

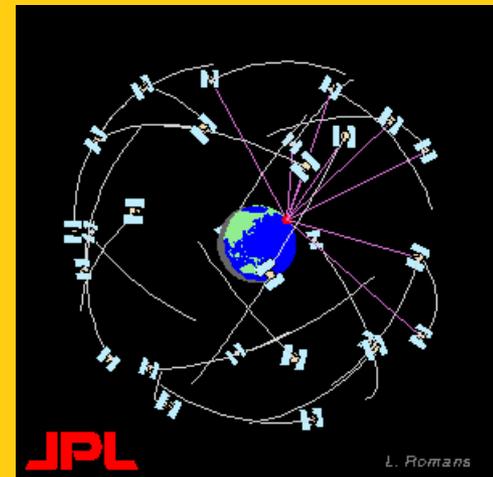
# GPS Base & Rover Training 101

- August 12, 2010
- Brian Visser – Support Specialist
- Butler Machinery
  - 12 Stores in ND & SD

Phone (701) 298-2149

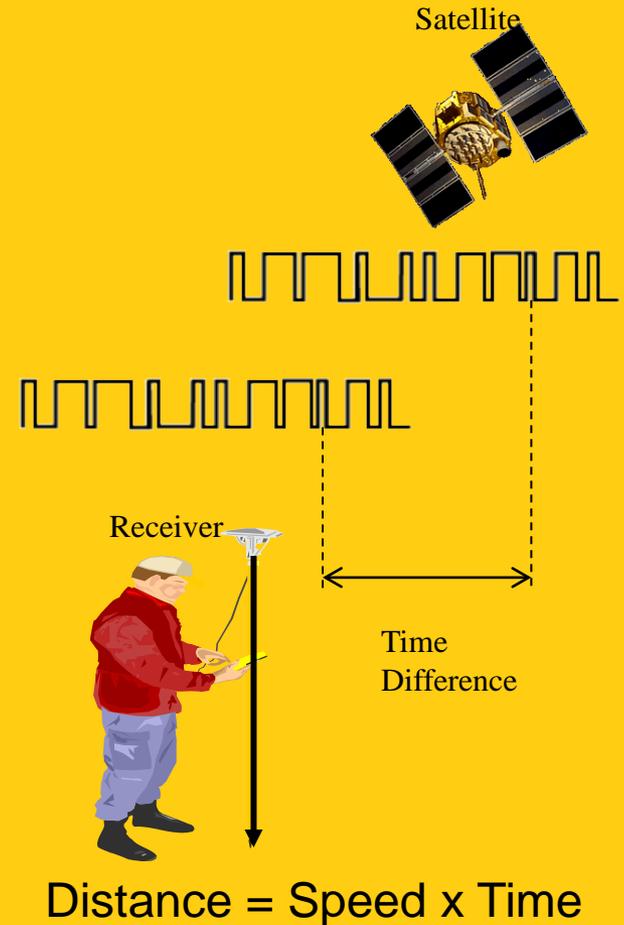
# What is GPS?

- Global Positioning System is government funded system originally created by the Department of Defense in 1978
- System of 38 satellites orbiting the earth from space sending signals to earth
- Other governments are also putting up positioning systems:
  - Russian / GLONASS (16 satellites)
  - European / Galileo systems (2 test satellites)
  - China / Compass (5 satellites)



