

“How to Win”

Strategy, Game Play, & Effective Design

Who are we?

- Andy Baker

- Lead Engineer, Team 45
- Mechanical Engineer, Delphi Corporation
- Co-Owner, AndyMark.biz
- '03 Championship Woodie Flowers Award Winner
- Coach of 1998 National Champion team

- John V-Neun – Team 20, 229, 148

- Mechanical Engineer at Innovation First, Inc.



DELPHI

TECHNO *K&S*

What We'll Cover Today

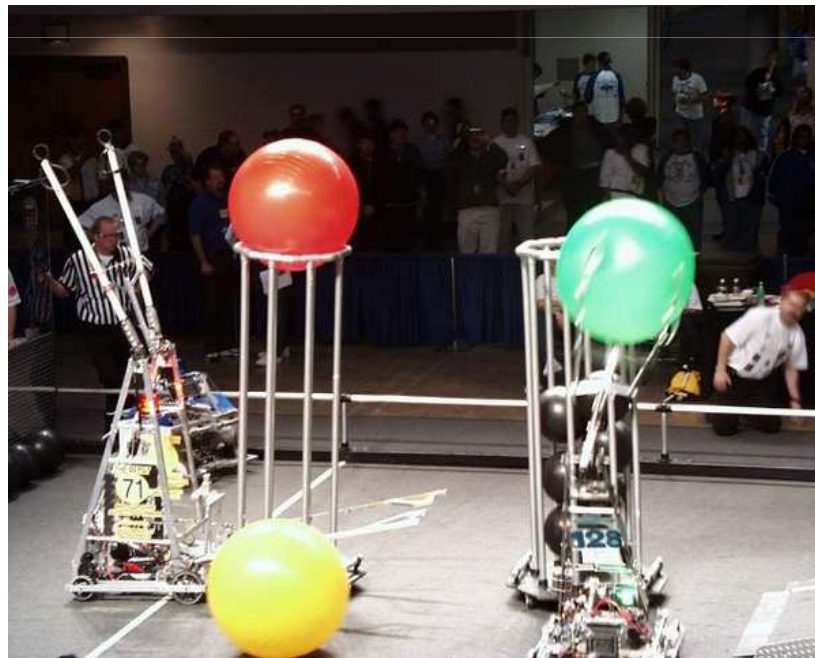
- Historical Successes – Who Won and Why?
- Strategy – *What* the robot does during a match.
- Design – *How* your robot will do it.
- Preparing for Competition
- At the Event – Successful Execution

Who Won and Why?

- 2000 – Team # 25
 - Blocked Center Field, Controlled Score

Who Won and Why?

- 2001 – Team # 71
 - Innovative Design “Balance off Ramp”
 - Do-All Robot Construction



Who Won and Why?

- 2002 – Team # 71
 - “Absolute Lock” – Grab all 3 Goals.



Who Won and Why?

- 2003 – Team # 111
 - Why Stack? – Adapt Strategy.
 - Block Central Ramp, Control Main Points.



Who Won and Why?

- 2004 – Team # 494
 - Specialized. – Defense + Hang



Who Won and Why?

- 2005 – Team # 330 & 67
 - Simplicity & Execution – Everybody Caps.



Who Won and Why?

- 2006 – Team # 217
 - Winning Autonomous Mode
 - Get Ahead Early.



Choosing a Strategy

- Choosing a Game Strategy:
 - Learn the Game
 - Try to distill the essence of the game
 - Sometimes this is easy, sometimes it is harder.
 - 2005/2006 vs. 2004
 - Think about “what” not “how”.
 - “How” will come later. Keep it in the back of your mind.
- This all may seem intuitive; these decisions are easier when you think about them in terms of these basic elements.

Basic Strategy Types

- Offensive Robot – Score LOTS of points.
 - Do 1 Thing vs. Do All Robot
 - Specialize?
 - Beware: Jack of All Trades, Master of None
 - QB Robot vs. Support Robot
 - “Win” Robot vs. “Play” Robot
 - Do we go for the “lock”?
 - Let our drivers win the matches?
 - Offensive “Power Moves.”

Basic Strategy Types

- Defensive Robot – Stop Opponent Scoring.
 - Basic Blocking – (Use the drivetrain.)
 - Advanced Blocking – (Specific Mechanism.)
 - Control Scoring Elements
 - Block key features (goals/choke points)
 - Block scoring objects
 - De-Score Opponent Points

How do Teams Decide?

- Democracy
 - Everyone has a say.
- Decision Making Group
 - Top Leaders get a say.
- Consensus Building
 - Faux-Democracy
- Dictatorship
 - The “Golden Rule”

Tools to Help Decide

- Quantitative Decision Making
 - Decision Matrix / Weighted Objectives Table
- Scoring Analysis
 - Where are the points?
 - List all ways to score & worth.
 - How many opportunities?
 - What will be a “good” score?

Tools to Help Decide

- Sub-Team Process
 - Multiple Parallel Efforts
- Putaside
- Prototyping / Game Walkthroughs
 - Try to simulate how the game will play out.
- Think about Diminishing Returns!

Strategy Execution – Robot Design

- What are the three most important parts of a FIRST Robot?

Strategy Execution – Robot Design

- What are the three most important parts of a FIRST Robot?
 - Drivetrain
 - Drivetrain
 - Drivetrain!
- If you can't move, you can't score.
- If you can't move, you can't defend.

