



# FIRST LEGO League Challenge Overview

Created by FRC 8027  
(Not the Droids You are Looking For  
and Tiger Techs alumni)

“I don’t use kids to build  
robots. I use robots to  
build kids”

- Dean Kamen



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- Overview of FIRST LEGO League
- Robot Game
- Innovation Project
- Core Values
- Global Innovation Award

# Three *FIRST* Programs (K-12)

FIRST LEGO League: Discover, Explore, Challenge

FIRST Tech Challenge

FIRST Robotics Competition





# What is *FIRST* LEGO League Challenge?

*FIRST* LEGO League teams get to:

- Research real world problems
- Design, build, test and program robots using LEGO Robotics
- Apply real-world math and science concepts
- Learn critical thinking, team-building, and presentation skills
- Participate in tournaments and celebrations
- Understand and practice the *FIRST* Core Values

# Team

- Children, ages 9 to 14, (grades 4-8) are eligible to participate in North America
- Elsewhere 9-16
- Teams consists of 2 (minimum) - 10 (maximum) students
- Two official adult coaches with clearances per team
- Youth and adult mentors are allowed, but kids on the team do the work

## Approximate Timeline

**August 17, 2021:** Challenge documents released

**August-November 2021:** Team meets weekly to solve the challenge

**November-December 2021:** Qualifiers

**December 2021 -January 2022:** State/Regional Championship

**April 2022:** World Championships

**May 2022:** Open Invitationals



## Team Costs

- Robot/Equipment - approx. \$500.00 per robot (2 per team is useful)
  - SPIKE Prime, MINDSTORMS EV3, MINDSTORMS Robot Inventor
- Wooden Robotics Table - approx \$100.00
- National Team Registration- \$225
- LEGO Challenge Set - \$75
- Local Tournament Registration - \$75-\$250 (more in some regions)
- Travel Expenses
- Shirts/Supplies

# Three Parts of FIRST LEGO League Challenge



CORE VALUES



ROBOT GAME



PROJECT



## CORE VALUES



# What are Core Values?

- The cornerstones of the program.
- They are among the fundamental elements that distinguish *FIRST* from other programs of its kind.
- The set of ideas that every *FIRST* team should live by:
  - Work with others in a respectful way
  - Impact the community in a positive way



# What is Gracious Professionalism and Coopertition?

## Gracious Professionalism:

- High-quality work, emphasis on the value of others
- Respect for individuals and the community.
- Competition and mutual gain are not separate notions.

## Coopertition:

- The idea you should respect and support teams you compete against.



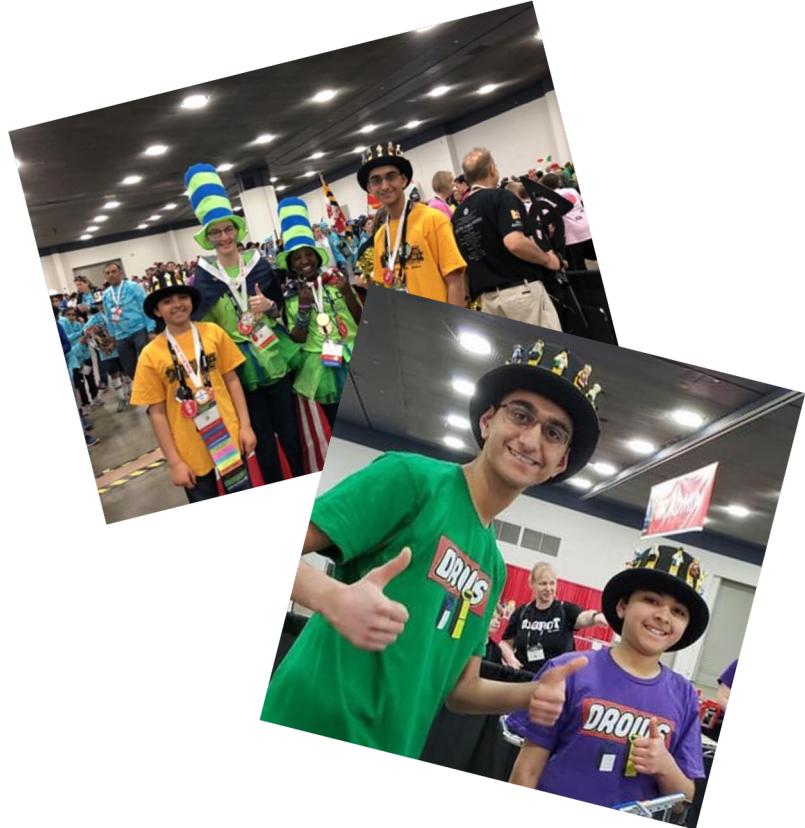
# Core Values Rubric

- The rubric addresses the major elements that teams are judged on and how overall Core Values skills are evaluated
- Students will give examples to demonstrate their understanding and use of each of the Core Values.