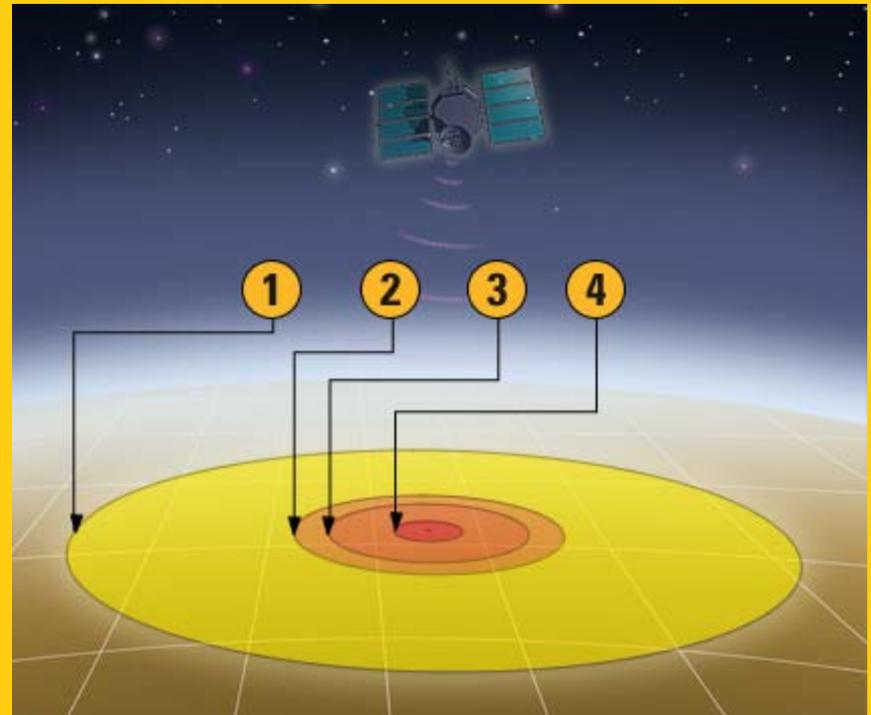
# How does GPS work?

- Satellites send signals (time stamps) down to receivers on Earth
- 3 satellites required for horizontal positioning, 4 for vertical
- AccuGrade requires 5, the 5<sup>th</sup> satellite is used for a check

