



Education & Public Outreach

Lars Perkins

Vice Chairman

Education and Public Outreach Committee

NASA Advisory Council

5 May 2011

Topics

- What We've Done
- Education
- Public Outreach
- Moving Forward



Richard Garriott



Dwayne McCay



Michael Bostick



Debbie Myers



Leslie Fenwick



Erika Vick



Peter Shankman



Iannis Miaoulis

WHO ARE WE?



Scott Parazynski



Doug King



Lars Perkins



What Have We Done?

- **FEB:** SBIR Visit
- **APR:** Participated on ISS panel at CSE meeting, Colorado
 - What will replace the shuttle “story”?
- **MAY:** EPO Meeting at FIRST Championship, St. Louis
- **MAY:** Presentation to ECC
- (Aeronautics, Tech & Innovation Cmte)

MAY EPO Meeting ...

- **FIRST**

- **Dave Lavery**, Program Executive for Solar System Exploration, OSS, HQ
- **Lucien Junken**, Engineering Design Lead, Rover, KSC
- **Katie Wallace**, Elementary and Secondary Education Programs Officer, Stennis
- **Karen Kelly**, MSFC
- **Rob Shate**, GSFC

FIRST

- “Inspiration”, not “Education”
- 20 year anniversary
- Dean Kamen, Woody Benson
- ~30 mm budget, \$15 mm from donations
- FRC, FTC, FLL, FLL, Jr. FLL
- Ages 6-18

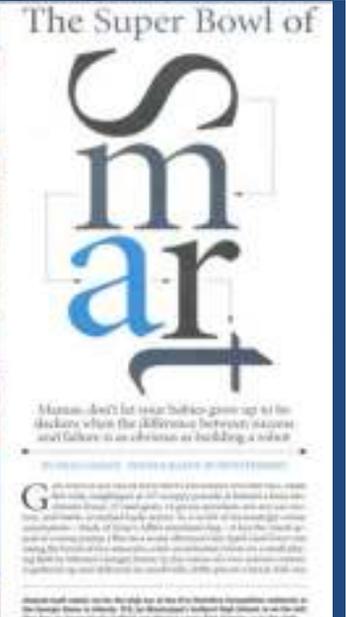


FIRST Impact

- 1810 teams
- 44 Regional Competition
- Touch 250,000 kids
 - 48,000 in FIRST Robotics
- 73,000 Mentors
- > \$15mm in scholarships

“It’s the only school sport you can play where everyone can turn pro”

National Media Coverage



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EDITORIAL COMMENTARY

THOMAS G. DONLAN

Robots to the Rescue

An inventor takes on nothing less than the transformation of American youth

"We have seen the future, and it works." At least, we hope it's the real future, because what we saw a week ago in the Georgia Dome in Atlanta was an inspiring combination of intelligent problem-solving and self-disciplined teamwork: It was the championship round of the 14th annual "FIRST" Robotics Competition.

About 10,000 high school and middle-school engineers, mostly mentored and coached by adult engineering professionals, built robots and brought them to the stadium to play a unique game.

FIRST is a foundation whose name signifies "For Inspiration and Recognition of Science and Technology." Doug Kamen, engineer and inventor, created it as a tool for peaceful revolution. He is credited by the American hero-worship of professional athletes figures and entertainment personalities.

"We have kids spending years and years grinding letters and letters at basketball, especially the basketball that require specific and elaborate arrangements, might to have something else to sponsor—something that will improve the lives of youth and make America a richer and better country.

Trying to attract sponsors, Kamen tells us, is a constant struggle. "What you are good at is creating demand. Why don't you agree that you will make money and engineering or something as you have made sports and entertainment? You need to give more options."

Making New Choices

Since there were no options for sponsors that made interesting look cool, Kamen set about inventing one. There's his work in the 2002 version.

On a particular day last January, each young team received a kit with motors, hydraulic actuators, radio controllers and other materials—and the rules of the year's game. The FIRST competition is not a demolition derby—robots must traverse around obstacles and score points by carrying objects and placing them in goals. And they work in teams—each member has a role to play. "It's every robot for itself." Every year the rules and tasks are different—changing the game forces experienced teams to create new robots with new special abilities.

In the 2003 game, the robots would have to pick up open triangular objects with three triangular sides and fit them into a goal. The goal would be the size of a basketball hoop, but there was extra credit for putting extra on one pre-specified goal in the middle of the playing area.

Nearly every team created an extralarge arm or some kind of moving platform. Some built the same to articulate like a human arm, others used telescoping tubes. Some used gears, some used flywheels, some used wire and some used electric winches. The automotive design included tanks, tanks as well as four-wheel, six-wheel and eight-wheel designs, some geared up for speed, others geared down for power. A few teams built defensive operations, heavyweight, caterpillar-wheeled robots designed entirely to block or tip an opposing alliance's robots while helping its partners to score.

The teams had six weeks to design, build, test and practice operating their robots. They had to follow rules limiting the size, weight and cost of their robots. The deadline day, all robots had to be crated up and shipped to the site of one of FIRST's 30 regional competitions.

Engineering always requires solving complex problems on time and within budget, and usually there isn't enough time or enough money, says Wendell Flanagan, an industrial-engineering professor at MIT, who has been with FIRST since the first year. FIRST has been designed to simulate a real engineering experience and stimulate real creative responses.

