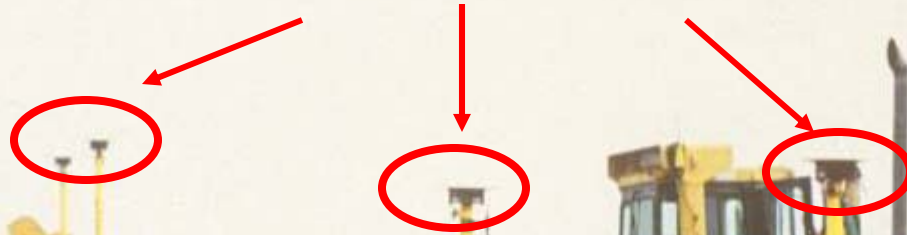


GPS



in

Construction 2008

Greg Mayo, P.E.

GA DOT Director of Construction

Photo courtesy of McAninch Corporation

Users of GPS technology need different accuracies

- Recreational (10 – 30 meters)
- Mapping (1 – 3 meters)
- Surveying (± 0.2 centimeters)

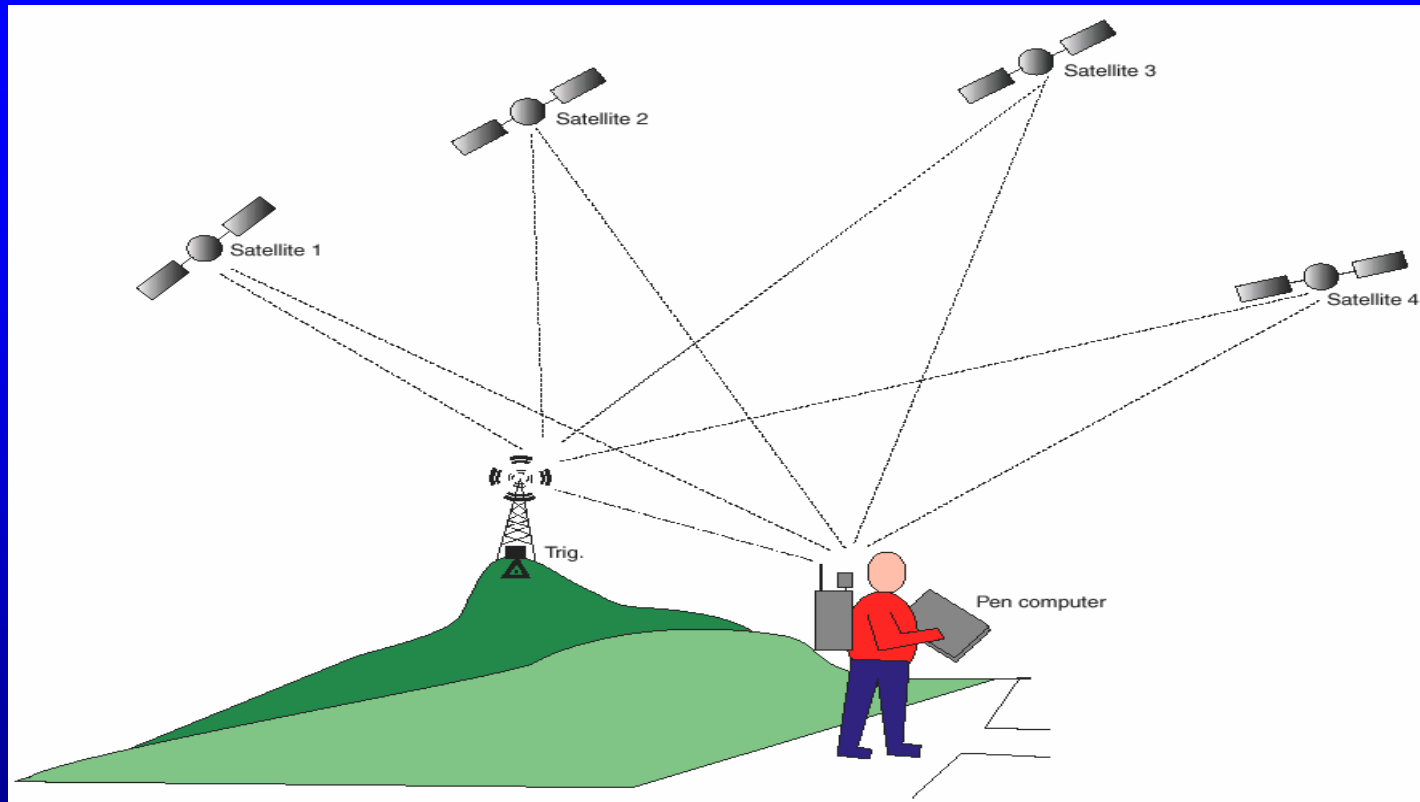
In the Transportation Construction Industry,
we need “survey” level accuracy

Lets focus on

Survey GPS

- How does it work?
- How is it used in the Transportation Construction Industry?
- What are the benefits?
- How much does it cost?
- How much training is involved?