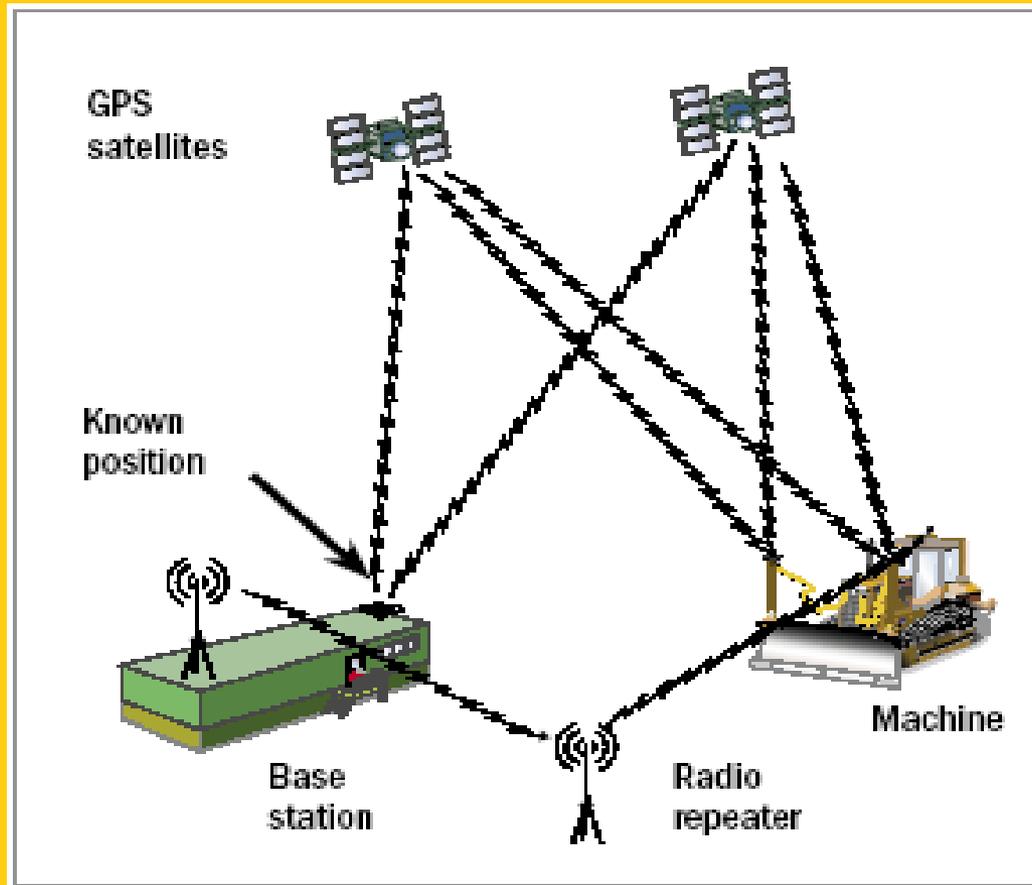


# GPS Correction

- 1. Autonomous: 30-45 ft
- 2. DGPS: 1.5-15 ft
- 3. Float: <1 ft
- 4. Fixed: 0.01-0.1 ft