Building Character With Robots

Just as Boy Scouts and Girl Scouts aren't just about woodcraft and other outdoor skills, and National Honor Society is just about survival in the mountains or the sea, FIRST isn't just about robots.

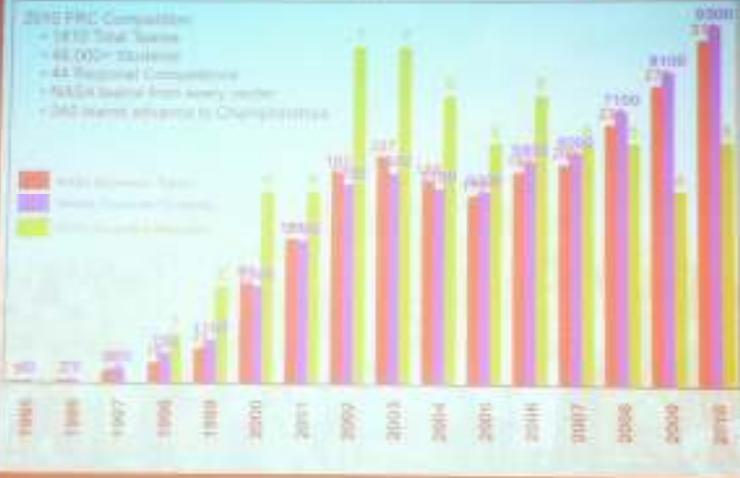
Like other challenging activities for youth, FIRST is an adult responsibility to build character. "FIRST is not about robotics; it's the struggle around which the kids gather," says Flanagan. "The



NASA Participation In FRC

2012 FRC Competition
→ 1812 Total Teams
→ 48,000+ Students
→ 44 Regional Competitions
→ NASA Award from every center
→ 242 teams advanced to Championships

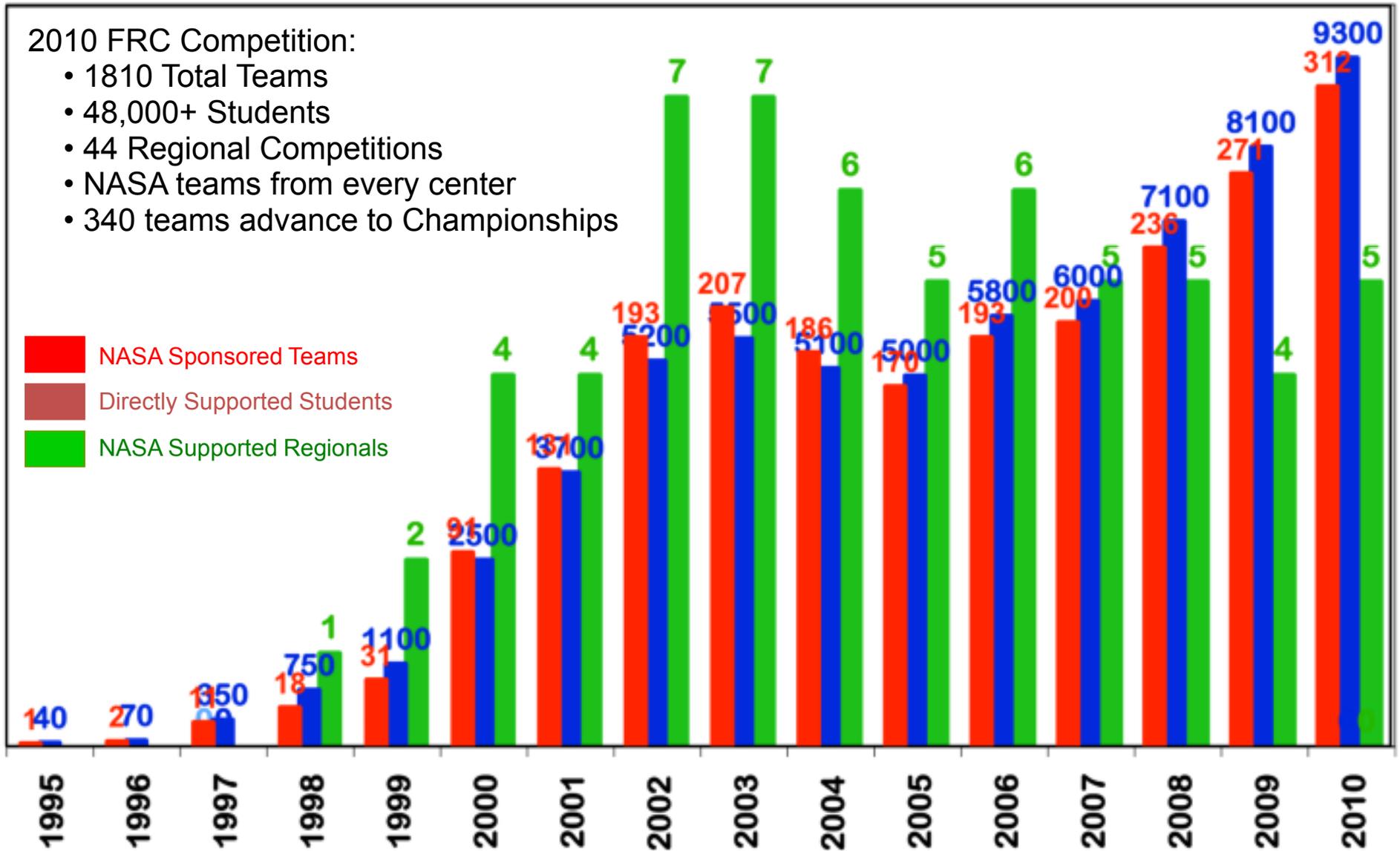
■ 2012 National Team
■ 2012 Regional Competition
■ 2012 Regional & National



