

# **2015 STEMpunk #4531 Build Log**

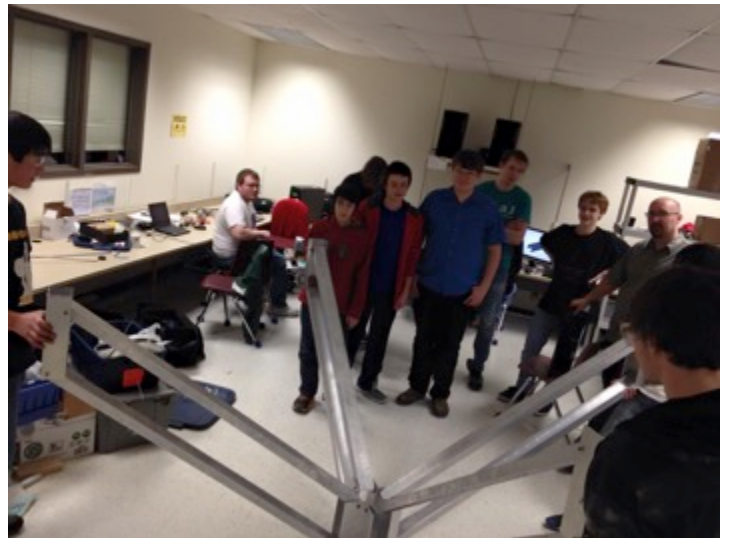
## **Week 4**

**Thursday 1-29-15;** The goal of the arms is to reach over the totes and pickup bins from the step in the center of the field. We realized that in order to clear the totes and pickup the bins our arms will be over the 7'6" height limit. We are devising ways to slide the arms up into position before the match to keep the transport height down.

**Wednesday 1-28-15;** Today we bolted all of the arms together and started putting what will mount the arms to the robot. They look sharp!

**Tuesday 1-27-15;** The other 3 arms were built this afternoon. There may be some misaligned hole problems, however like the first, they will be fixable. There wasn't time to assemble them, so that will need to be done tomorrow.

*Manual Update:*



[http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2015/2015GameManual0127.pdf](http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2015/2015GameManual0127.pdf)

*What Changed:*

[http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2015/TeamUpdateBundle0127.pdf](http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2015/TeamUpdateBundle0127.pdf)

**Monday 1-26-15;** Tonight we were able to get a final template for Dock-Ock built. There were some things about it we needed to buff out (slightly misaligned drill holes, binding in the joints etc. – fixable problems). Tomorrow we will be building the other 3 for the final robot. The roboRIO was re-imaged today. The roboRIO had its ip address switched from the test 4532 address to the official 4531 address.

**Saturday 1-24-15;** Made a pugh matrix to determine which arm we were going to use. You can find that pugh matrix below. Made a pugh matrix to determine which hand we were

going to use. You can find that pugh matrix below. A new type of arm was introduced today entitled Doc Ock. It is easily replicable and will have 3 other copies of itself onboard our robot. It will be layed out on our robot in an "X" pattern, and we will be able to pick up 4 bins/totes simultaneously on the 4 separate arms. Easily manufactur-able and simple to build. The design used on Armstrong will be applicable for Doc-Ock too.

## **Week 3**

**Friday 1-23-15;** We figured out how to clamp the bins/totes to the end of Armstrong.

*Game Manual Update:*

[http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2015/2015GameManual0123.pdf](http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2015/2015GameManual0123.pdf)

**Monday 1-19-15;** Parts list for the feet are done. Team was put together to focus on moving the arm. Rookies worked on programming. A camera was set up on the kit-bot. We will cad up the double 4-bar before building it. Figured out how we're moving top arms. Need people for media.

*Updated Q&A:* <https://frc-qa.usfirst.org/Questions.php>

**Saturday 1-17-15;** The aluminum chassis for the final robot was re-constructed today after some measurements were taken wrong. We are continuing working on the final design of a modified version of the double 4-bar linkage. We now have a single bar going up ~6ft, with a bar platform hanging down about 4'9". There was a group of people working on the kit-bot and managed to get the CAN bus working. The chassis and the lifting arms have been modeled in PTC Creo.

## **Week 2**

**Friday 1-16-15;** After some discussion it was decided to do a more precise prototype of a 4-bar linkage style device to lift/reach/stack the bins.

**Thursday 1-15-15;** Shipment of parts arrived from Andy Mark today for prototyping but we are really looking forward to the FIRST Choice parts coming tomorrow including seat motors and the new Talon motor controller.

**Tuesday 1-13-15;** Optional meeting today, prototyping began on a new type of reaching arm.

*Manual Update:*

[http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2015/2015TeamUpdates-asof0113.pdf](http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2015/2015TeamUpdates-asof0113.pdf)

*Game Manual Updates that were missed between original release and this update: 1-6-2015 and 1-9-15. Both of those updates are provided in the link above.*

**Monday 1-12-15;** Prototyping continued today but we are focusing on the lift/reaching arm and will detail the pickup mechanism/claw later. We need to decide on a lift mechanism so the mechanical team can CAD and start manufacturing the device.

**Sunday 1-11-15;** Prototyping continued on both the Grabbing Mechanism and the Reaching Arm

**Saturday 1-10-15;** Prototyping continued. The meccanum Drive on the kitbot got working today, and we were able to get about an hour of practice on it.