# Real Time Kinematic GPS

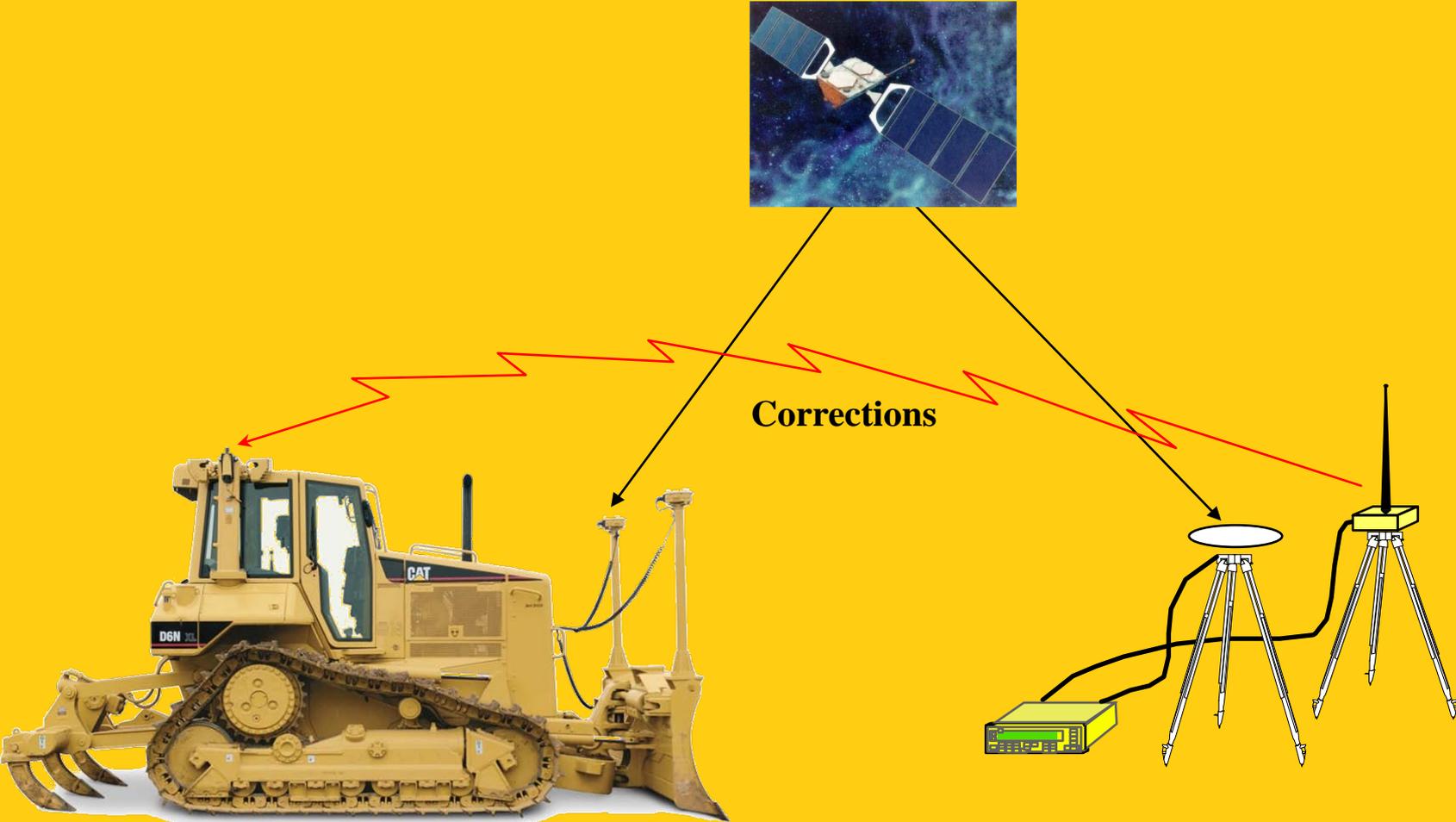


# What is a base station and what does it do?

- Base Stations receive signals from the satellites and create a correction factor
- This correction is sent via radio to rovers and machines
- A base station is required to achieve .1' accuracy, without a base station accuracy is within 30'
- When a base station signal is used this is call a “RTK Fixed” GPS position, if no base is used position might be “DGPS” “Float”, or “Autonomous”



# Base Station sends correction signal to GPS rovers



# What is Rover?

- A Rover is a survey tool used to receive signals from satellites and a base station to calculate grade



# GPS used in many applications

- Airplanes
- Communications
- Agriculture
- Recreation
- Construction

GPS is becoming more and more commonplace as technology advances

# GPS and Construction Equipment



Base/Rover 101



# Engineers Create Files

- Engineers Create 3D design files that are used to create paper plans
- 3D plans can also be used for stakeouts and machine control
- Surveyors set control points in the field that are used to correlate lat long to local coordinate system

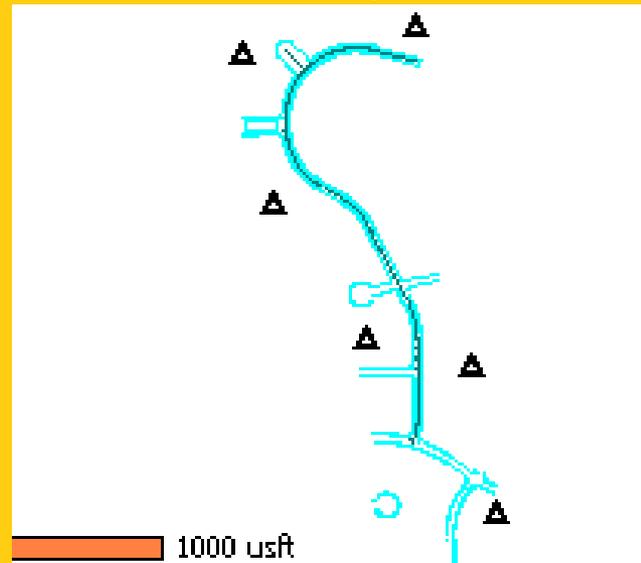


# Site Calibrations

- A site calibration makes it possible to use GPS equipment along with engineers plans
- Control points need to be set by surveyors, and coordinates given to grade checker
- Control points are typically set using a laser level loop or ATS robot, this way more accurate elevations are achieved
- Calibrations link coordinates from design to coordinates in the field- converts lat, long to northing, easting

# Site Calibrations

- Minimum of 3 control points are required, at least 5 are recommended
- Control points should encompass the job site and not be bunched together-This is important for high accuracy



# Site Calibrations

- Calibration is performed at the beginning of the job, unless base station is moved
- The rover is used to occupy each control point for 30 seconds, after that is completed, a calibration file is created
- This file is also used for machine control

# Customer Comments

- Fewer passes
- Less Waste - (avoid moving unneeded material)
- Information is right in front of them
- Less time putting in cut stakes
- Efficiencies for multiple machines

# Questions?