BEGINNING Minimally observed across the team.	DEVELOPING Inconsistently observed across the team.	ACCOMPLISHED Consistently observed across the team.	EXCEEDS	<i>How has the team exceeded?</i>
1	2	3	4	
<b>DISCOVERY</b> – Team explored new skills and ideas.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>INNOVATION</b> – Team used creativity and persistence to solve problems.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>IMPACT</b> – Team applied what they learned to improve their world.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>INCLUSION</b> – Team demonstrated respect and embraced their differences.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>TEAMWORK</b> – Team clearly showed they had worked as a team throughout their journey.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>FUN</b> – Teams clearly had fun and celebrated what they have achieved.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## Create a Team Identity/Have Fun

- Team Identity is a huge part of being a FIRST team.
- Many teams choose to express themselves with hats and team t-shirts.
- Helps your team stand out in a crowd
- Gives a team a sense of personality and individuality.



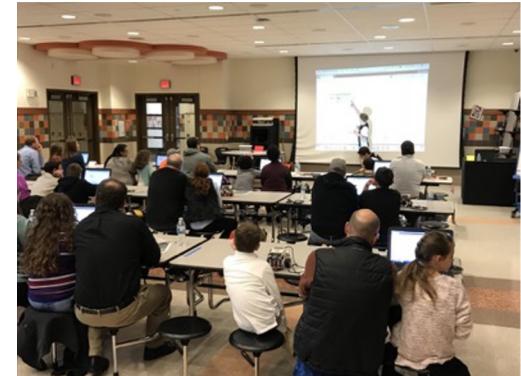
## Spread STEM in the Community

FIRST is all about sharing your knowledge of STEM within the community:

- Reaching out with other teams,
- other students,
- or anyone with an interest in STEM

A great way to get others involved and further build your program:

- Events
- Team Workshops
- Online Mentorship



## Help Other Teams

Helping out others can do worlds of good within the FIRST community.

- Help others, even if you have to compete against one another
- Help if you see a team struggle with a mission
- Lend parts if you have a missing piece that they do not have

Sharing your knowledge and resources can build bonds with others and spread success on a greater level.



# Learn to Communicate

Communication is key when it comes to being a successful team.

- Communicate with your own team so you can learn from each other
- Communicate with others on and off the field

Teams build communication skills so that they can speak to the media and even the Governor of Pennsylvania

- Helps spread the importance of STEM in the community



# Core Values Judging

Core Values, just like the other 2 aspects of FIRST has its own set of judging. Judges make evaluations of a team based on the the rubric.

- Looking to see if a team understands each of the Core Values and has implemented them on their team

Judges are looking to reward well-rounded team where...

- everyone has a role to play
- everyone is treated with respect
- students have understood FIRST and applied in their daily lives and community

Judging *may* include a Teamwork Activity (in some regions)

- This give the judges a sense on how everyone works together and how a team can problem solve effectively in tough situations

## Learn to Work Together as a Team

- Help team members get to know each other
- Make sure everyone is involved
- Help to learn to problem solve in a large group
- Help to learn to reach a consensus when there are different ideas



Doing a Teamwork Activity during team practices allows everyone's voice to be heard and can prepare a team when

# Learning life skills through FIRST

- Teamwork
- Communication
- Problem Solving
- Helping one another
- Giving back to community



# Events

- Fun and exciting
- Meet teams from different places
- People who share similar interests with you
- Everyone at events is very willing to help
- Learn from each other
- Get feedback from judges and improve your work





ROBOT GAME

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CARGO CONNECT

FIRST  
LEGO  
LEAGUE  
CHALLENGE

# Overview

- 4ft x 8ft table with a mat
- All mission models are LEGO-based
- LEGO MINDSTORMS or SPIKE Prime
- Yearly theme:
  - 2021 - CARGO Connect
  - 2020 - RePLAY
  - 2019 - City Shaper
  - 2018 - Into Orbit