## **Week 1**

**Friday 1-9-15;** The nylon bevel gears arrived for that prototype to be completed. A full scale prototype was started for the 4-bar linkage. Our rookie members are nearly finished with the KitBot after having some trouble with missing gearbox parts. Tomorrow we will have a full prototype of our bin-acquisition mechanism and be able to start modeling the drivetrain in CREO!

**Thursday 1-8-15;** With 2 of the prototypes nearly ready for testing, the team began setting up last years kitbot for meccanum drive to test the code and become familiar with how meccanum handles. Nathan challenged the team to start thinking of ways to mount the claw/forklift to the robot and how to extend it's reach. Gabe did a 2 foot mockup of a 4-bar linkage that would accomplish this.

**Wednesday 1-7-15;** The team continued to work on the Bin acquisition prototypes and several rookie members continued assembling the kit bot.

**Tuesday 1-6-15;** A short captains meeting preceded the team meeting to discuss the teams path. We began prototyping the forklift, and 2 clamp designs. One claw consisted of bevel gears, driven by a shaft – each arm on the claw would move simultaneously. The other claw design was driven by pulley/rope system closing the arms to acquire the bin.

**Monday 1-5-15;** After yesterday’s discussion of drive bases, we today got into figuring out how the actual mechanism would work for picking them up. While there were many subdivisions of each mechanism that won out, the winners were Straight Clamp, Curved Clamp, and Forklift. Of those three winners, our team split up into different subgroups, doing basic mark up and designs of our ideas, though no prototyping happened.

<b><u>Bin Control Mechanism</u></b>		<i>Outside Perimeter Lasso</i>	<i>Hole Lid Turret</i>	<i>Handle</i>	<i>Hole Clamp</i>	<i>Clamp</i>	<i>Forklift from middle lip</i>
<b>QUALIFICATIONS</b>							
<b>5 = good / 1 = bad/hard</b>	<b>WEIGHT</b>						
Ease of Programming	4	4	3	5	4	4	5
Weight	5	5	2	3	4	3	3
Complexity	4	3	1	5	2	4	5
Reliability/ Strength	5	2	1	4	2	4	5
Ease of setup on Field	2	4	1	5	2	4	4
can it pickup a tote	2	2	1	3	1	5	4
Speed to Change States	3	1	1	3	2	5	4
Efficacy/ Number of motors	3	4	1	5	2	4	5
Fixability	3	3	1	5	2	4	4
Cost	1	4	1	4	2	4	5
Cool Factor	1	4	4	2	2	2	1
Ease of Manufacturing	4	3	1	4	2	4	4
<b>Totals:</b>		<b>119</b>	<b>53</b>	<b>152</b>	<b>90</b>	<b>146</b>	<b>157</b>

Prototyping should begin tomorrow, if not within the next couple of days. There were a few designs that required parts that we don’t have, so they will need to be ordered.

**Sunday 1-4-15;** Today we discussed the type of drive train we were planning on using. Discussed drive trains were meccanum, swerve/crab, tank, 2Omni Front/2Plaxion Back, and Darth drive (6 wheel drive with omni on front and back & plaxion in the center). Meccanum won out with 140 points, with 2 Omni/2 Plaxion coming in a close second at 138

STEMpunk # 4531 DRIVE-TRAIN Pugh matrix		Meccanum	swerve/crab	tank	2 omni/2 plaxion	
						QUALIFICATIONS
5 = GOOD/EASY      1 = BAD/HARD						
ease of programming		3	4	2	5	5
agility/maneuverability/precision		5	4	5	1	2
speed		1	3	4	5	5
cost		1	3	1	5	5
traction		1	3	5	5	4
complexity/ease of mfg		5	4	1	5	5
aesthetic		1	4	5	2	3
weight		4	3	2	4	4
power consumption/ # of motors		2	3	1	5	5
packaging		4	4	3	2	5
ability to play the game		5	5	5	1	1
reliability		4	4	1	5	5
<b>TOTAL</b>		<b>140</b>	<b>102</b>	<b>121</b>	<b>138</b>	

points.

Swerve/crab drive is being given a more serious thought this year. Plans are being made to order parts to tinker with the swerve/crab drive and add it to the kitbot. If it works well, and our final design is compatible, we will consider adding it.

Another interesting idea was introduced called the mini-bot. This would detach from the large robot and act independently of it, save for the single cord attaching the two so as to not officially be considered a different robot entirely. How implementable it will be in this game, however, is still tentative and is being discussed.

A poll was posted to Reddit and Chief Delphi asking what different team's strategies will be for the year. So far it seems that upwards of 75% have tote manipulation included as a main part of their strategy.

Strawpoll: <http://strawpoll.me/3338531/r>

**Saturday 1-3-15;** Today was kickoff. All team started out in the Valders High School Cafetorium. After the release of this year's game, Recycle Rush, we immediately split off into our different groups to more quickly dissect the manual for this year. Due to how many people there were, there were multiple groups for each section of the game that presented to everyone else. After that, each team individually split off into different rooms to start brainstorming.

After some discussion of different game strategies, we all took a vote, and we ended up voting on gathering the bins as a primary strategy with totes as a secondary. Gathering totes was a close second, losing by one vote - 9:10. After that our team split off to brainstorm for 5 minutes or so, we returned to the room and further developed our strategic ideas.

It was also announced that we will be meeting every day until the 15<sup>th</sup>

Manual can be found here:

[http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics\\_Programs/FRC/Game\\_and\\_Season\\_Info/2015/2015GameManual0113.pdf](http://www.usfirst.org/sites/default/files/uploadedFiles/Robotics_Programs/FRC/Game_and_Season_Info/2015/2015GameManual0113.pdf)