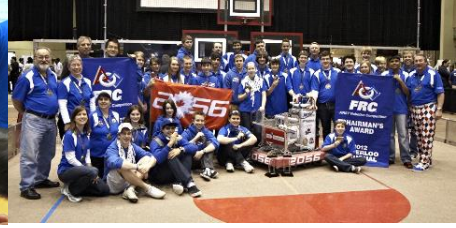
2056



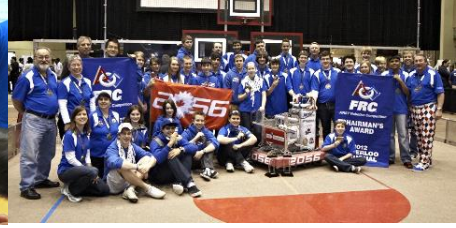
OP Robotics Team 2056 Keys to Success

2056

FIRST®

Who am I?





Tyler Holtzman

Lead Design Mentor 07-Present

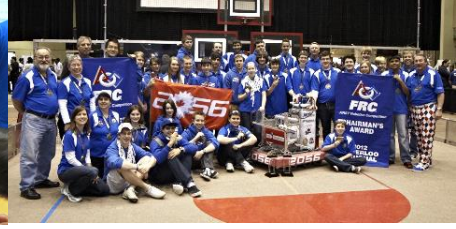
1114 Alumnus 03-07

Senior Design Engineer – Volm Companies

2010 Woodie Flowers Finalist Award Winner

2056 Ways to win

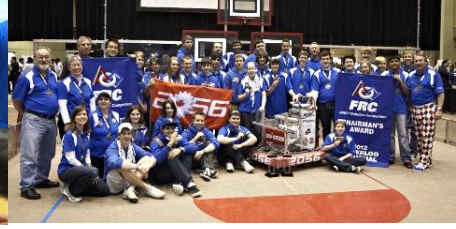




Outline

1. Goal Setting
2. Build Schedule- No More Bag
3. Decision Making
4. Design Methodology
5. Fabrication & Assembly

Goal Setting

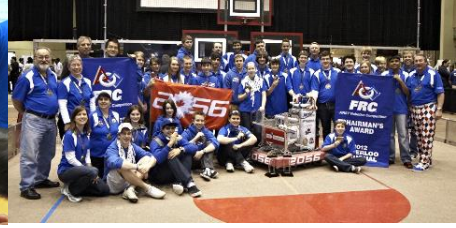


Set goals for everything!

- Season
- Event
- Week of build
- Day of build

Start big, work your way down.

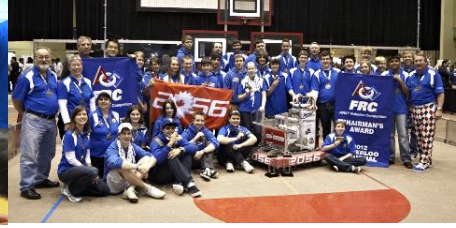
Goal Setting



"Focus on the little things, and the big things take care of themselves."

Build Schedule

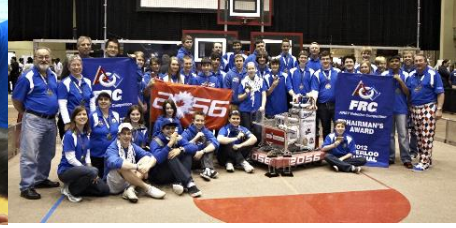




Official Team Meetings Jan 6 – April 30
Monday, Wednesday, Friday 2:30 – 9:30
Saturday 9 – 6
30 Official hrs weekly