# Robot Runs

- Robot Competition: 3 rounds, top score qualifies
- Each team has 2.5 minutes to complete as many challenges as they can
- Each mission on the board is worth a different number of points
  - Harder missions are not always worth more points
- Each mission has its own set of rules and instructions
- Referees score you at the end of each run



# CARGO CONNECT 2021 Season

- The theme is based on cargo and transportation
- Lines are provided to allow the robot to line follow
- Missions are based on real-world scenarios such as moving a turbine blade, unloading/loading containers, etc.



# Challenges Teams Face

- Building an efficient and sturdy robot
  - LEGO Technic is often new material for teams
  - Learning to use the right elements
  - Learning to build compactly
  - Teams are often tempted to copy robots from online, but we encourage creativity
- Navigating to the correct location requires teams to think about how to use sensors
  - Sensors are often “scary” for young teams
- Teams struggle with reliability
  - Robot does not behave the same day-to-day or at event





# Robot Missions

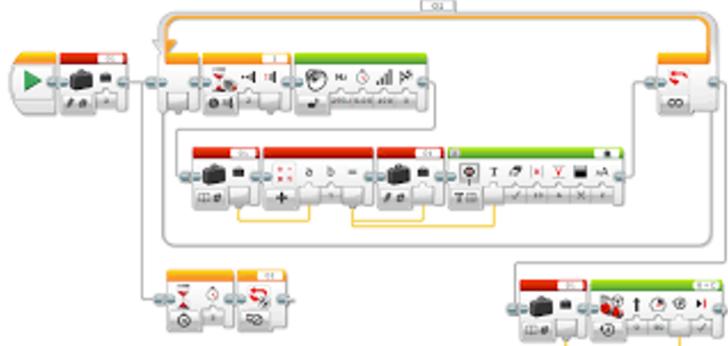
- Typically 15 missions every year
- Teams pick and choose based on their experience and ability
- FIRST provides the solution to one mission every year to get rookies started
- Rookies are expected to complete 2-3 mission reliably
- Veteran teams will complete more
- A few high-end teams will aim to complete \*all\* the missions

SCORE			
 <b>M10 SORTING CENTER</b> If the containers have been sorted so that the light orange container is the only container remaining completely in the blue sorting area box: • Partly: 20 • Completely: 30			
<b>HOME DELIVERY</b> If the cargo has been delivered to its destination so that it is on the doorstep: • Partly: 20 • Completely: 30 <small>If the cargo does not score if it is touching any equipment at the end of the match.</small>			
<b>LARGE DELIVERY</b> If the blade is touching only the blue holder and: • The mat: 20 • Nothing else: 30			
<b>CHICKEN STATUE</b> If the chicken statue is upright with its base in its circle: • Partly: 5 • Completely: 10			
<b>PLATOONING TRUCKS</b> If the truck(s) are latched together completely outside of home: • Latched to the bridge: 10 • Both of the above are true: 10 Added			
<b>RIDGE</b> If the deck(s) have been lowered and rest on their center support: 10 Each			
<b>CARGO SHIP</b> If the cargo ship has been loaded onto the deck: • Placing the cargo ship on the deck: 20 points • Train: 20 each (Max 40 points) • Cargo Ship's West Deck: 30 each (Max 60 points) <small>On Platooning Trucks must be completely outside of home</small>			
<b>CARGO CONNECT™</b> If the cargo connect is completely closed: • Partly full of contents (1-5 content pieces): 20 • Completely full of contents (All 6 content pieces): 30			
<b>UNLOAD CARGO PLANE</b> If the cargo plane has been prepared for unloading so that the cargo door rests completely down, touching its black frame: • If the cargo plane has been unloaded so that the container is completely separate from the plane: 10 • If both of the above are true: 20			
<b>TRANSPORTATION JOURNEY</b> If the truck has reached its destination, completely past its blue end line, on the mat: • If the airplane has reached its destination, completely past its blue end line, on the mat: 10 • Bonus: If both of the above are true: 10 Added			
<b>SWITCH ENGINE</b> If the engine has been switched from diesel to electric so that the yellow bar rests all the way down/south: • If the engine has been switched from diesel to electric: 20			
<b>ACCIDENT AVOIDANCE</b> If your robot is parked over the blue accident-avoidance line: • At the end of the match and the yellow panel is: • Not knocked down: 20 • Knocked down: 30 <small>If the black frame is knocked down at the end of the match, this mission does not score.</small>			
<b>UNLOAD CARGO SHIP</b> If the container is no longer touching the cargo ship's east deck: • If the container is completely east of the cargo ship's east deck: 20 • If both teams have separated their food packages from their field's helicopter: 10			
<b>AIR DROP</b> If the food package is separated from your helicopter: • If the food package is separated from the other field's helicopter and is completely in your field's CARGO CONNECT™ circle: 20 • If both teams have separated their food packages from their field's helicopter: 10			
<b>TRAIN TRACKS</b> If the train track is repaired so that it rests completely down/west: • If the train has reached its destination, latched at the end of the tracks: 20			
<b>PRECISION TOKENS</b> Number of precision tokens left on the field is: 2: 15    3: 25    4: 35    5: 50    6: 50			
<b>FINAL SCORE</b> FINAL SCORE = SUM OF ALL VALUES IN THE "SCORE" COLUMNS			
<b>LOSE ITEMS</b> If the blade & Platooning Trucks, 6 Container Contents, 1 Package, Containers – 4 Gray, 1 Lime Green, 1 Blue, 1 Orange, 1 Yellow, 1 Red, 1 Purple, 1 Black, 1 White, 1 Hinged, 1 Airplane, 1 Truck, 1 Train, 1 Food Package, 6 Precision Tokens, & 1 Chicken Statue are lost: <small>If Professionalism* displayed at the robot game table:</small>			
<b>DEVELOPING</b> <b>ACCOMPLISHED</b> <b>EXCEEDS</b> 2                  3                  4			

