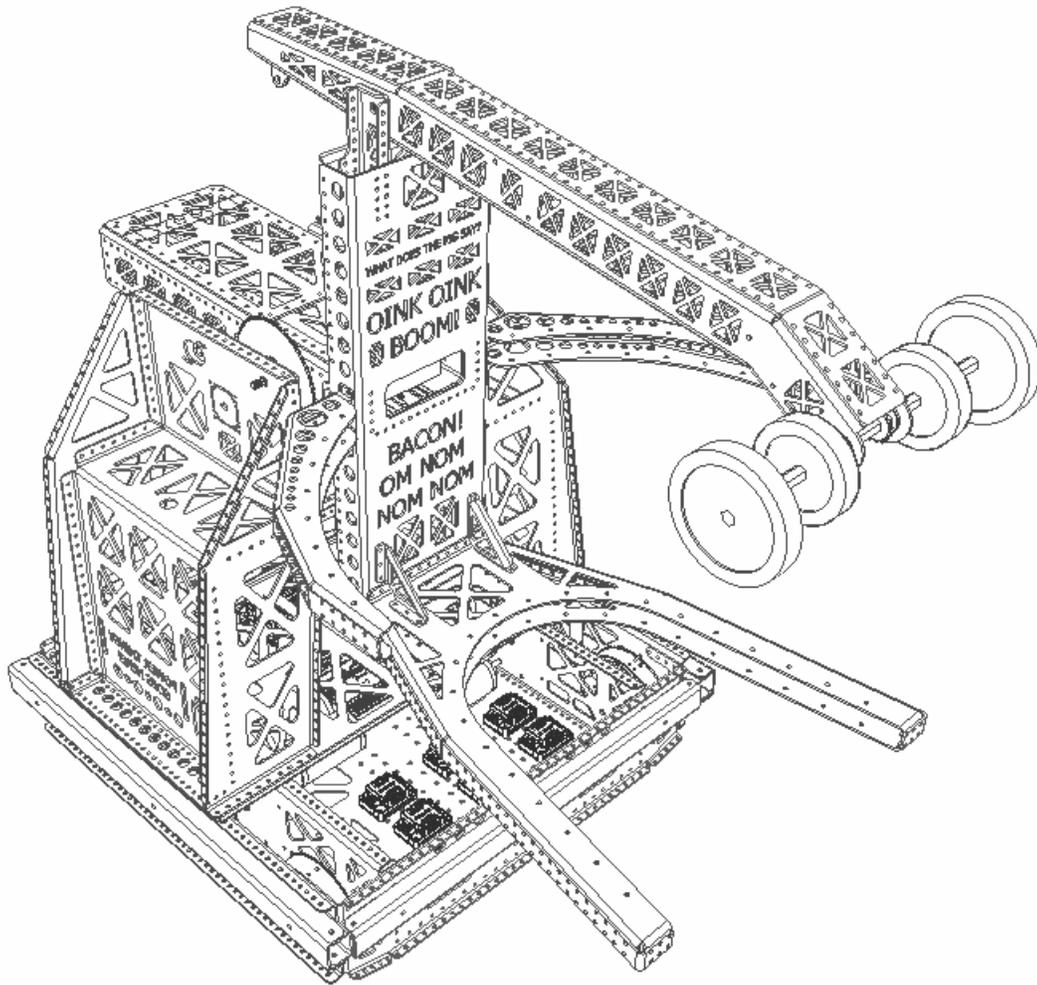


# Owner's Manual

Revision 1.0



2014 FIRST Robotics Competition  
Aerial Assist Robot  
"The Kung-Fu Pig Part 2:  
The Revenge of the Ball"

Model No.  
200620141902  
Serial No.  
00001 of 00001



CAUTION: Read and follow all Safety  
Rules and operating Instructions before  
FIRST using this product.

Assembled in the USA at: FRC Leads Garage, Orlando, FL from parts fabricated at Magnus Hi-Tech  
Industries, 1605 Lake St., Melbourne, FL  
For more information visit our web page: [www.explodingbacon.com/robot](http://www.explodingbacon.com/robot)

## **TABLE OF CONTENTS**

Warranty	2
Introduction	2
Specifications	3
Safety	4
The Game	5
Strategy	5
Design	6
Drive Base	6
Manipulator	7
Sponsors	8

### **WARRANTY**

#### **FULL ONE YEAR WARRANTY ON KUNG-FU PIG**

The robot covered by this manual is guaranteed to inspire kids to pursue careers in STEM fields for a period of 1 (one) year following the 2014 bag and tag date. In the event that this robot fails to give complete satisfaction, **RETURN TO EXPLODING BACON 6021 S. Conway Rd, Orlando, FL 32812 THE U.S.**, free of charge.

