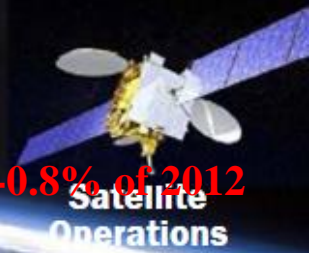


*...The time is...
...My position is...*

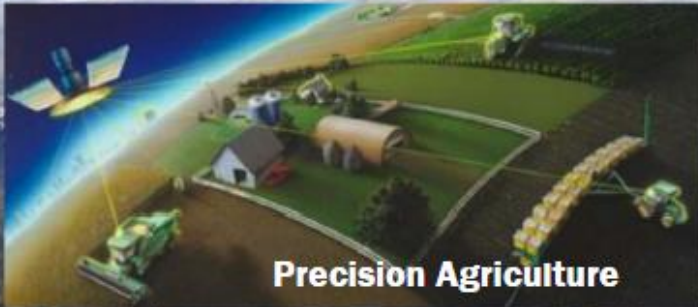
- 4 satellites in each of 6 orbital planes
- Currently 31 operational satellites
- 12-hour orbit period
- 10,900 nmi (20,200 km) altitude
- At least 5 always in view

GPS is Critical to Our Economy and National Infrastructure

Advisory Board Estimate of Contribution to US Economy: \$67.6B to \$122.4B (0.4%-0.8% of 2012 US GDP of \$15.7T)



Satellite Operations



Precision Agriculture



Surveying & Mapping



Aviation



TeleComm



Disease Control



Power Grids



Trucking & Shipping



Oil Exploration



Fishing & Boating



Personal Navigation

All Segment – GPS Modernization

Satellites

Legacy (Block IIA/IIR)

- Basic GPS
- C/A civil signal (L1C/A)
- Std Pos. Service
- Precise Pos. Service
 - L1 & L2 P(Y) nav

Modernized (Block IIR-M)

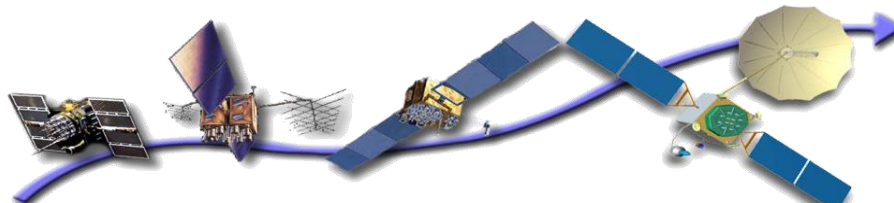
- 2nd civil signal (L2C)
- M-Code signals

Modernized (Block IIF)

- 3rd civil signal (L5)

GPS III (Block III)

- Increased accuracy
- Increased signal strength
- Signal integrity
- Search and Rescue
- Common Galileo signal (L1C)



Control Systems

Legacy

- TT&C
- L1 & L2 monitoring



Upgraded (AEP)

- IIR-M IIF TT&C
- WAGE, AII, LADO
- New MCS/AMCS



OCX (Modernized)

- New Architecture
- L1C, L2C, L5, M-Code
- Flex Power



User Equipment

Upgrading

- Military User Equipment



Military Applications

- Force location
- Navigation
- Force employment
- Weapon guidance
- All weather operations
- Satellite positioning
- Communications & Network timing



GPS – Force Multiplier

- **WWII Schweinfurt-Regensburg Raids:**

376 B-17s dropped 24 million pounds of bombs to strike 5 ball bearing plants



Today...Same Mission 1 Bomber with PGMs



Summary

- **GPS System**
 - 3 Segments; Ground Control, Space and User
 - Sustaining constellation while providing best accuracy
- **GPS Applications**
 - Unlimited civil/commercial global user capacity
 - Military users
- **GPS Modernization**
 - Key to meeting emerging civil/commercial demands
 - Key to remaining the preeminent military space-based PNT service

**GPS – The World's Gold Standard in
Space-Based PNT Services**

NASCTN: Concept

Who: Department of Commerce (DoC), with DoD element to handle DoD matters/information.

- National Institute of Standards and Technology (NIST)
- National Telecommunications and Information Administration (NTIA)
- DoD Chief Information Officer (CIO), Acquisition, Technology and Logistics (AT&L), Test Resource Management Center (TRMC)

What: National federation of federal, academic and commercial test facilities, modeling and simulation (M&S), and laboratory capabilities (engineering capabilities) supporting spectrum sharing research, development and deployment.

Why: Meet the Federal Government's challenge to support expanded wireless development and exploitation (Presidential Memo)

Where: NASCTN functionality organized within the Center for Advanced Communications (CAC) in Boulder, Colorado

Facilitate, coordinate testing of spectrum sharing technologies