# Types of Programming

## EV3:

- Block-based or Scratch-based
- Less condensed approach



## SPIKE Prime:

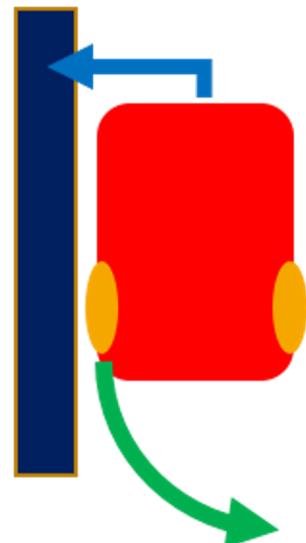
- Scratch or Micro Python
- Linear approach



# Programming Concepts to Learn Through FIRST

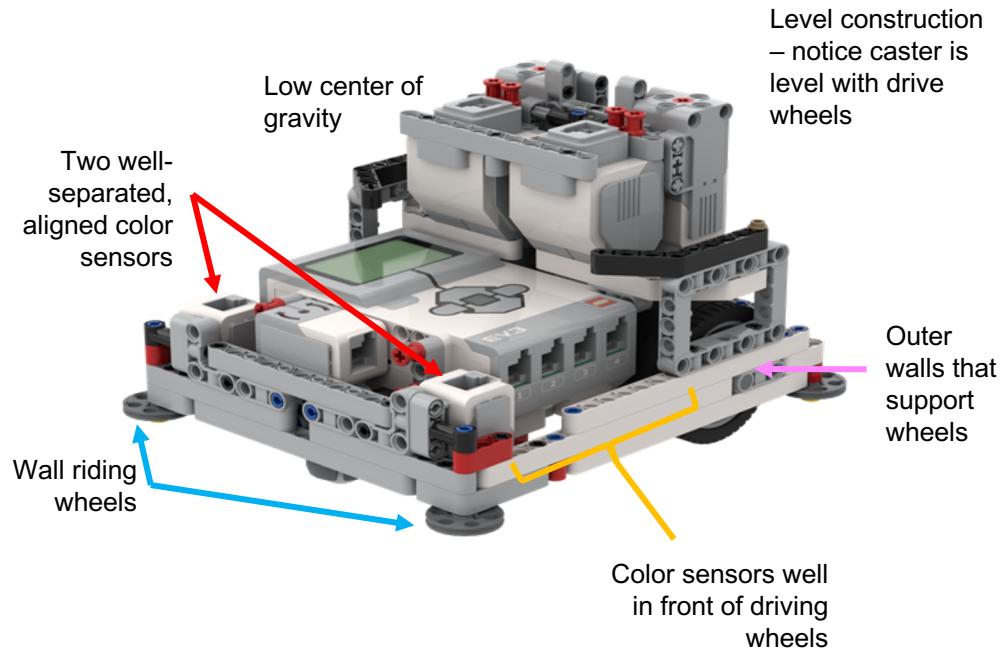
- Basic skills
  - Basic sensor usage, loops, switches, basic line following
- Intermediate skills
  - Custom MyBlocks, decision/logic blocks
- Advanced skills
  - Proportional control, PID line follower, gyro sensor usage, menu system