NOTE: This warranty does not apply to any failure (mechanical, electrical, software, workmanship, or materials), as these types of failures create unique challenges and only contribute more to the FIRST experience.

### **INTRODUCTION**

Congratulations! You and your team are now the proud owners of Kung-Fu Pig, a custom-built, one-of-a-kind FRC robot, specifically designed to play the 2014 AERIAL ASSIST game. This robot was carefully designed and built by 4-H Exploding Bacon Robotics Club, a dedicated group of high school and middle school students, and their mentors. The robot was conceived, designed, produced, and tested in exactly 45 days. It has the ability to quickly traverse the length of the field. It is designed to push other robots as well as resist being pushed. It can catch, throw, and pick up balls. It can be programmed to work autonomously. It can also be controlled remotely from a driver's station (included). It has everything a team needs to play the game, and play it well. It is an excellent tool for learning the importance of teamwork, dedication, perseverance, and gracious professionalism. The team that competes with this robot will be inspired and inspire others to accomplish their goals, whatever they may be.

## ***SPECIFICATIONS***

### Overall Robot:

Main Material:	0.125" aluminum sheet
Number of motors/speed controllers:	8
Number of pneumatic storage tanks:	1
Number of pneumatic cylinders:	4
Dimensions:	27" long X 28" wide X 59" tall (starting position)
Weight:	119.9 lbs (not including battery and bumpers)
Power Supply:	1 12 VDC 18Ah Sealed Lead-Acid Battery
Compressed air supply:	1 12 VDC 1.03 Cfm compressor, 120 psi
Working Pneumatic Pressure:	60 psi

### Drive Base:

Type:	6-wheel drive w/direct drive, dropped center wheel
Wheels:	6-inch AndyMark Performance Wheels
Transmission:	2 AndyMark supershifters with pneumatic shifting
Gear ratio:	Low: 24:1 High: 6:1
Speed:	Low: 5ft/s High: 20ft/s
Torque:	Low: 20ft lb High: 5ft lb

### The Punching Foot of Fury!:

Punching force:	225lb of force
Release force:	440lb of force

### The Clawww!:

Grabbing force:	32lb of force
Intake wheels:	4-7/8" in diameter, 4 wheels

## ***SAFETY***

Robots, like any other tool, can be dangerous if not operated properly. Always be aware of your surroundings and make sure others are aware of the robot.



Safety glasses and close-toed shoes are not just a safety precaution – they're a part of the FRC culture! Always wear them when working on or near your robot. Keep long hair tied back and tuck in loose clothing.



Aerial Assist robots shoot flying Balls at high speed. Never stand in front of a robot's Ball shooter. Do not load the shooter until the robot is ready to be operated safely. Do not fire Balls at people!



It takes a lot of energy to make a robot run, shoot, and hang. Don't release all of that energy at the same time by sticking a tool in the wrong place! Always unplug the battery before servicing the robot.

Exploding Bacon spends the first day of build season learning about the safe use of tools in the build space. Each student and mentor has to pass a safety test before using any equipment.

## ***THE GAME***

AERIAL ASSIST is played by two competing Alliances of three robots each on a flat 25' x 54' foot field, straddled by a truss suspended just over five feet above the floor. The objective is to score as many balls in goals as possible during a two (2)-minute and 30-second match. The more Alliances score their ball in their goals, and the more they work together to do it, the more points their Alliance receives. The match begins with one 10-second Autonomous Period in which robots operate independently of driver. Each robot may begin with a ball and attempt to score it in a goal. Alliances earn bonus points for scoring balls in this mode and for any of their robots that move in to their zones. Additionally, each high/low pair of goals will be designated "hot" for five seconds, but the order of which side is first is randomized. For each ball scored in a "hot" goal, the Alliance earns additional bonus points.

For the rest of the match, drivers remotely control robots from behind a protective wall. Once all balls in autonomous are scored, only one ball is re-entered in to play, and the Alliances must cycle a single ball as many times as possible for the remainder of the match. With the single ball, they try to maximize their points earned by throwing balls over the truss, catching balls launched over the truss, and scoring in the high and low goals on the far side of the field.