NASA Participation In FRC

2010 FRC Competition:

- 1810 Total Teams
- 48,000+ Students
- 44 Regional Competitions
- NASA teams from every center
- 340 teams advance to Championships



FIRST & NASA

- Part of NASA Robotics Alliance Project
- FIRST, BotBall, VEX
- \$4.5mm (30%)
- 312 teams
- 9300 direct students
- 4 sponsored regionals

The screenshot shows the NASA Robotics Alliance Project website. At the top, it features the NASA logo and the text "NATIONAL AERONAUTICS AND SPACE ADMINISTRATION". Below this is a search bar labeled "Search Robotics" and a "NASA Home Page" link. The main header is titled "The Robotics Alliance Project" and includes a navigation menu with links for HOME, EVENTS, EDUCATORS, STUDENTS, ARCHIVE, and LINKS. The main content area is divided into several sections. On the left, there is a "Robotics Alliance Project" sidebar with a "I WANT YOU FOR ROBOTICS ALLIANCE" graphic and a navigation menu. The central section features a "2011 FIRST Robotics Competition Championship" announcement, a "FIRST" logo, and an "Awards List" link. Below this is a "STS-134 Launch" section with a graphic of the shuttle and text stating that the launch date is expected no sooner than May 8th, 2011. On the right, there is a "Robotics Corner" section with links for "FIRST info", "BotBall info", "VEX info", and "Educational Matrix", followed by a "Robot News" section with links for "Robotics Boy Scout Merit Badge", "Carnegie Mellon creates Vibrating Robotics Orchestra", and "Robot throws first pitch". At the bottom right, there is a "Robot News Archive" section and a "Robotics Alliance" link.



FIRST → NASA

- “FSU” – “First Standard Unit” - 6 weeks
- “Think you can be a manager? Run a FIRST team”
 - Too little money
 - Unreasonable schedule
 - Unknown resources
 - Lack of experience
 - Demonstrate you know “what matters”