Figure 1



# Engineering Concepts you Learn Through FIRST

- Students learn physics and engineering concepts when designing a robot
- Some teams CAD their LEGO robots





# Robot Design Rubric

- How the team identifies what they need to do and how they do it
- Overall design of their robot
- What the team has created
- How the team tested their creations
- How well the team communicates how they've done in each of the other areas.
- Focus on all team members programming and building
- Team members test and document process

BEGINNING 1	DEVELOPING 2	ACCOMPLISHED 3	EXCEEDS 4
<i>How has the team exceeded?</i>			
<b>IDENTIFY</b> – Team had a clearly defined mission strategy and explored building and coding skills they needed.			
<input type="checkbox"/> Unclear mission strategy	<input type="checkbox"/> Partially clear mission strategy	<input type="checkbox"/> Clear mission strategy	<input type="checkbox"/>
<input type="checkbox"/> Limited evidence of building and coding skills in all team members	<input type="checkbox"/> Inconsistent evidence of building and coding skills in all team members	<input type="checkbox"/> Consistent evidence of building and coding skills in all team members	<input type="checkbox"/>
<b>DESIGN</b> – Team produced innovative designs and a clear workplan, seeking guidance as needed.			
<input type="checkbox"/> Minimal evidence of an effective plan	<input type="checkbox"/> Partial evidence of an effective plan	<input type="checkbox"/> Clear evidence of an effective plan	<input type="checkbox"/>
<input type="checkbox"/> Minimal explanation of robot and code's innovative features	<input type="checkbox"/> Partial explanation of robot and code's innovative features	<input type="checkbox"/> Clear explanation of robot and code's innovative features	<input type="checkbox"/>
<b>CREATE</b> – Team developed an effective robot and code solution matching their mission strategy.			
<input type="checkbox"/> Limited explanation of their robot and its attachment and sensor functionality	<input type="checkbox"/> Simple explanation of their robot and its attachment and sensor functionality	<input type="checkbox"/> Detailed explanation of their robot and its attachment and sensor functionality	<input type="checkbox"/>
<input type="checkbox"/> Unclear explanation of how code makes their robot act	<input type="checkbox"/> Partially clear explanation of how code makes their robot act	<input type="checkbox"/> Clear explanation of how code makes their robot act	<input type="checkbox"/>
<b>ITERATE</b> – Team repeatedly tested their robot and code to identify areas for improvement and incorporated the findings into their current solution.			
<input type="checkbox"/> Minimal evidence of testing their robot and code	<input type="checkbox"/> Partial evidence of testing their robot and code	<input type="checkbox"/> Clear evidence of testing their robot and code	<input type="checkbox"/>
<input type="checkbox"/> Minimal evidence their robot and code was improved	<input type="checkbox"/> Partial evidence their robot and code was improved	<input type="checkbox"/> Clear evidence their robot and code was improved	<input type="checkbox"/>
<b>COMMUNICATE</b> – Team's explanation of the robot design process was effective and showed how all team members have been involved.			
<input type="checkbox"/> Unclear explanation of robot design process	<input type="checkbox"/> Partially clear explanation of robot design process	<input type="checkbox"/> Clear explanation of robot design process	<input type="checkbox"/>
<input type="checkbox"/> Minimal evidence that all team members were involved	<input type="checkbox"/> Partial evidence that all team members were involved	<input type="checkbox"/> Clear evidence that all team members were involved	<input type="checkbox"/>