Alliances receive large bonuses for "assists," which are earned for each robot that has possession of the ball in a zone as the ball moves down the field.

## ***STRATEGY***

Exploding Bacon designed Kung-Fu Pig specifically to play AERIAL ASSIST. Before picking up a single wrench or writing a line of code, the entire team met and discussed what they thought would be required in this year's game. Here's what they came up with:

- Speed is very important, there's a lot of defense this year. Also, it is an open field with no obstacles (other than robots) and no safe zones.
- Pushing other robots may be necessary to get into position.
- Passing, shooting, and catching the balls are all very important. We need a general purpose robot that can do all of these tasks well.
- Autonomous mode is very important – if we don't get the autonomous balls out of play quickly (by scoring), we waste time getting rid of it during remote operations.
- This year, the robot must be very durable. We expect frequent high-speed collisions and we need to ensure our robot doesn't get disabled when it happens.



## DESIGN

The Exploding Bacon design process focuses on ensuring that the final design is a result of a team effort. Every student, mentor, and parent that comes to the meetings has an opportunity to have their ideas heard. Emphasis is placed on keeping the robot simple and practical while encouraging innovation and eloquence in design. The team relies heavily on the experience of the mentors when deciding what designs we should spend precious time prototyping. The team prototypes everything - sometimes two or three times over!

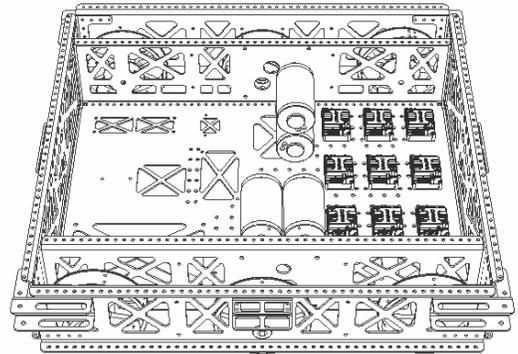
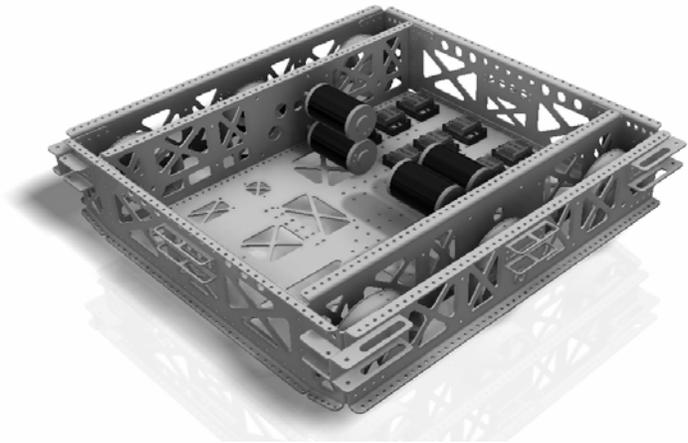
Normally, the final working prototype would be found on the final robot. Several of our mentors and students have been developing their CAD skills. Magnus Hi-Tech, a machine shop in Melbourne who just joined our team two years ago, donated machine time to fabricate our final parts! This extra step really improved the quality and reliability of the robot, and makes it look awesome!

