

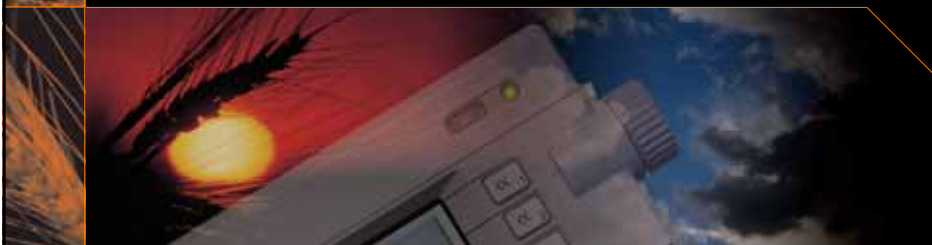
The Future of Agricultural Equipment, or...



Sam Freesmeyer
AGCO Corporation
January 19, 2005



All I Really Need to Know About Electronic Communications, I Learned in Kindergarten



Sam Freesmeyer
AGCO Corporation
January 19, 2005



What's Hot?

- Agricultural technologies are advancing most strongly in the area of :
 - Low cost electronic and computing elements
 - Sensors, including Global Positioning (GPS)
 - Data Communications
- As much as 60% of new features derive from these technologies
- Demand is being driven by other markets:
 - Automotive
 - Consumer electronics (TV, Guidance systems, Cell phones)
 - Business productivity (PDA, All-in-one phones, Laptops)

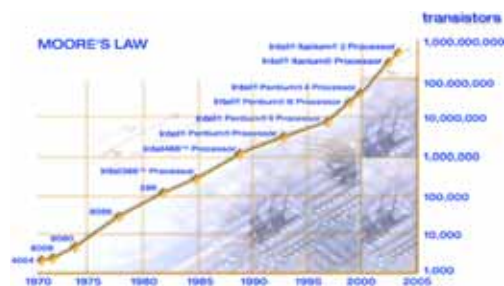
Why???



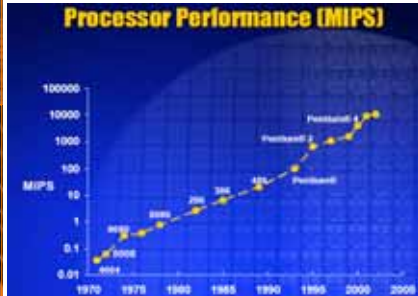
Why Electronics Drives Us?



Cramming More Components onto Integrated Circuits, by Gordon Moore. Electronics Volume 38, No 8, April 19, 1965.



Moore's Law in Action



But Why Does This Drive Us?

- Government intervention
 - “US Spaced Based Positioning, Navigation, and Timing Policy”, December 15, 2004
 - Development, acquisition, operation, sustainment, and modernization of:
 - GPS and other space based navigation and timing signals
 - US and Allied access to such systems
 - Control of foreign access to such systems
 - Affects WAAS, LAAS, Beacon, and others
 - To protect “...national, homeland, and economic security...”
- Market forces
 - Individual ingenuity (Innovators)
 - Corporate competitive advantage
- Global communications
 - Connecting people with new ideas



“ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN”

All I really need to know about how to live and what to do and how to be I learned in kindergarten. Wisdom was not at the top of the graduate school mountain, but there in the sand pile at school.

These are the things I learned:

- Share everything.
- Play fair.
- Don't hit people.
- Put things back where you found them.
- Clean up your own mess.
- Don't take things that aren't yours.
- Say you're sorry when you hurt somebody.
- Wash your hands before you eat.
- Flush.

Source: "ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN" by Robert Fulghum. See his web site at <http://www.robertfulghum.com/>]



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*In other words:
Communicate,
Cooperate, and
cleanup*

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Application: Communication Modes

- **Broadcasting**
 - Conferences (Like this one!)
 - Television and Radio
 - GPS and Correction signals
- **Point to Point**
 - Telephones
 - Mobile phones
 - Monolithic electronic controller architectures
- **Networking**
 - The Internet
 - Discussion groups (Like this one!)
 - CAN based electronic architectures



Networking Communication

- The Internet may be the single largest disruptive innovation in history.
 - 1969: 4 hosts
 - 1979: 188
 - 1989: 159,000
 - 1999: 56,218,000
 - 2004: 285,139,807
- **Email**
 - First application provided in 1971
 - By 1973, email was 75% of traffic
- **World Wide Web**
 - Introduced in 1991
 - By 1995, Web browsing was the single largest application on the Internet

Hobbes' Internet Timeline, Robert H. Zakon. See <http://www.zakon.org/robert/internet/timeline/> for details



www.talk.newagtalk.com

The screenshot shows the PrecisionTalk forum interface. The browser address bar displays the URL <http://talk.newagtalk.com/forum/precisiontalk/index.html>. The forum title is "PrecisionTalk" with a sub-header "AgTalk Home". Navigation links include "Post Message", "Find", "Reply", "Create", "Print", "Chat", "Admin", "Home", and "Login". The main content area lists several discussion threads:

- Seedstar - Multiple Units on One Display --- both* (05/10/2005, 08:20:08)
 - Re: Seedstar - Multiple Units on One Display --- both.L* (05/10/2005, 08:42:41)
 - Re: Seedstar - Multiple Units on One Display --- both* (05/10/2005, 07:10:44)
- John Deere Parallel Tracking --- EFWave (05/10/2005, 05:13:22)
 - Re: John Deere Parallel Tracking --- Dietrich-Eastern* (05/10/2005, 05:07:04)
- Parallel Tracking (as test) --- EFWave (05/10/2005, 05:13:22)
- Fieldstar Info to AgLeader SMS --- Linn's Farm (05/10/2005, 05:20:39)
- Re: Fieldstar Info to AgLeader SMS --- AgLeader Tech Support* (05/10/2005, 12:28:01) **Hot**
- Auto steer with tramlines????? --- DG* (05/10/2005, 18:34:32)
 - Re: Auto steer with tramlines????? --- North Dakota Farm (05/10/2005, 08:00:30) **Hot**
- Price for anOutback e-drive system --- Max the Farmer (05/10/2005, 12:30:34)
 - Re: Price for anOutback e-drive system --- Badger* (05/10/2005, 07:31:38)
 - Re: Price for anOutback e-drive system --- mls-jordan (05/10/2005, 14:22:22)
 - e-drive on non-listed tractors --- John Burns* (05/10/2005, 08:49:42)
 - Re: e-drive on non-listed tractors --- mls-jordan (05/10/2005, 07:35:22)
 - Re: Price for anOutback e-drive system --- DWI* (05/10/2005, 11:34:21) **Hot**
 - Try the Max --- John Burns* (05/10/2005, 05:21:39) **Hot**
- Expanding on the Auto Steer from below --- Ray Leeks* (05/10/2005, 07:00:02)
 - As an example field --- DGN, AL* (05/10/2005, 23:14:39) **Hot**

The footer includes the "gta" logo and the text "Global Technologies by MARS".

www.agriculture.com

The screenshot shows the Precision Agriculture forum interface. The browser address bar displays the URL <http://www.agriculture.com/precision-agriculture/precision-agriculture>. The forum title is "Precision Agriculture" with a sub-header "Welcome to the forum for site-specific technologies, ideas and practices." Navigation links include "Home", "Top Talk", "Precision Agriculture", and "Messages". A search bar is present with "Message Boards Search" and "Advanced Search" options. A table of discussions is shown:

New	Messages (2008 Total)	Replies	Posted by	Date	Time
•	2.5 acres and something	11	msjordan	10/16/04	5:13 PM
•	Autobank for other tractors? [1 2]	17	agleader@agleader.com	10/24/04	5:24 PM
•	WEED STEER TECH? [1 2]	10	efwave	1/10/05	9:23 PM
•	Mapna program	0	msjordan	5/16/05	7:47 PM

The footer includes the "gta" logo and the text "Global Technologies by MARS".

In Agriculture

- CAN communication is the networking strategy for mobile machines
 - Initially developed in the Automotive industry
 - Most Self-propelled machines now use a CAN architecture, usually proprietary
 - Built in encapsulated layers
- Major developments coming in standard CAN protocols
 - SAE J1939: a US Standard being globally deployed
 - ISOBUS: an International standard being globally developed
- All New Sensors will communicate in a Network architecture, facilitating
 - much faster “time to market”
 - Lower development overhead
 - More powerful whole solutions, incorporating standard “tractor services”
 - Upgradeability to new generations of technology



ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN

Networking Protocols do exactly this:

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- ~~Flush.~~

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Well, most of this !



ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN (2)

- Warm cookies and cold milk are good for you.
- Live a balanced life - learn some and think some and draw and paint and sing and dance and play and work every day some.
- Take a nap every afternoon.
- When you go out in the world, watch out for traffic, hold hands and stick together.
- Be aware of wonder. Remember the little seed in the Styrofoam cup: the roots go down and the plant goes up and nobody really knows how or why, but we are all like that.
- Goldfish and hamsters and white mice and even the little seed in the Styrofoam cup - they all die. So do we.
- And then remember the Dick-and-Jane books and the first word you learned - the biggest word of all - LOOK.



ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN (2)

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Application

- The technology of today has created unprecedented capability to “Acquire Data”
 - Remember that email and Cell Phones were supposed to **facilitate** communication?
 - Remember that portable computers were supposed to make us **more** productive and **reduce** our work load?
 - Remember the “Paperless Society”?
- Data is not Knowledge. Data is Data.



In Agriculture

- New applications are being designed with highly graphical content
- Data aggregation and warehousing concepts are being explored
- New sensors think in terms of geo-referenced data display



In the Future

- Customers are more exposed to information, and will dictate the direction of new technologies
- Manufacturers will not try to “Own” technology, but will harness it
- Alliances of technology will be necessary
- We will all have to play together to some extent



ALL I REALLY NEED TO KNOW I LEARNED IN KINDERGARTEN (3)

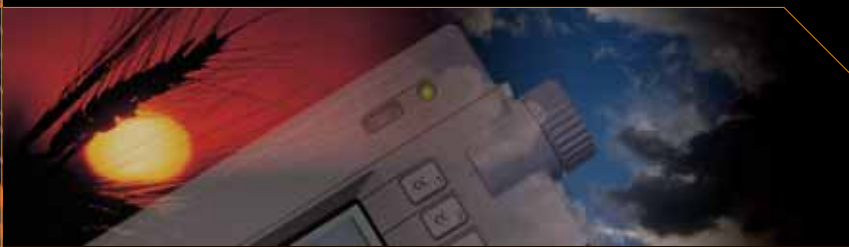
Everything you need to know is in there somewhere. The Golden Rule and love and basic sanitation. Ecology and politics and equality and sane living.

Take any one of those items and extrapolate it into sophisticated adult terms and apply it to your family life or your work or government or your world and it holds true and clear and firm. Think what a better world it would be if we all - the whole world - had cookies and milk at about 3 o'clock in the afternoon and then lay down with our blankies for a nap. Or if all governments had as a basic policy to always put things back where they found them and to clean up their own mess.

And it is still true, no matter how old you are, when you go out in the world, it is best to hold hands and stick together.



Questions?



Thank You!!