# Focus on the Engineering Design Process

**Step 1:** Analyze the missions and develop a strategy

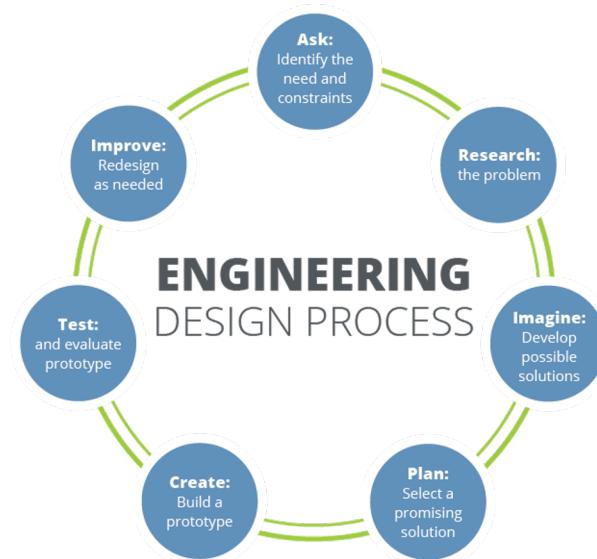
**Step 2:** Build and program a robot to meet that strategy

**Step 3:** Test the robot and make improvements as needed

**Step 4:** Develop solutions to individual missions

**Step 5:** Test out code and robot

**Step 6:** Iterate as needed



# Document Your Engineering Design Process

- How the team is following the engineering design process
- Document any changes made
- Document how much progress was made at every practice
- Document any new strategies
- Create goals for the next practice to plan what the team needs to work on next

Attachment Testing		Name:		
Date: Mission Name:	Attachment Tested			
	Test 1	Test 2	Test 3	
What worked well?				
What did not work?				
Next steps: What will you change or modify?				

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# Robot Testing is Very Important

- Test your runs 10 times to see if they work. If they do not, think about how to make them more reliable
- No two competition tables are alike
- Shift the mats, change tables, move the mission models slightly

Reliability										Name:	
<b>Instructions:</b>											
<ol style="list-style-type: none"> <li>1. Run each mission 10 times and see how reliable it was</li> <li>2. Work on your solution until it becomes more reliable</li> <li>3. Use FLLTutorial's Scorer to score your runs</li> </ol>											
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10	Total
Ex. M00	Yes	No	No	Yes	No	No	Yes	No	No	Yes	4/10
Points											12
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# Judging

- Create a presentation that showcases the work of the team (usually 4-5 mins)
- Explain the engineering process.
- Point out the greatest strengths and innovations in both building and programming





PROJECT



# Innovation Project is based on a yearly theme



2020-2021 RePlay Season - Help people get more active



2019-2020 City Shaper Season - Improve a building or space in your community



2018-2019 Into Orbit Season - Improve mental or physical health in space



2017-2018 Hydrodynamics Season - Improve the way people find, transport, use, or dispose of water.

# Research Project Process/Engineering Design Process

- **Identify** a problem
- **Design** a solution
- **Create** a prototype
- **Share** with experts
- **Iterate** your design



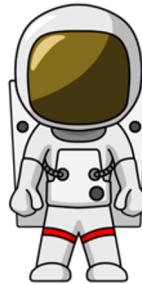
# Innovation Project Rubric

- Project Rubric includes the engineering design process
- Provides team with the process of how they are going to be evaluated
- Teams are asked to create a drawing/prototype, share the solution with others, and iterate the design