College/University Participation

31% of Entering Freshman at MIT were FIRST graduates



MICHIGAN STATE
UNIVERSITY



BOSTON
UNIVERSITY

WAYNE STATE
UNIVERSITY



150
EASTERN MICHIGAN
UNIVERSITY

T · H · E
OHIO
STATE
UNIVERSITY

PURDUE

DeVry
University



Georgia
Tech

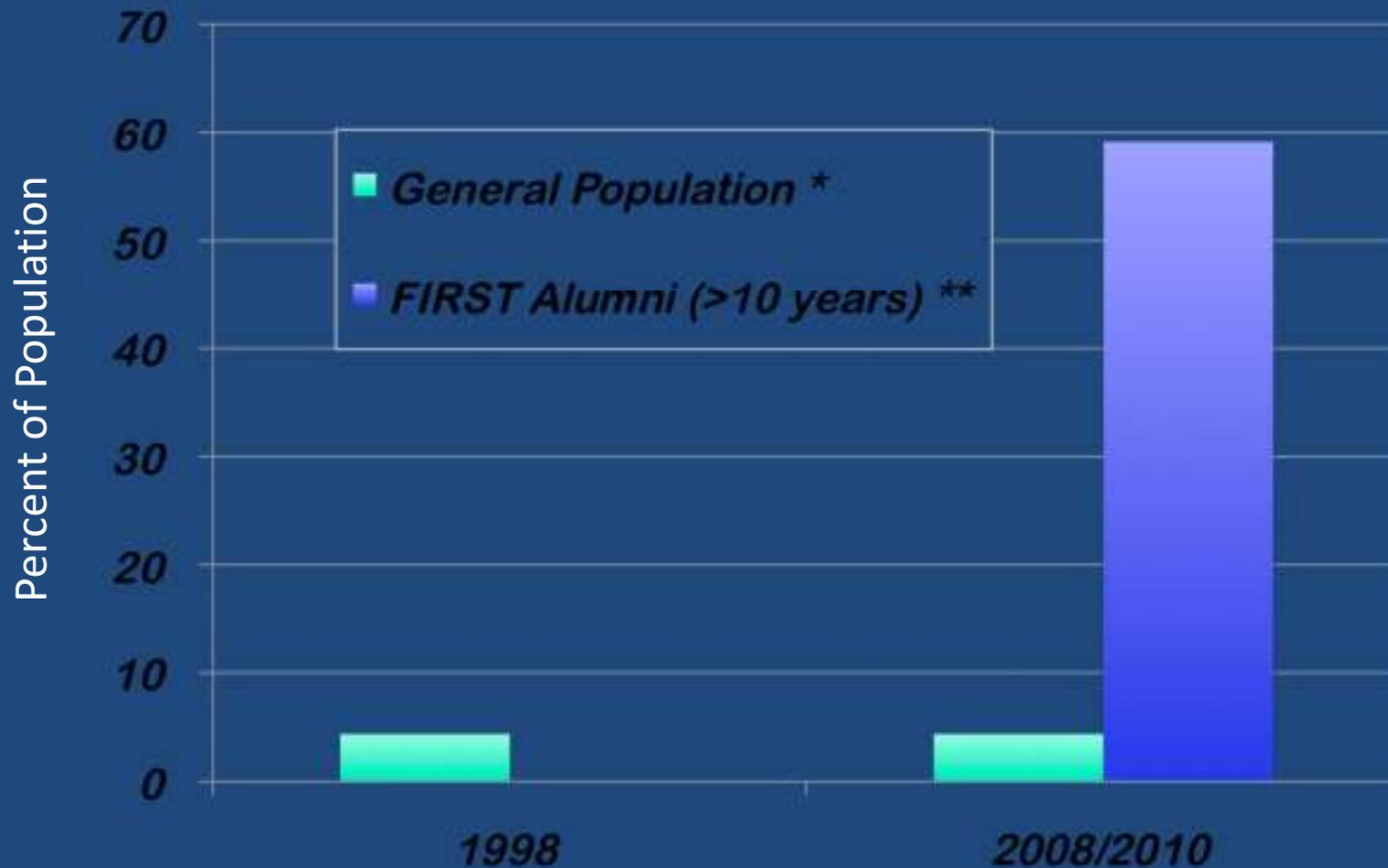
VCU

NJIT
NEW JERSEY INSTITUTE OF TECHNOLOGY

UC DAVIS
UNIVERSITY OF CALIFORNIA

UNIVERSITY OF DENVER

Population Fraction Employed In Engineering, Math, Science and Computer Careers

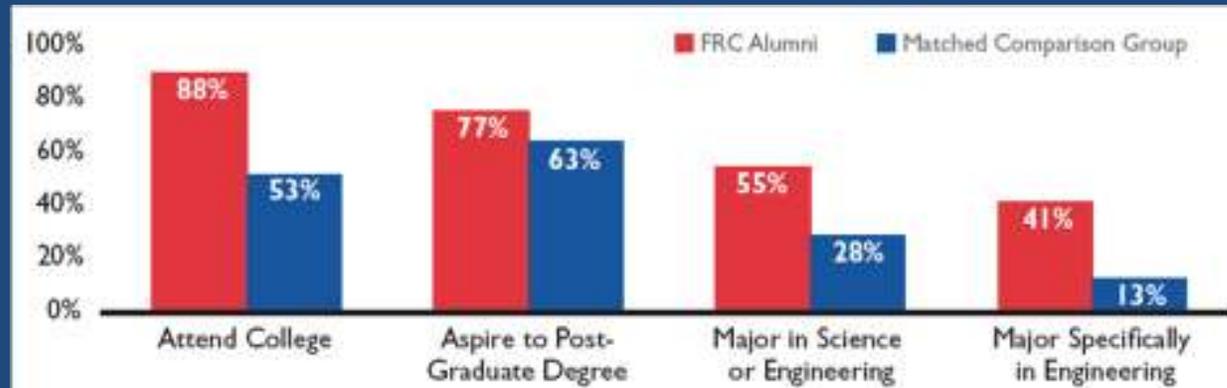


* Source: U.S. Bureau of Labor Statistics, May 2008 Databook

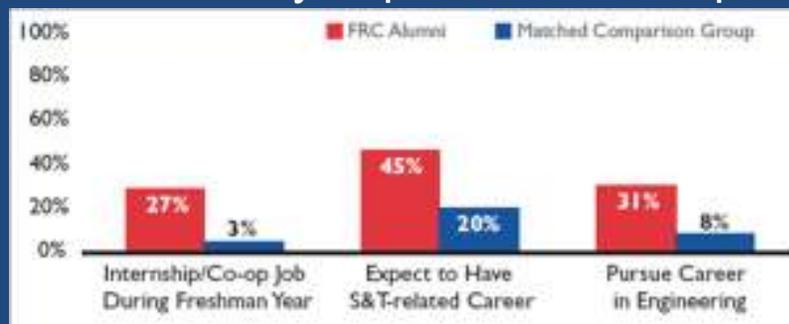
** Source: NASA House Teams Alumni Study, preliminary results

Effectiveness

- Participating students seek education in science & technology
 - Twice as likely to major in science or engineering (vs. comparison group)
 - More than three times as likely to major specifically in engineering



- Participating students earn Career Opportunities:
 - Almost ten times more likely to have internship
- Participating students are expected to Pursue Science & Technology Careers:
 - More than twice as likely to pursue S&T career
 - Nearly four times as likely to pursue career specifically in engineering



Source: Brandeis University, Center for Youth and Communities, Heller School for Social Policy and Management