### Drive Base

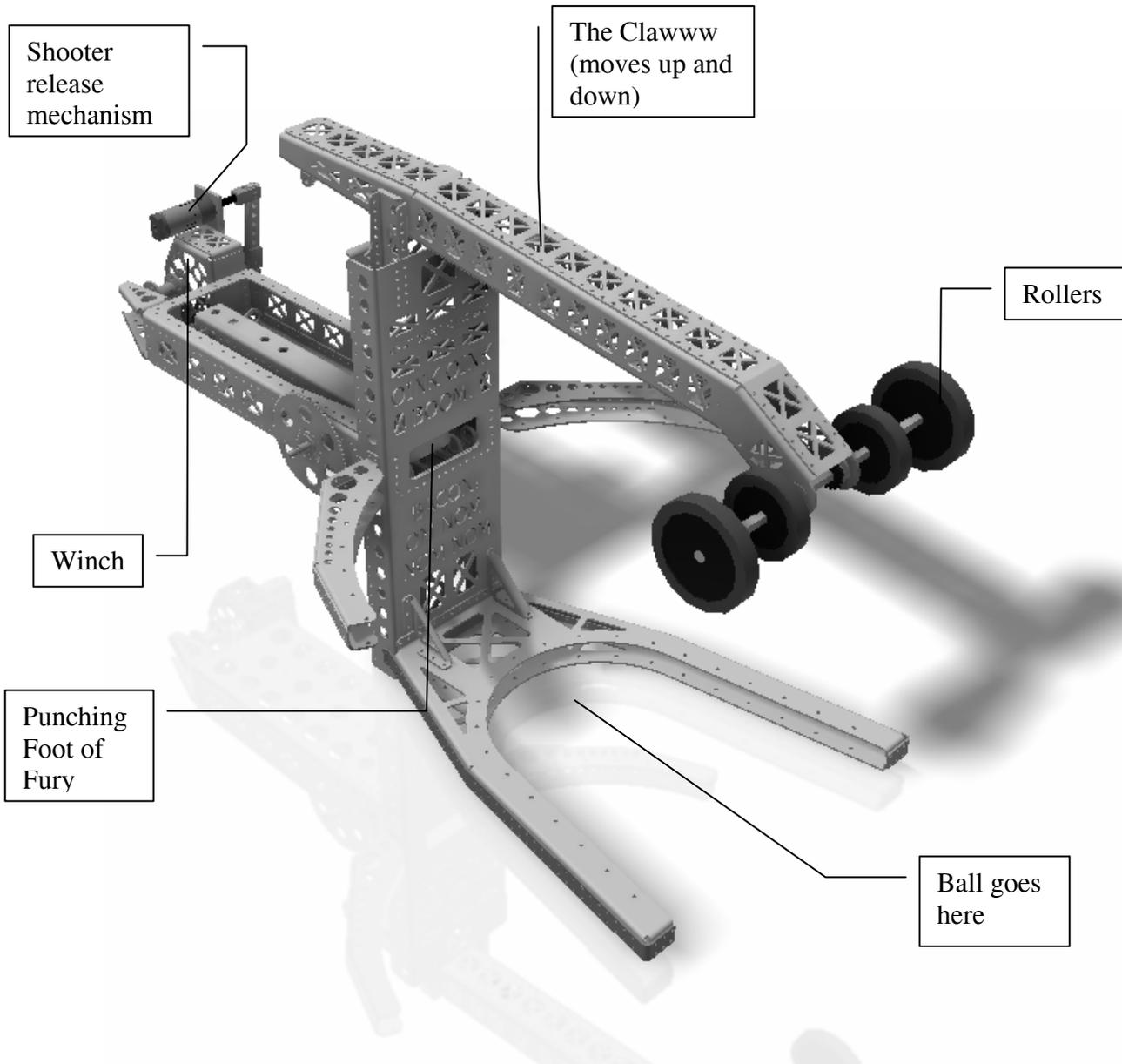
Exploding Bacon has been using custom-built, bent sheet metal drive base designs for years. This year's design builds on that experience and perfects it! The drive base provides structural support for every other component of the robot, so, above all else, it is strong! We have reinforced areas that have sustained damage in the past. We have removed material and used smaller shaft diameters to make the drive base lighter. We chose a 6-wheel, drop-center configuration to support our strategy of speed and power. The lower center wheel provides reduced resistance to quick turns by causing either the front or back wheel pairs to float above the floor by a fraction of an inch. The drive uses pneumatic shifters which are programmed to stay in high speed unless commanded otherwise by the driver. So, the driver only uses low speed for quick acceleration from a stop, pushing other robots, or precisely lining up for a shot. For everything else, the robot runs in high speed.

Each wheel's axle is supported on two sides for strength - no cantilevered axles! Every wheel is driven via chain. The middle wheels are directly driven by super-shifter shafts.

Therefore, any broken chains will not disable the robot! With two CIMs on each super-shifter, there is plenty of power to go around, whether you want to use it for speed or torque. Each CIM is precisely controlled by Talon speed controller. Kung-Fu Pig is a highly maneuverable, quick, strong, and smooth robot!



# Manipulator



**LOCKHEED MARTIN**

*We never forget who we're working for™*



**PARENTS  
GRANDPARENTS  
FRIENDS OF BACON**



**2014 Aerial Assist**

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