How Survey GPS Works



What is happening in DOT Construction Today?

- According to the AASHTO subcommittee's Technology Implementation Group's (TIG) 2002 survey:
 - Only 9 of 36 States reported contractors were using GPS controlled machinery
- 6 of 17 reported GPS use in Construction in the SOC "Technologies Used in Construction" 2004 survey

Technology Implementation Group (TIG)

- **Group first met: July 2007 in St. Paul, MN**
- **Formed to promote GPS technology use in transportation construction projects**
- **Marketing Plan has been adopted**
 - **Workshops are scheduled to share success stories**
 - **Attend trade conventions to promote technology**
 - **Provide a web site to share information**

Area II Highway Engineering Exchange Program Conference

- Held in Atlanta Ga June 9 – 11, 2008
- Hosted by the GA DOT
- 11 state DOTs in attendance with 5 state construction offices represented
- Construction track held with 6 construction specific panels/topics
- Field trip to active GPS grading project

Partnered with FHWA

- FHWA Resource center paid for a New York Contractor (travel expenses) to speak at the conference
- FHWA Resource Center provided
 - assistance with conference planning
 - speaker coordination
 - panel participation
 - teleconference coordination prior to conference

Reviews from State representatives about including construction track was very positive.

Construction Track Included:

- **CAD Models for Automated Machine Guidance (AMG)**
- **Contractor Panel on Contractor use of AMG**
 - What DOTs are doing that helps promote the Technology
 - What could be done better
- **LIDAR in Construction**
- **Rovers in Construction**
 - Contractor furnished vs DOT furnished
 - pros and cons
- **Field Trip**

