Agricultural Autoguidance
- Fact not Fiction

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Uses:

- All general farming practices
  - Cultivation
  - Strip Tillage
  - Planting
  - Fertilizer and Herbicide Application
Spraying:

- Don’t have to rely on foam markers
- Reduce Skips while keeping overlap to a minimum
- Spray at night, 24/7, (when less windy) even though you can’t see end of boom
Planting:

- Disk markers not needed
  - But, be careful, you may still want to keep markers on the planter in case system not working.
Guidance Systems:

- Automatically (or through visual cues) steers a tractor through a series of GPS points or down an A-B Line.
- **Reduces driver fatigue.**
- **Allows for straighter rows.**
- **Reduces overlap and skips.**
- Can skip a wet spot in field during planting/cultivating, work other side of field, then go back and plant or cultivate area that was skipped.
Different Guidance Systems

Choices:

- Manual Guidance:
  - Light Bars, PDA's

- Automatic Steering Systems (performs the steering function for you):
  - WAAS
  - OmniSTAR®
  - Base station
  - RTK
Typical Accuracies:

- **WAAS** – 6 to 12 inches – 5 ft. deviations year-to-year.
- **OmniSTAR** – 2 to 5 inches
  - **XP** - +/- 8 inch year-to-year accuracy
  - **HP** - +/- 4 inch year-to-year accuracy
- **RTK** – 1 inch or less and year-to-year
How They Work:

- **WAAS:**

- **OmniSTAR®:**
  - Similar to WAAS, but with carrier phase (L2) information.

- **RTK:**
  - L1 and L2 with Base Station.
Sensors Needed:
First Type of System:

- All-in-one
  - Less Wires
  - Easier Installation
  - Moveable
  - Available in:
    - WAAS
    - OmniSTAR®
    - RTK
  - Low Cost: $3000 to $6000
Second Type of System:

- Multiple Unit

  - Does guidance, mapping, and other functions (Typically $10,000 or more when combined):
    - AgGPS Fieldmanager:
    - Insight:

    Usually needs a Trimble Autopilot (this really does the guidance for you).

    Usually mounted in Tractor and not moveable.
Multiple Systems Can do More:

- Monitor Allows:
  - Yield Monitoring
  - Sprayer Control
  - General Mapping
  - Controlling other units (Raven, etc.)
  - Auto-steering
  - Spray Height Control
  - Etc.

- Software Modules
Full Auto-Steer System:

- GPS Antennae
- Computer Decision Computer and Operator Interface
- Steering Controller and Hydraulic Valve Block
Other Systems:
Patterns:

- A-B Line
- A+ (based on degrees direction)
- Adaptive Curve
- Headlands
- Pivot
- Etc.
WAAS Update – New Satellites:

- WAAS Satellites 122 and 134 taken out of service July 31st!
- These were the main Satellites for WAAS reception.
- Upgraded with 135 and 138 (newer, higher transmitting power, etc.).
- Older GPS units may need software updating!!!
Light Bar / WAAS Guidance System
- Light Bar Steering Only:

Set overlap correctly to manufacturers recommendations!
## Multiple Days – WAAS System

### Original A-B Line:

<table>
<thead>
<tr>
<th>Day</th>
<th>Offset from Original A-B Line (in.)</th>
<th>Maximum Diff. each day (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 23</td>
<td>4.2</td>
<td>14.5</td>
</tr>
<tr>
<td>May 25</td>
<td>0.4</td>
<td>21.4</td>
</tr>
<tr>
<td>June 15</td>
<td>-0.3</td>
<td>17.5</td>
</tr>
</tbody>
</table>
Baseline - Single Frequency Portable Base Station:

- Outback Guidance
  - L1 Only

Advantages/Disadvantages:
- Accuracy: 1 inch (from manufacturer)
- Transmitter rated for 2.5 miles
Steering Wheels Actuator:

- Major Improvements with the Trimble EZ-Guide System:
  - Faster line acquisition
  - EZ-Guide 500 +/− 2 inch accuracy
  - Older EZ-Guide Plus +/− 6 inch accuracy
Future Noise:

- We are in a minimum of energy disruption caused by sun spots, etc.
- This will continue to get worse to a maximum at 2012.
- Some worry for WAAS
Cost:

Typical Cost of Guidance Systems

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Bar</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>WAAS</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Radio Becon</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>RTK</td>
<td>$25,000.00</td>
</tr>
</tbody>
</table>
Payback Period:

- Estimate 30” off without guidance, better than 15” with WAAS alone.
- Typically, 2.5 yrs needed to pay off lower-end system (depending upon type of system purchased and number of uses per year).
New Stuff:

- Auto-turn-in / John Deere – ITEC Pro
- Implement Steering
  - Trimble®
    - GPS on Implement
  - AutoFarm AFTracker
Advantages / Disadvantages:

**Advantages:**
- Most electronics works pretty good anymore
- Sealed cases, etc.
- Unit should not wear out before life expectancies
- No Foam Markers / Disk Needed (some say leave on just in case!)

**Disadvantage:**
- Loss of Signal
  - Tree Lines, Hills, etc.
  - Can be turned off in War time, etc.
- Satellite acquisition time – can be 5 to 15 minute or longer
  - Start equipment up when you leave the barn!
  - Leave running in the field?
Questions?