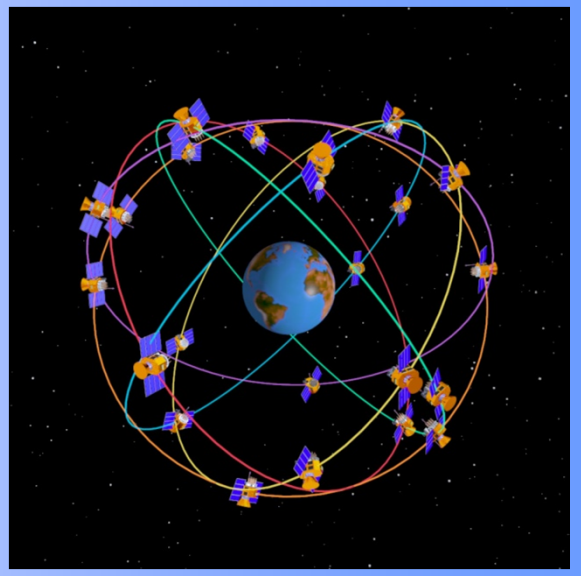
INTRODUCTION TO GPS
(GLOBAL POSITIONING SYSTEM)

Revised April 8, 2013

What is GPS?

The Global Positioning System (GPS)

A Constellation of Earth-Orbiting Satellites Maintained by the US Department of Defense for the Purpose of Defining Geographic Positions On and Above the Surface of the Earth. It consists of 3 Segments**:**

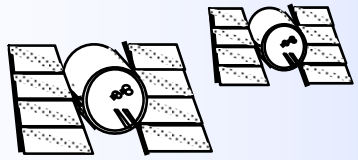


User Segment

Control Segment

Space Segment

User Segment



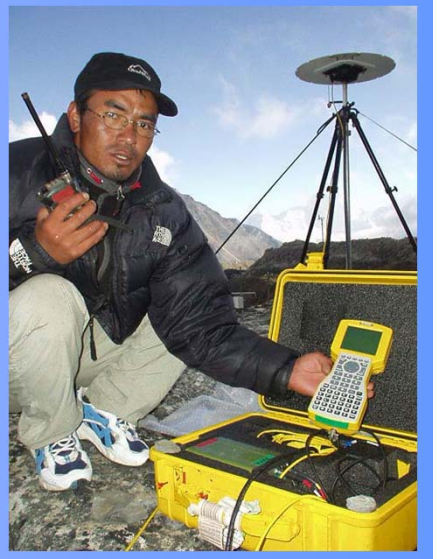
The Current locational position is Transmitted to the User from GPS Satellites