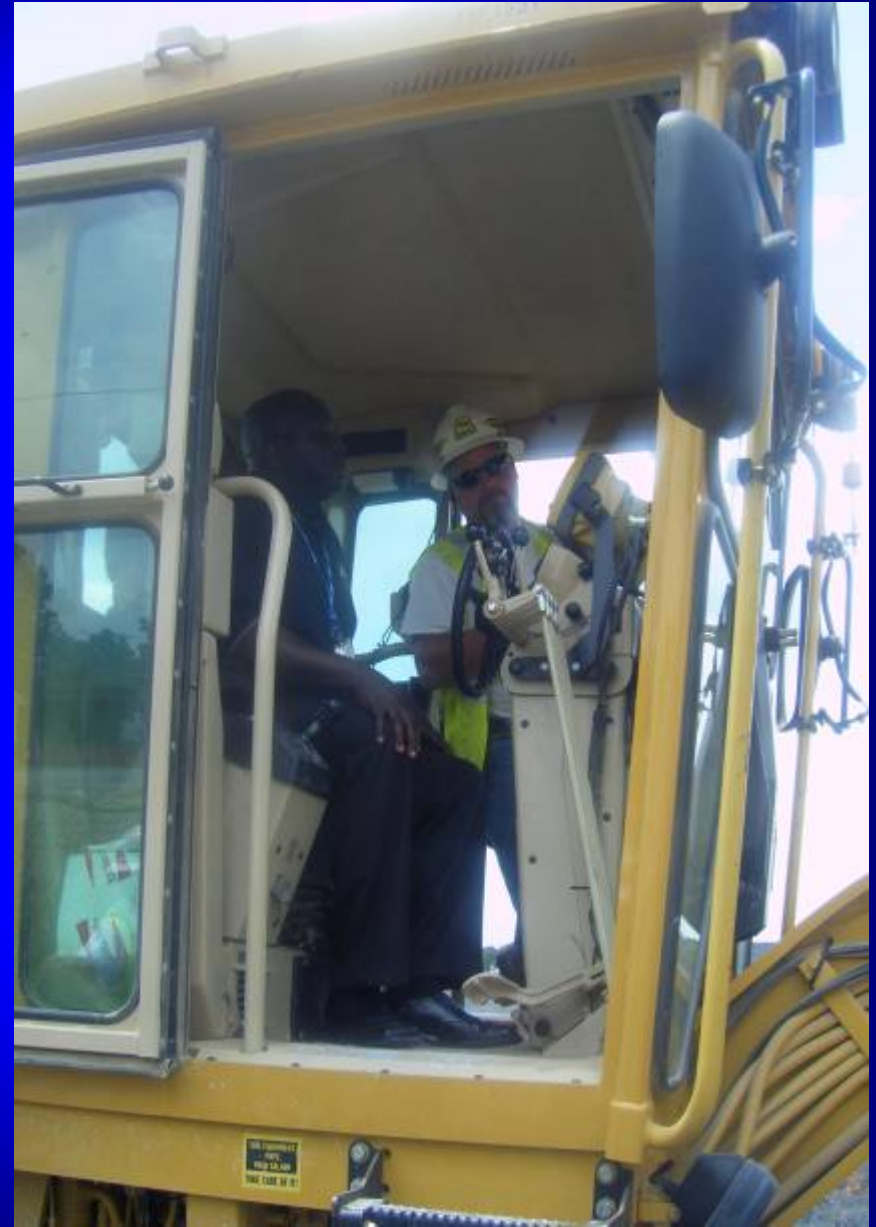
HEEP II Field Trip

- GDOT Inspector Field Book demonstration and discussion
- Grader Operator (In Cab demonstration)
- Contractor discussing his equipment and business model
- Vendor describing equipment operation (Rover demonstration)

GDOT Inspector Field Book demonstration and discussion



Grader
Operator
(In Cab
demonstration)



What the operator is seeing in the cab



Contractor discussing his equipment and business model



Vendor describing equipment operation (Rover demonstration)



Quality Assurance with Stakes



Quality Assurance without Stakes



Contractor's are using GPS

- Many contractors are using GPS data for placing survey stakes (unless a State DOT specification prevents this).
- Many contractors are using GPS data to guide their grading machines

WHY ?

Advantages to the Contractor

- **Places the design in front of the operator.**
- **Unlimited machines possible on one base**
- **Line of sight not required**
- **Dramatically increases production**
- **Dramatically reduces labor costs-
layout, stakes**
- **Not effected by fog, dust etc.**
- **Operators love to use it!**



Contractor file conversion



- Contractor receives 2 dimensional plans from DOT
- Contractor converts 2-D, DOT paper plans into electronic files that his equipment can process

GPS Technology

GPS technology	Compared with	Estimated savings
Grade Checking	Manual method	Up to 66%
Reduction or Elimination of Stakes	Using stakes	Up to 85%
Improved material yields/select fills/undercutting	Overruns using manual methods	3% to 6% in volume
Un-interrupted earth moving production under any weather conditions (24/7)	Daytime / fine weather operation only/night work	30% to 50%
RTK, robotics stakeout	Traditional survey stakeout	More than 100% in speed and 66% in staffing

- **Other savings from:**
 - Improved utilization of equipment/30%
 - Lower skill level required realize over 100%
 - Erosion control as you go
 - Accurate location of testing for QAQC

How Project Costs are saved

- Greater accuracy (less rework)
- Contractor can eliminate (at least minimize) survey stakes
- State Inspection can be simplified and reduced
- Finish grading can be done with a production grader instead of a trimmer

The use of GPS Technology in Construction may also provide:

- **Training challenges for DOT Staff**
- **GPS survey equipment challenges**
 - **STD can choose to purchase one “rover” (to be used with total station) approximately \$17,000**
 - **Contractor can furnish but State needs to control**
- **Greater coordination between various offices within the STD**

So why isn't GPS Technology being used in more State transportation construction projects?

- **State DOTs are reluctant to give electronic survey data with contract documents**
 - **Fear of misuse or misapplication**
 - **Procedure for QC does not exist for stakeless grading**
 - **Current plans are 2 dimensional and leave a paper trail**

Remember this slide?

Contractor Converts file



- **Converting paper files to electronic files is “Reverse Engineering”**
- **This is a nationwide challenge that is being resolved as we speak**

Help Needed With GPS Machine Control

- Provide 3-D electronic data along with 2-D paper plans during bid process and at contract award
- Revise standard specifications to allow stakeless Automated Machine Guidance (AMG) grading
- Quality control guidelines for stakeless construction need to be implemented by DOT's
- DOT's need to add GPS Machine control as an option in their Bid packages
- Provide training of the entire Team involved with the project (certification by Level of Training)
- Have Contractor return paper and electronic "asbuilt" files when Project is complete

How can the AASHTO SOC assist?

- Continue to facilitate all State Transportation Department's (STD)'s use of GPS Technology from initial survey through plans development to construction and back to the STDs
- Continue to explore new and innovative uses of this technology that will benefit the transportation construction industry.

Questions?