Behind the Scenes, additional 20+ hrs

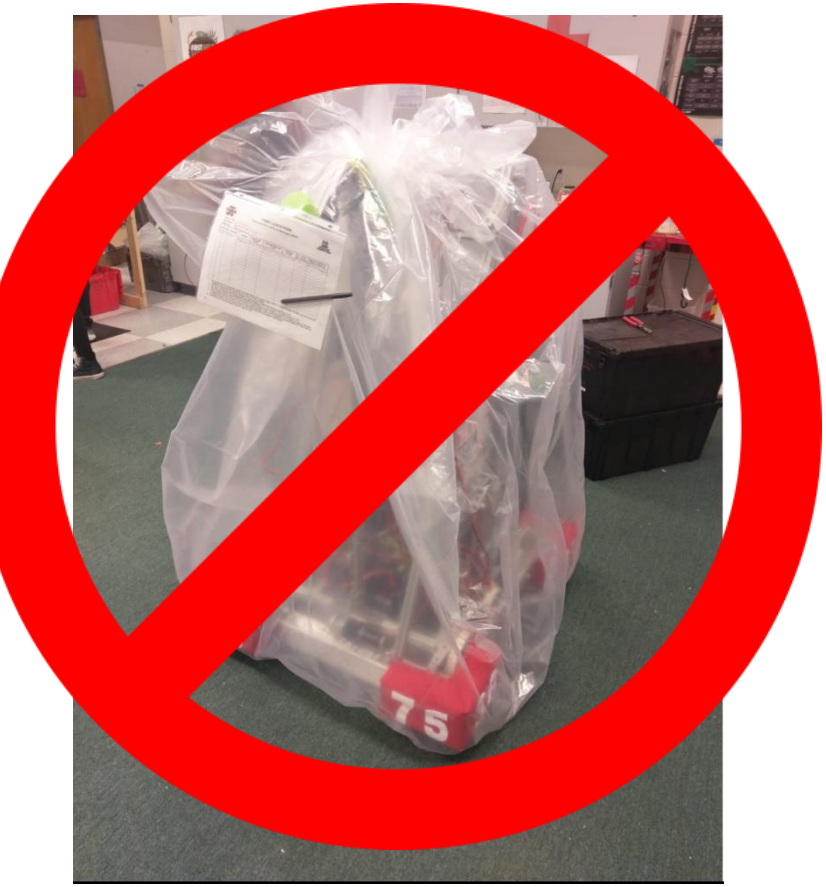
Build Schedule



Disclaimer: Find a schedule that works for your team.

YMMV

No More Bag!



What does that mean for us?

Honestly, Not much.

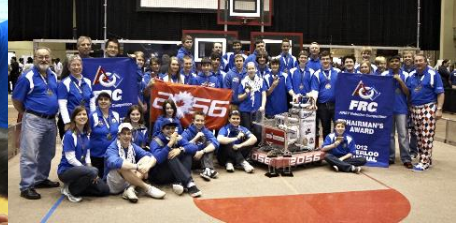
No More Bag!

What does that mean for us?

- Still build two complete robots
- No changes to our approach to robot build
- Slightly relaxed build schedule compared to previous seasons
- No plans to build secret championship only robot… or do we?

Build Schedule

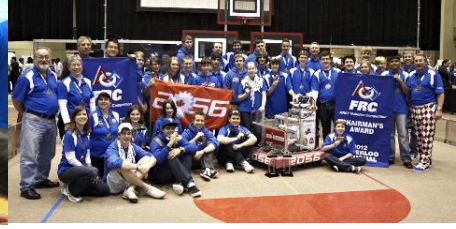




2020 Planned Build Schedule

Week 1





Saturday Kickoff Meeting

- Completely Read and understand rules

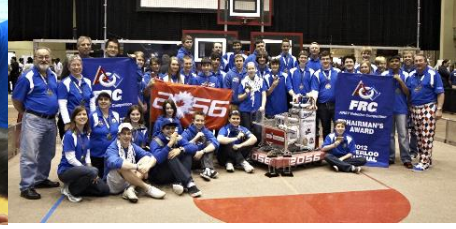
- Establish design Constrains, Scoring Challenges
- Order Game elements

Monday Team Brainstorming Meeting

- **Examine Scoring**
- Identify what tasks the robot will need to do
- Identify trade-offs if necessary
- Some years doing everything is necessary, other years its not possible.
- Decide on Drive base and order components if possible. If this decision is anything other than 6 or 8 wheel tank drive, you'd better have a good reason.
- Begin Detailed CAD Design of Drive base

Week 1





Wednesday Team Meeting

- **Continue Brainstorming**
- Decide on upper mechanism layout
- Prototype as necessary
- Continue Detailed CAD Design
- Order more components as design firms up

Friday Team Brainstorming Meeting

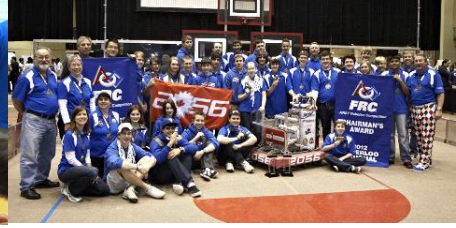
- Prototype as necessary
- Continue Detailed CAD Design
- Order more components as design firms up