End User

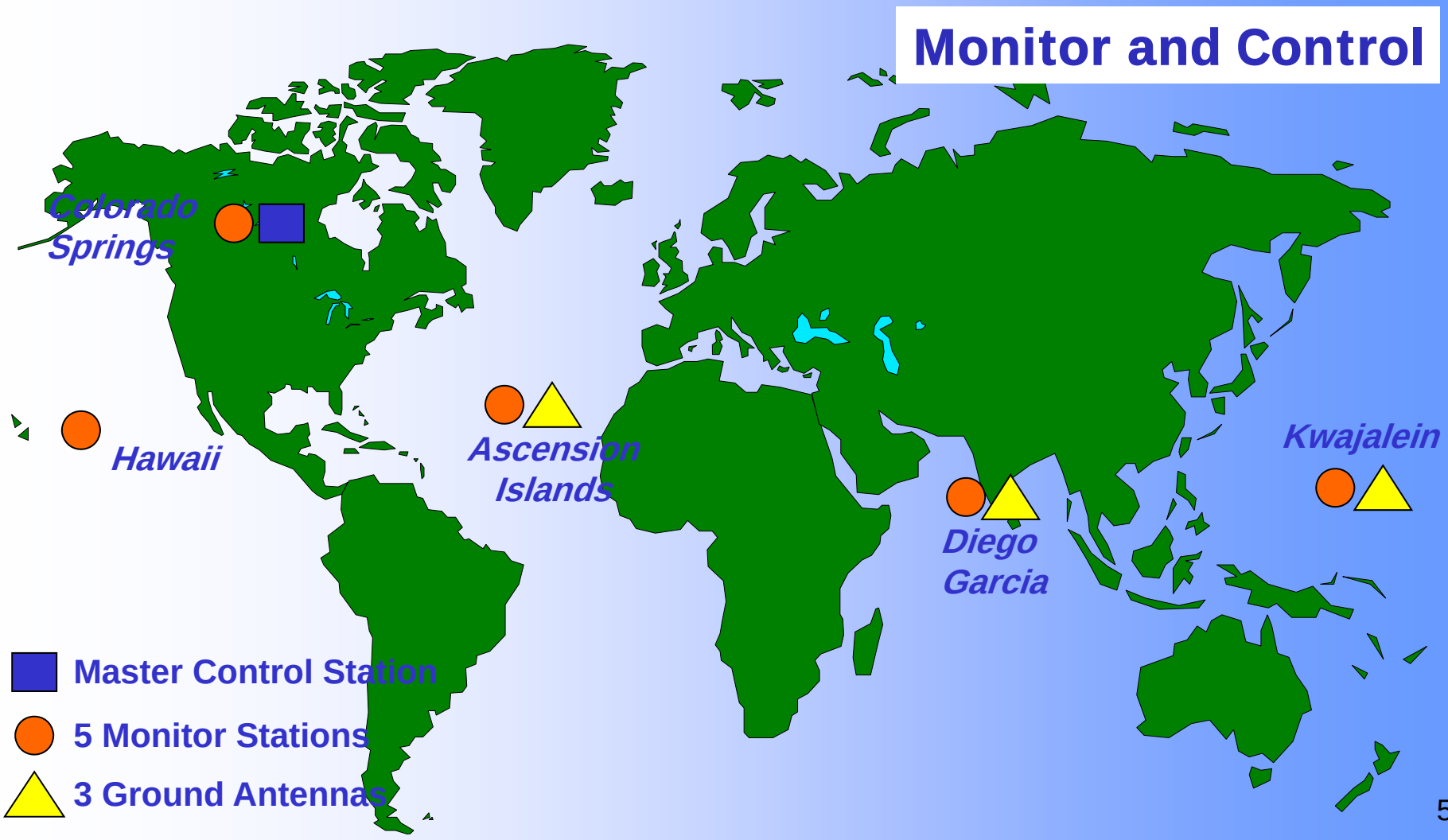
4 satellites are required to solve for x, y, z

User Segment (Continued…)

- Dual Use System (civil & military) started 1985
- Hundreds of receivers on the market
- 3 billion in sales, double in 2 years
- 95% of current users are civilian