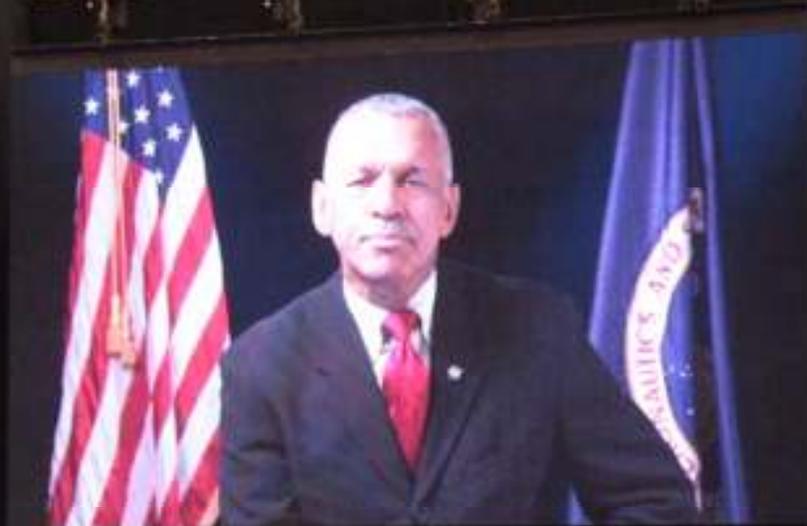
FIRST[®] Robotics Competition





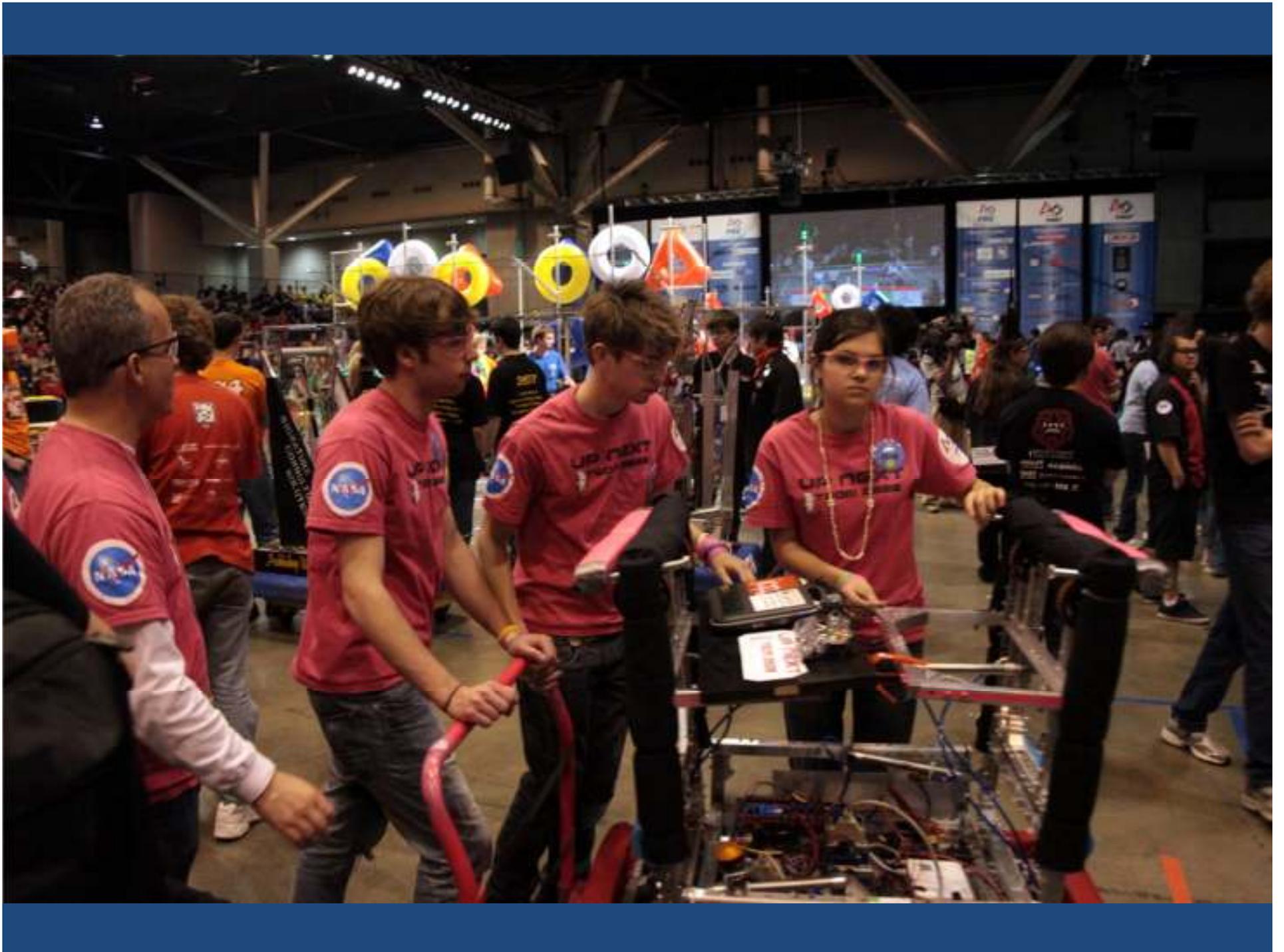