Saturday Team Meeting

- **Build the Field**
- **Finalize Conceptual design of robot**
- Prototype as necessary

Week 2



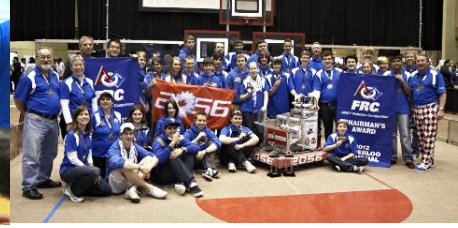


Monday, Wednesday, Friday

- **CAD, CAD, CAD**
- Prototype as necessary
- Begin in-house fabrication of drive base components
- Order outstanding required raw materials (sheet, tube, bar)

Week 3





Monday, Wednesday, Friday

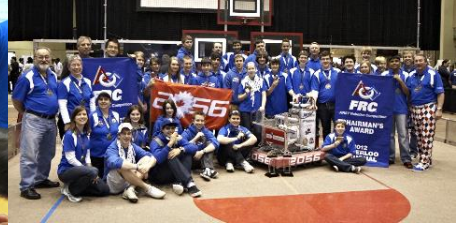
- **CAD, CAD, CAD**
- Prototype as necessary
- in house fabrication
- Determine initial control design and begin software development

Saturday

- Release Drawings for outside fabrication

Week 4
Exam Week





Monday, Wednesday

- in house fabrication of all outstanding components

Friday

- Receive components back from outside fabrication
- deburr

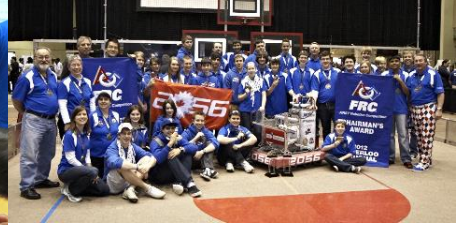
Saturday

- in house fabrication of all outstanding components

- begin practice robot assembly

Week 5





Monday

- Complete mechanical assembly of practice robot

- identify any areas of concern or possible rework

- Begin wiring of practice robot

- in house fabrication of all outstanding components

Wednesday

- **Complete wiring of practice robot**

- Continue software integration and automation

- practice robot mechanical testing

- in house fabrication of all outstanding components

Friday

- in house fabrication of all outstanding components

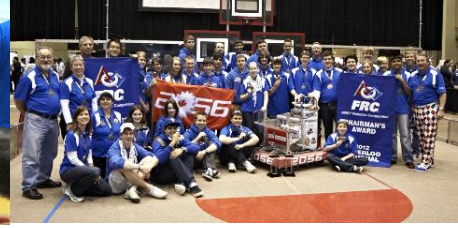
- design revisions as necessary

Saturday

- Finalize design prior to competition robot assembly

Week 6



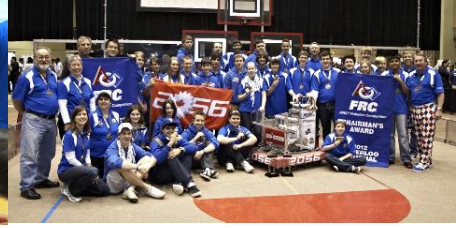


Monday - Wednesday – Friday - Saturday

- **Competition robot assembly**
- software integration and automation
- Practice robot functional testing

Week 7





Monday

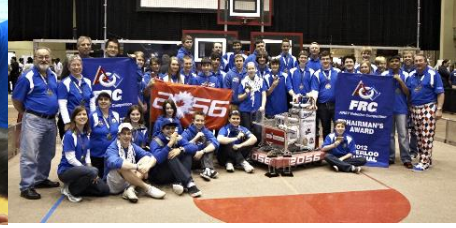
- **Competition robot assembly Complete**
- Continue software integration and automation
- Autonomous mode

Wednesday – Friday – Saturday

- **Buffer for unexpected delays**
- Competition robot Shakedown
- Continue software integration and automation
- Autonomous mode