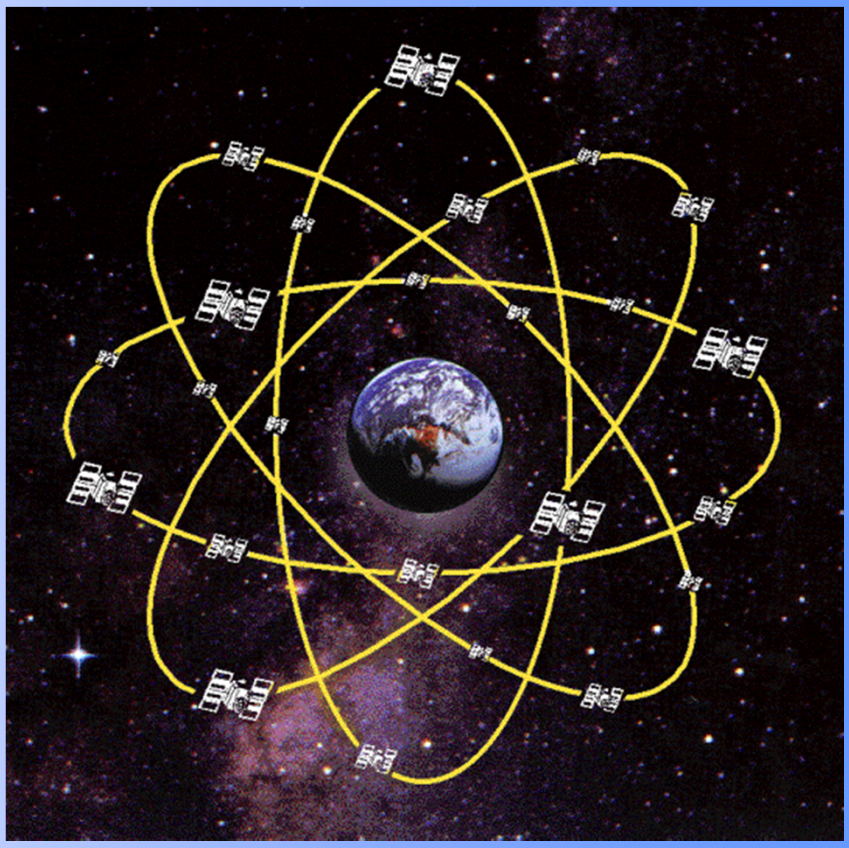


Control Segment



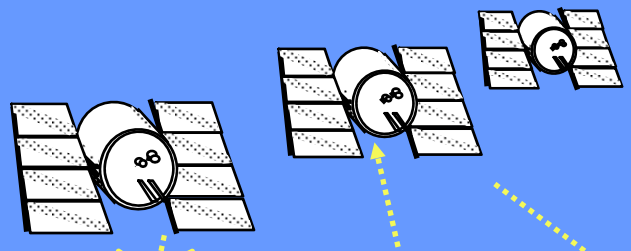
Space Segment

- 24+ satellites
  - 6 planes
  - Each plane has 4-5 satellites
  - 20,200 Km altitude
  - 1 revolution each 12 Hrs
  - Speed 11,200 Km/H



How the System Works

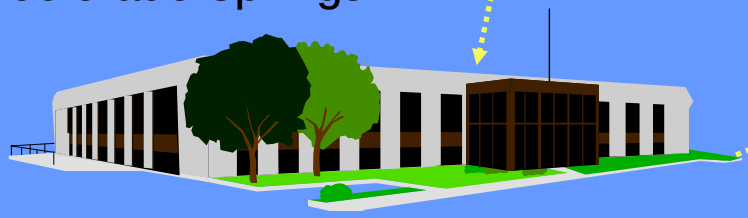
Space Segment
24+ Satellites

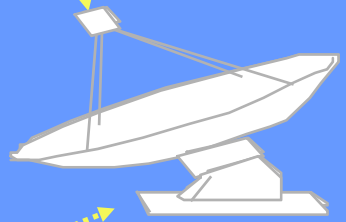


The Current locational position is Transmitted to Users

Monitor Stations

- Diego Garcia
- Ascension Island
- Kwajalein
- Hawaii
- Colorado Springs



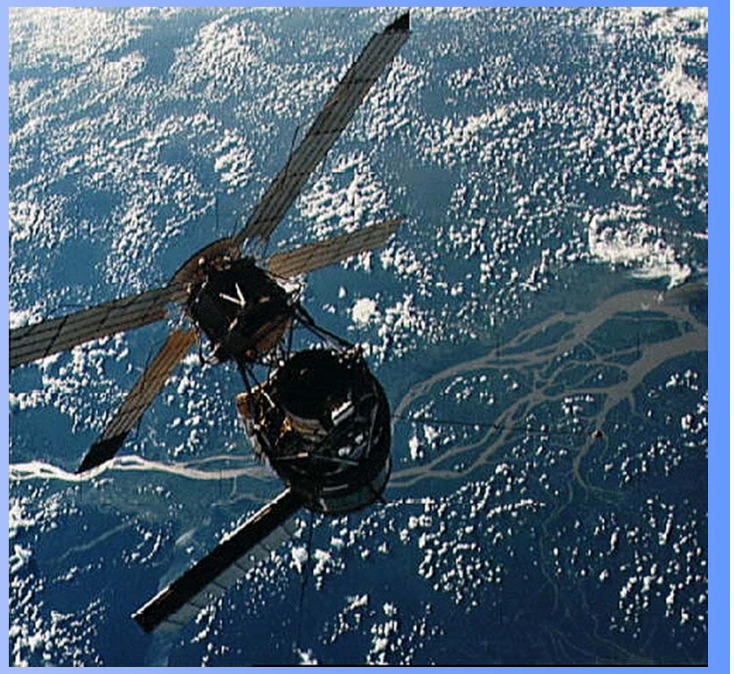


GPS Control
Colorado Springs

End User

GPS Satellites

- First GPS satellite launched in 1978
- Full constellation achieved in 1994
- Satellites built to last about 10 years
- Approximately 2,000 pounds
- Transmitter power is only 50 watts or less