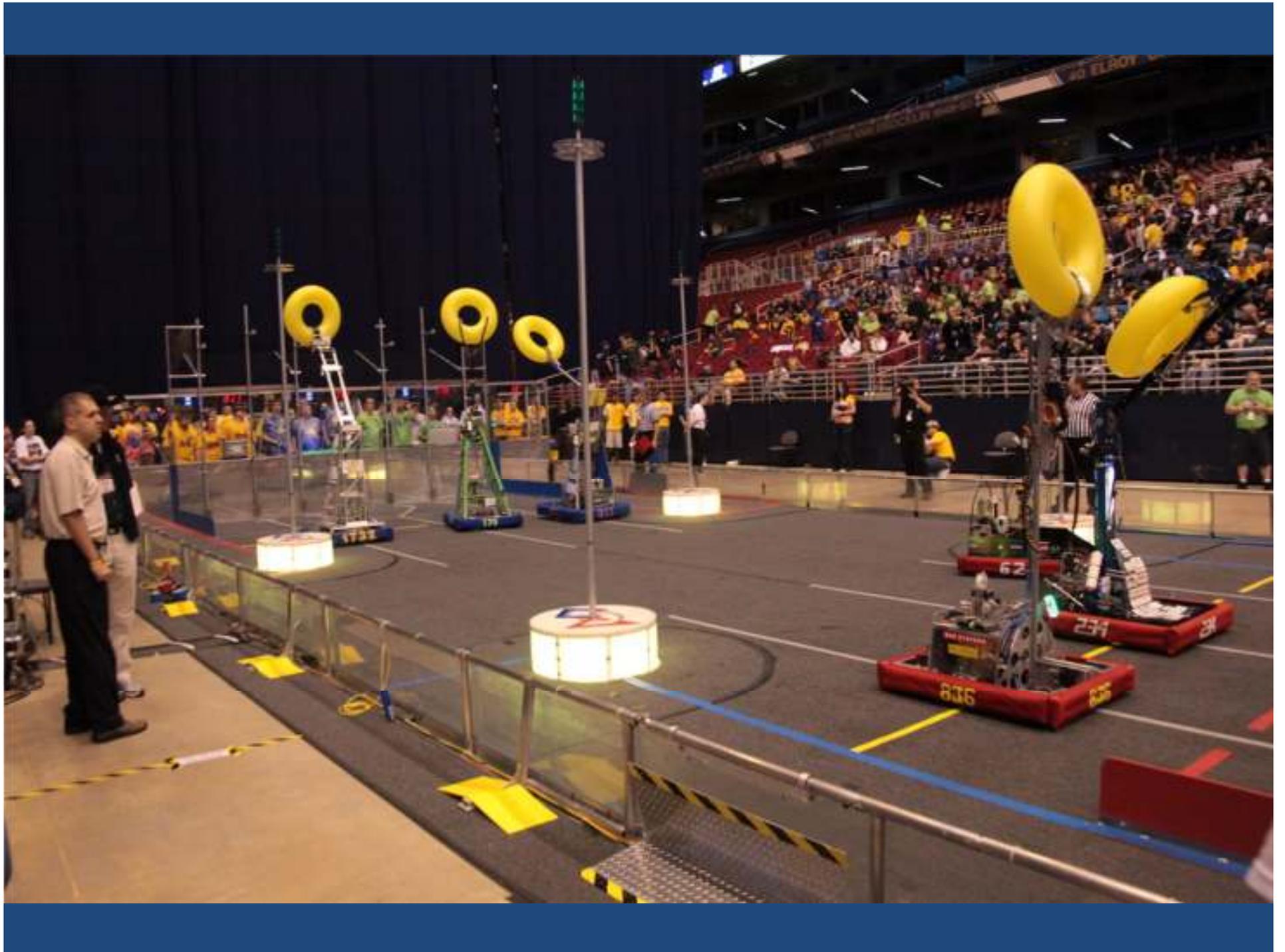




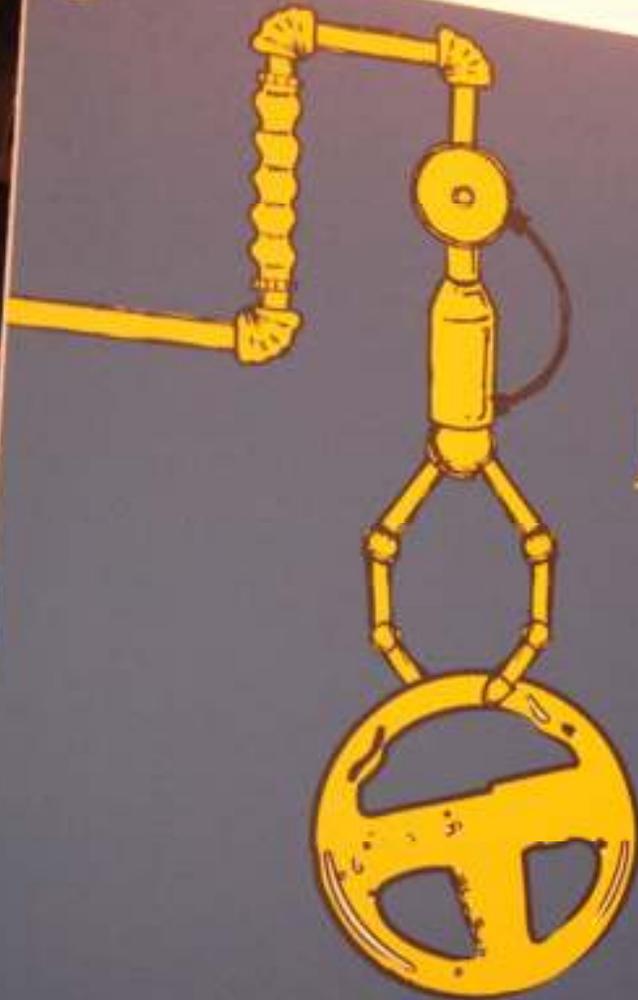












engineer
ANYTHING