Week 7+



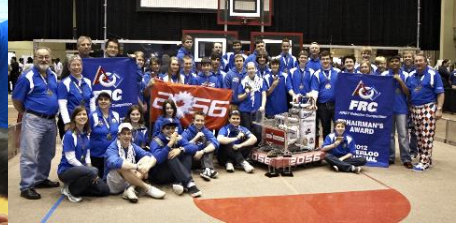


Monday, Wednesday, Friday, Saturday,

- Practice Lunch time ½ hr, 1-2 hrs after school(Everyday)
- Design revisions as needed

Competition Season





- Daily driver Practice 1 – 2 ½ hrs
- Practice robot maintenance
- Practice robot programming
- Watch other events
- Look for areas to improve
- Constant Iteration

Schedule

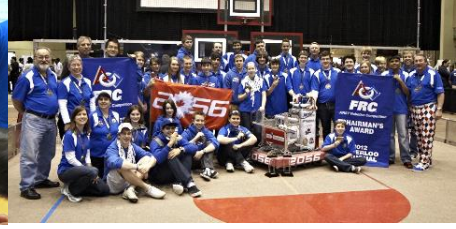
Questions on build Schedule?

Decision Making

- Make decisions early! More time to regret them later.
- Heavily CAD Driven
- Rely on Experience
- Look to the past for inspiration
- Learn from others (CD, RI3D, Build Blitz)

Decision Making

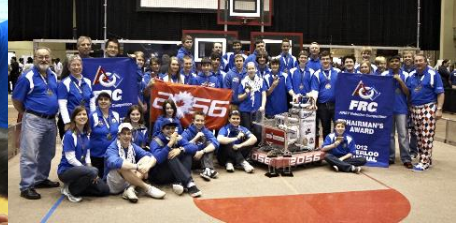




- Consensus vs Voting
- Know your limits. Design within them.
- Don’t do everything!

Design Methodology



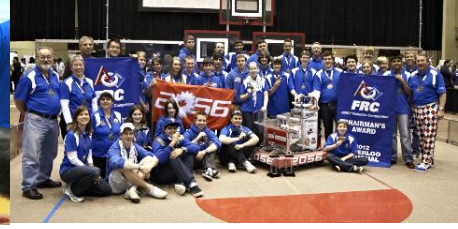


- Simple, Simple, Simple
- Robust
- Fewer parts, less design time, less fabrication time, less things to go wrong
- Avoid doing everything!

Design Methodology

- Design according to your resources
- Buy everything you can. Make only what you can't… and are capable of.
- Order Parts Early
- Finish Early, iterate

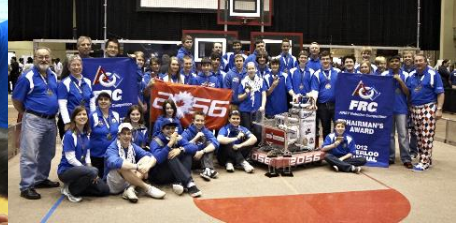
Design Methodology



- CAD Everything
- Or not, remember your resources

Decision Making & Design Methodology

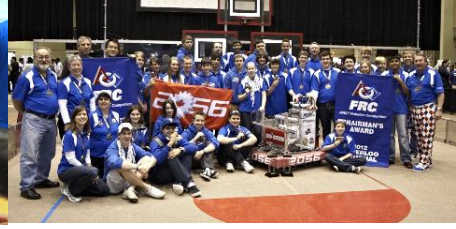




- Design & Decisions Making Questions?

Fabrication

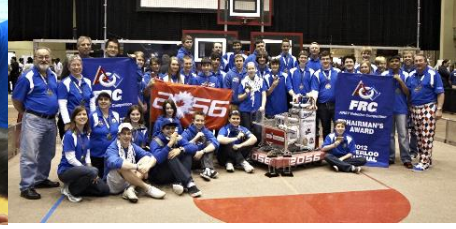




- Build to your resources!
- Know your schedule, be conservative

Assembly

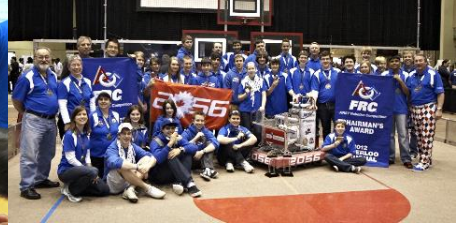




- Practice Robots should be identical
- Take the time to fit your parts nicely
- Standardize Fasteners, Pneumatic fittings, electrical connectors, solenoid valves

AMA





- Final Questions?