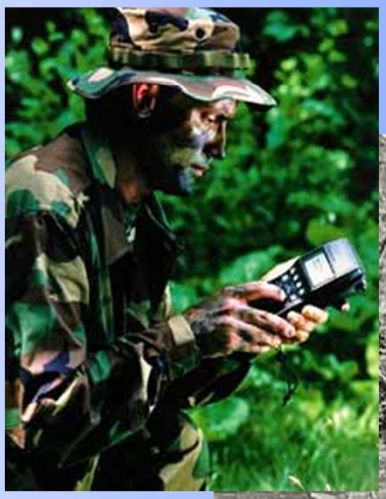


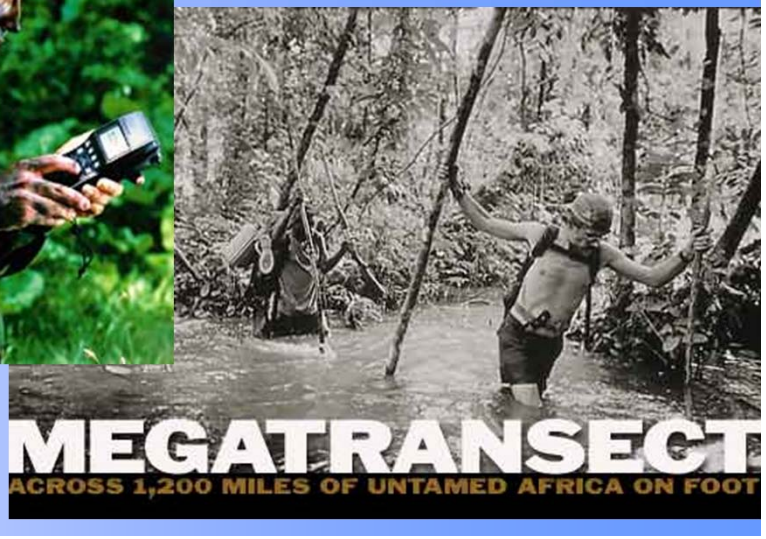
Satellites Clocks

- Each satellite carries around four clocks
- Cost around $500,000 each
- Accuracy: plus/minus a second over more than 30,000 years!!

Common Uses for GPS

- Land, Sea and Air Navigation and Tracking
- Surveying / Mapping
- Recreational Uses
- Military Applications



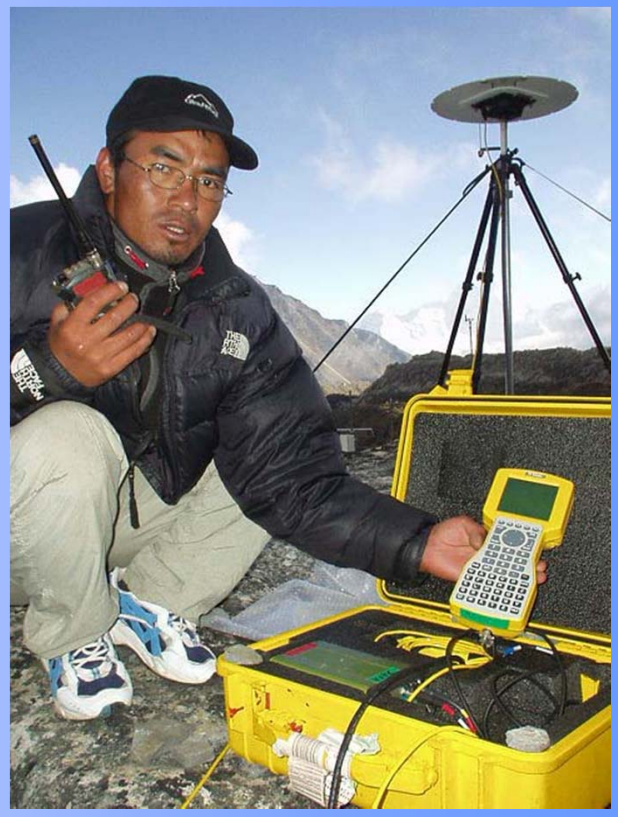


Precise Positioning System (PPS)

- Authorized users ONLY
- U. S. and Allied military
- Requires cryptographic equipment, specially equipped receivers

Standard Positioning Service (SPS)

- Available to all users
- Accuracy degraded by Selective Availability
  - Intentional degradation of GPS accuracy by DoD
  - Horizontal Accuracy: 100 m
  - Vertical Accuracy: 160 m
  - Accounted for most error in standard GPS



- SPS now has roughly same accuracy as PPS, through 2 Methods to reduce Error:

  Differential GPS: down to +/- 6 m

  Wide Area Augmentation System (WAAS): down to +/- 3 m

Thanks for Listening

Any Questions?