BEGINNING 1	DEVELOPING 2	ACCOMPLISHED 3	EXCEEDS 4
How has the team exceeded?			
<b>IDENTIFY</b> – Team had a clearly defined problem that was well researched.			
<input type="checkbox"/> Problem not clearly defined	<input type="checkbox"/> Partially clear definition of the problem	<input type="checkbox"/> Clear definition of the problem	<input type="checkbox"/>
<input type="checkbox"/> Minimal research	<input type="checkbox"/> Partial research from more than one source	<input type="checkbox"/> Clear, detailed research from a variety of sources	<input type="checkbox"/>
<b>DESIGN</b> – Team generated innovative ideas independently before selecting and planning which one to develop.			
<input type="checkbox"/> Minimal evidence of an inclusive selection process	<input type="checkbox"/> Partial evidence of an inclusive selection process	<input type="checkbox"/> Clear evidence of an inclusive selection process	<input type="checkbox"/>
<input type="checkbox"/> Minimal evidence of an effective plan	<input type="checkbox"/> Partial evidence of an effective plan	<input type="checkbox"/> Clear evidence of an effective plan	<input type="checkbox"/>
<b>CREATE</b> – Team developed an original idea or built on an existing one with a prototype model/drawing to represent their solution.			
<input type="checkbox"/> Minimal development of innovative solution	<input type="checkbox"/> Partial development of innovative solution	<input type="checkbox"/> Clear development of innovative solution	<input type="checkbox"/>
<input type="checkbox"/> Unclear model/drawing of solution	<input type="checkbox"/> Simple model/drawing that helps to share the solution	<input type="checkbox"/> Detailed model/drawing that helps to share the solution	<input type="checkbox"/>
<b>ITERATE</b> – Team shared their ideas, collected feedback, and included improvements in their solution.			
<input type="checkbox"/> Minimal sharing of their solution	<input type="checkbox"/> Shared their solution with user OR professional	<input type="checkbox"/> Shared their solution with user AND professional	<input type="checkbox"/>
<input type="checkbox"/> Minimal evidence of improvements in their solution	<input type="checkbox"/> Partial evidence of improvements in their solution	<input type="checkbox"/> Clear evidence of improvements in their solution	<input type="checkbox"/>
<b>COMMUNICATE</b> – Team shared a creative and effective presentation of their current solution and its impact on their users.			
<input type="checkbox"/> Presentation minimally engaging	<input type="checkbox"/> Presentation partially engaging	<input type="checkbox"/> Presentation engaging	<input type="checkbox"/>
<input type="checkbox"/> Solution and its potential impact on others unclear	<input type="checkbox"/> Solution and its potential impact on others partially clear	<input type="checkbox"/> Solution and its potential impact on others clear	<input type="checkbox"/>

# Identify a Problem

- Teams research a topic according to the yearly theme
- Team members need to:
  - brainstorm ideas within the topic
  - conduct research
  - take notes when doing research
  - be sure everyone is participating
  - be aware of existing solutions
  - keep an open mind for ideas



**INTO ORBIT** Sample:  
Identify a physical or social problem in space with long term space flight.

**Research Problem:**  
Due to little to no gravity in space, body fluids rush toward the head and extremities causing many problems for astronauts.

# Meet Experts

- Brainstorm what experts to contact
- Only choose experts who would benefit your team,
  - e.g. if you have an idea for an app, meet with a developer.
- Keep in mind that you can always meet with an expert virtually.
- Make sure that all team members can attend so that everyone can ask questions and learn as much as possible.
- Take notes to retain as much information as possible
- When meeting with an expert it is a good idea to take pictures to show the judges at your event



## Go on Fieldtrips

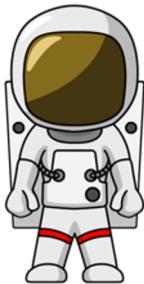
- Great way to learn about problems
- E.g. the Tiger Techs visited New York City to learn about the city's urban planning.
  - Taking a field trip doesn't have to be as big as going to New York City
  - Even a local park or city council
- Important to take notes so that you can reflect what you learned.
- Be sure to ask questions, take lots of pictures and observe as much as possible when taking field trips.



Field trip to US Airways to learn about engines

# Design And Create A Solution

- Teams take research and apply it to a new innovative design
- Design should improve something or be brand new
- A good way to start is with multiple drawings to get the team's idea on paper
- Continue to meet with experts for feedback
- Prototypes are required this year for project
- For advanced teams, CAD could be an option for a prototype
- Documentation should be kept throughout the entire process for a journal



## INTO ORBIT Sample Continued:

### Design:

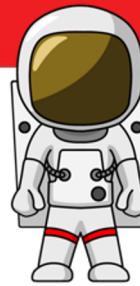
As a team, the Techs came up with many spacesuit designs based off of existing solutions.

For example, during a field trip we saw one existing solution at the Air and Space Museum in Washington, D.C.

### Create a Solution:

Using information learned during the research phase, we designed a prototype. The name of our suit was Shape Shift.

# Iterate



- Teams test designs and then continually improve them
- Any feedback given by experts should be used to improve design
- Documentation is important during this step
  - Record results from testing
- Continue testing until team is satisfied with the results

## INTO ORBIT Sample Continued:

### Iteration Process:

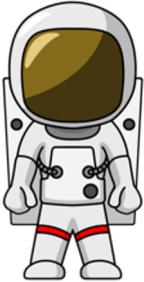
The team sampled several materials for the layers of the space suit.