Strategy Execution – Robot Design

- Manipulate the Scoring Object:
 - Fast, Fast, FAST!
 - Prototype, Test, & Tweak
 - Smooth like buttered silk.
 - Hold securely.
- Think about Motor Allocation Early!

Design Principles

- PROTOTYPE IT! (Can't over-stress this.)
- Design for Fabrication/Assembly/Repair
- Design for Use!
 - Must be easily controlled.
- Seek Inspiration
- Celebrate Mistakes

Design Principles

- Simplify it!
- Make it FAST – (Do Less, Faster?)
- Unify Functions
- Innovate, but don't reinvent the Wheel
- Every Ounce Counts
- Pay Attention to the Details
 - We CAD EVERYTHING.

Design is an Iterative Process

- How do I make this:
 - Lighter?
 - Faster?
 - More Robust?
 - Smaller?
 - Simpler?
 - More Efficient?
 - Cheaper?
 - Easier to Construct?
 - Easier to Repair?
 - Easier to Assemble?
 - More Effective?
 - Easier to use?
- How can I combine this with something else?
- What else can this do easily?
- Who can help me with this?
- Is there anything I can use to accomplish this?
- Does this fulfill our primary strategy goals?
- **Why am I doing it this way?**
 - Beware: Propagating Constraints

Incremental Advantage

- Continually ask yourself... “What can I do to get even a slight edge over our competition?”
- Get enough of these slight advantages, and your winning chances increase greatly

Prepare for Competition

- Leave time for Software & Debug
 - Autonomous is more and more important.
- Driver Selection
 - Choose dedicated students.
 - Robot ability isn't most important factor?
 - Leadership Role.
- Coach Prep
 - Critical Role, needs to be prepared.
 - Think Dungy & Manning...

Driver Practice

- Practice Makes Perfect.
 - Robot Familiarity
 - “Wax On, Wax Off” training.
 - “Play your game.”
 - Tailor your game to different partners.
 - Situational Adaptability
 - Dealing with Defense
 - Playing Successful Defense

Pre-Event Scouting

- What are other robots doing?
 - How does the game play out?
 - What works?
 - How should we adapt our game?
 - Game Evolution
-
- Early Regionals vs. Late Regionals

At-Event Scouting Preparations

- Determine most important factors
- What a Robot Does?
 - Hang? Cap? Plow?
- How well it does it?
 - Try to be Quantitative
 - “Averages 10.6 balls per match”
 - Capped 6, 5, 2, 5, 7 Tets in the last 5 matches.

Pit Planning & Organization

- Get this stuff done early!:
 - Robot Maintenance Checklist
 - Pre-Match Checklist
 - Fabricating / Purchasing Spare Parts
 - Team “at the event” organization

At the Competition

- Robot Adaptability
 - Making smart changes is risky, but can yield good results.
- Strategy Adaptability
 - Fulfill your robot/team's potential!
 - Based on “at the event” observations and “pre-event” scouting.

At the Competition

- Be Organized as a Team
 - Come to the event each day with a plan.
 - If there is a major Robot overhaul to be done, outline each step in the process!
- Team Support is Critical
 - Scouting
 - Pit Crew
 - Field Runners

Networking for Success

- Identify and talk to the main decision makers on other teams.
 - Not limited to Coach/Driveteam.
 - Make Friends.
 - Give Robot Updates
 - “We had some trouble with the blah, but it’s all fixed now.”
 - Be Honest!
 - Seal the Deal
 - Make them feel good about working with you.

Team Image

- Professional.
- Organized.
- Experienced.
- Reliable.
- SMART.
- “Not-A-Jerk”
 - Don’t get black-listed. It happens.

Performing Under Pressure

- Drive-team, Pit Crew, Support Team
- Food, Water, & Rest

Manage Your Alliances

- Well Oiled Machine
- Everyone needs to know their role.
- Ensure Communication during the match.
- Be Creative with Strategy to win tough victories.

Be Prepared for the Draft

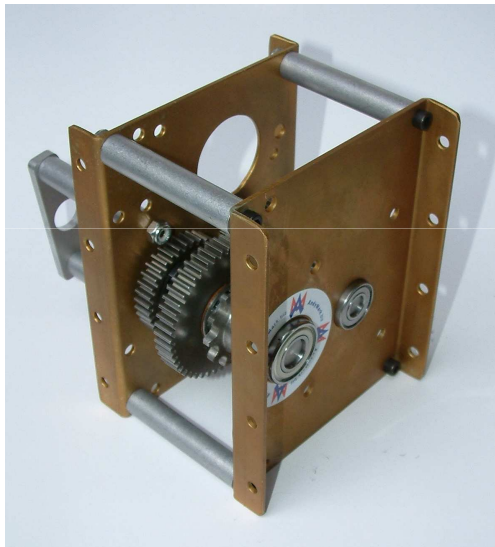
- Make a List, no matter what!
 - Full Draft Length (24 teams)
 - Typically started on Thursday
 - Detailed on Friday Night
 - Finalized Saturday Morning
- Go over the list with your student rep.
 - Give them a copy, make sure they are one of the people to help create the list.

Most Important Factor

- Bring your Lucky Rabbit's Foot (or two).
- Winning has a LOT of luck involved.
 - Get the planets as aligned as possible through hard work. Then cross your fingers.
 - Preparation brings Confidence, Confidence brings Success.
- Play at a high enough level for long enough, and eventually you will win it all.

Thank you!

- Any Questions?



<http://www.andymark.biz>

<http://www.ifirobotics.com>