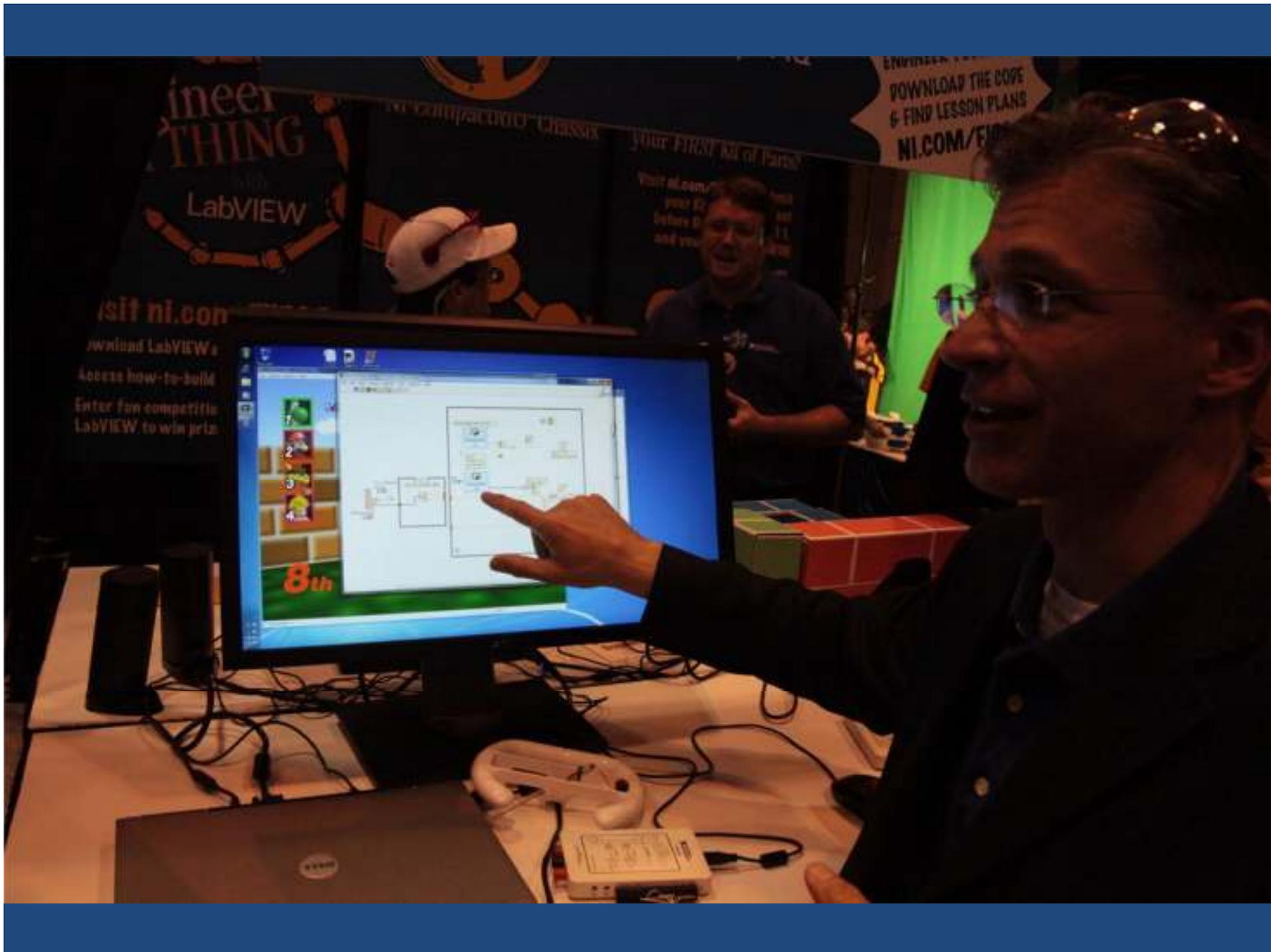
with
LabVIEW™
and
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High School
&
College