Fasteners such as buttons, zippers and velcro were tested to determine how strong they would be.

We reached out to a space suit design company to provide feedback for our suit.

# Share With Experts

- Team's reach out to an individual, business, or an organization that would benefit from the solution and pitch idea to them
- Return to your original experts so that they can see the entire engineering design process
- Take feedback as a way to improve the design
- Sharing can be virtual or in person



## INTO ORBIT Sample Continued:

### Sharing with Experts:

The Techs shared their product with:

- a cardiologist
- professional athlete
- astronaut Mike Fincke
- biomedical engineer
- several experts at NASA



# GLOBAL INNOVATION AWARD



# What is Global Innovation Award?

- Started in 2011
- Showcases teams' innovative projects
- GIA requires teams to go more in depth with their project than before
- Many GIA teams get patents, meet leaders, etc.
- There is no additional cost to participate in GIA other than travel costs if you make top 20



## How do you qualify for it?

- Most regions nominate the top-ranked Innovative Solution team(s) from their Championship.
- Some have a separate judging process
- Nominated teams submit an application to qualify for the top 20
- Application has many essay questions about the project and solution
- The top 20 submit an Engineering Change document before they attend the final event if they have made any changes since submission



# What happens when you make Top 20?

- 20 teams semi-finalist compete at the annual event
- Prior to the event, teams create pitches
- At the event, teams present their idea to a panel of judges
- \$20,000 to help further develop product
- Teams interact with each other
- Teams meet experts in field
- Learn about patents and innovation





# GIA has a separate rubric

- Different from normal project rubric
- Rubric will help team think more in depth than before
- Teams who base strategy around rubric will excel

## Global Innovation Award Rubric

Team:

Submission Name:

For each criterion, select the box that best describes the team's accomplishments.

Beginning	Developing	Accomplished	Exemplary
<b>Problem Identification</b>		<b>Clear definition of the problem being studied</b>	
unclear; few details	partially clear; details missing	mostly clear; detailed	clear; very detailed
<b>Innovation</b>			<b>Degree to which the team's solution makes life better by improving existing options, developing a new application of existing ideas, or solving the problem in a completely new way</b>
existing solution/application	solution/application contains some original element(s); potential added value	original solution/application; potential added value	original solution/application; demonstrated added value
<b>Solution Development</b>			<b>Use of a systematic process to develop the solution, where alternative solutions are considered and narrowed, the chosen solution is evaluated and improved, feasibility of process solutions assessed</b>
process AND explanation need improvement	process OR explanation need improvement	systematic and well-explained, including evaluation or verification	process uses evaluation or verification across multiple steps
<b>Implementation</b>			<b>Consideration of factors for implementation (such as cost, ease of manufacturing, etc.)</b>
minimal factors considered; idea not feasible	some factors considered; idea may be feasible	factors well considered; some question about proposed solution	factors well considered and feasibility confirmed by professionals in the field
<b>Motivation to Implement</b> (check if demonstrated)	Team demonstrates motivation to implement (clear idea of a next step(s) to make a reality; OR consultation with a professional for advice beyond production, such as business, marketing, design, etc.; OR demonstrates strong desire to see the end-user's problem improve with this solution)		

## Comments:

Please provide 1-2 comments about this team's submission. Please write one comment describing something you liked about this idea and one thing you think the team can improve. Comments will be provided to the teams, so please make them positive and constructive.

# Why is GIA important?

- The GIA leaves a huge impact on teams
- Friendships are made over the few days
- Teams will meet experts and inspirational people
- Many teams will further develop their product and get patents
- These experiences will prepare teams for future FIRST programs



## 2010 Body Forward

- BOB-1 Hand Device by The Flying Monkeys of Ames, Iowa
- Low-cost prosthetic device
- Represented FIRST at the White House Science Fair
- June 16, 2015: U.S. Patent No. 8,840,157



## 2016 Animal Allies

- The H20 Post by The Hydrators of Oakville, Ontario, Canada
- The H20 Post (Horses Hydrating Outside) monitors the amount of water horses drink.



## 2020 City Shaper

- E-Wall by Aldeatron Robotix of the Canary Islands, Spain
- Low cost, lightweight, eco-friendly building block made from recycled cardboard and Fountain grass.



# QUESTIONS?

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