ENGINEER YOUR OWN!
DOWNLOAD THE CODE
& FIND LESSON PLANS
NI.COM/FIRST

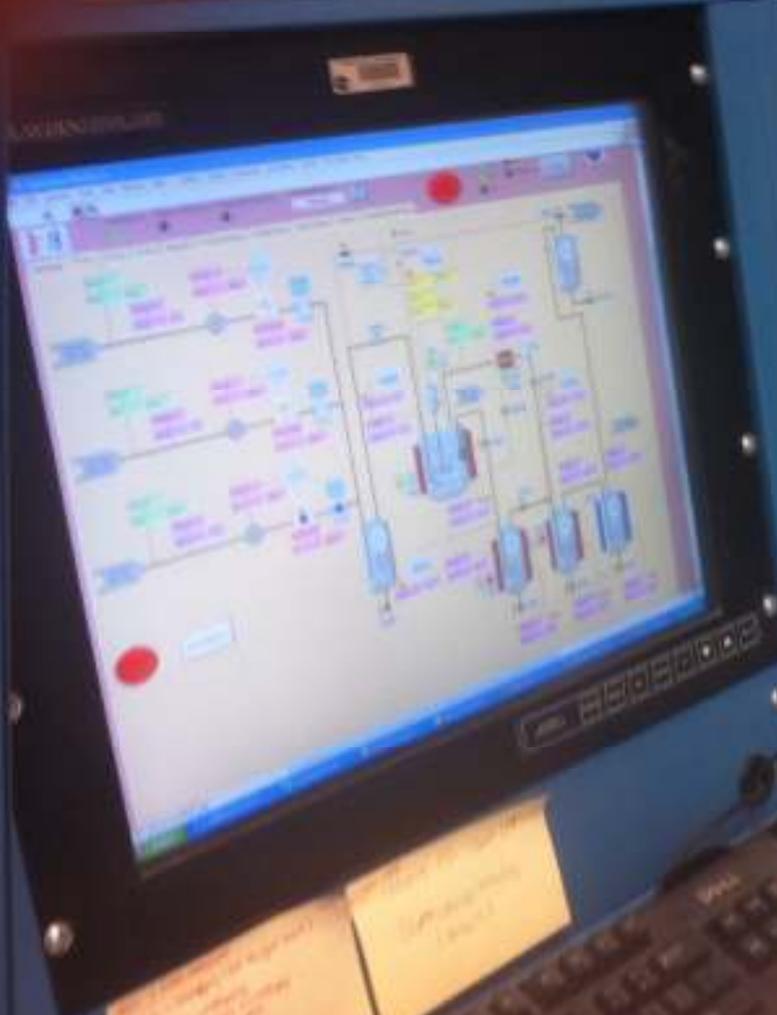
your Kit of Parts...
before Decem...
and your t...





LABVIEW MONITOR

OPERATOR MONITOR



Handwritten notes on sticky paper attached to the bottom of the LabVIEW monitor.

Keyboard

Mouse

Open binder or manual

Mug



Our FY 2011 Plans

- Continue supporting the program through the SMD *Robotics Alliance Project*
- Sponsor >300 FRC teams
- Mentor highly diverse set of >10,000 students
- Sponsor/host 5 regional competitions
- Continue hands-on participation by engineers and mentors from every NASA center
- Expand community outreach
- Show off NASA capabilities
- Investigate NASA scholarship options
- Our annual challenge: Can the centers (with engineers and technologists) beat the Headquarters team (with bureaucrats and accountants)?



Can NASA do more?

- Dave Lavery has turned DOWN budget increases in the past
- \$1 mm more would help
- Encourage “5% time”
- Strongly endorses Leland’s direction

... don't break what's working

Why does it work?

- Limited resources are amplified by volunteer efforts and partnerships
- People get infected
- They do it because they want to
- There is no central planning
- The rules make sense

EDUCATION

Context

4,000,000 kids will start school this year. By the time they graduate, 60-70,000 will have chosen to major in science or engineering.

... It's not enough

What is NASA's role?

The Future

NASA is making significant and sustained investments in:

- Transformative technology development and demonstrations to pursue new approaches to space exploration, including heavy-lift technologies;
- Robotic precursor missions to multiple destinations in the solar system;
- U.S. commercial spaceflight capabilities;
- Extensions and increased utilization of the International Space Station;
- Cross-cutting technology development in a new Space Technology Program;
- Climate change research and observations;
- NextGen and green aviation; and
- Education, including focus on Science, Technology, Engineering and Math (STEM).

The Budget Reality

- \$138 mm
- \$40 mm back to states – Space grants
- \$98 mm – What do we do with it?

Informal observation: The FIRST grassroots model is at least 10x more cost effective than programs designed and implemented from the top down.

Informal observation: NASA's core competency is not "education", it is "science". Let the scientists educate by inspiring students.

Informal observation: It may be more efficient for NASA's Ed office to incubate, support and coordinate programs initiated at the directorate level rather build programs themselves.

... recommendation(s) may follow

Leland's Recommendations ...

- ① Focus NASA's Education Programs
- ② Strategically Manage Partnerships
- ③ Participate in State/Nat'l STEM Discussions
- ④ Create Structure (O of E, MD, others)
- ⑤ Expand ECC Charter
- ⑥ Improve Communication

*... A 90 degree turn, not 10 degrees ...
recommendation may follow*

ECC Feedback

- What more can we do?
- General public doesn't "get it"
- Budget uncertainty makes it hard
- Changing administrations make it hard
- Must not formalize the informal projects

PUBLIC OUTREACH

NASA Vision

What Does NASA Do?

02.01.10

NASA's vision: To reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind.

“To reach for new heights and reveal the unknown, so that what we do and learn will benefit all humankind”

“To benefit all humankind, NASA reaches for new heights and reveals the unknown.”

“To benefit all humankind, NASA reaches for new heights and reveals the unknown, on Earth and beyond.”

Effective Public Messaging

- CLEAR
- CONCISE
- CONSISTENT
- CONTEXT

... Rinse and repeat

Tier Communication Strategy

- Low touch fulfillment of statutory requirement to inform
- Separate higher touch effort to support strategic communication goals
 - Review quarterly
 - 1, 2, 3 messages
 - Relentless, repetitive



... recommendation may follow

Moving Forward ...

- Support Leland
 - Process & Partners
- Assist in Translation of Strategic Vision to Clear Public Message
- Help Office of Communication Coordinate Message Streams
- Liaise with Aerospace & Tech & Innovation Committees

Increase the *Awesome* ...



