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### Best Bots

Local tech teams pick their favorites

08/24/17

By Ryan Lessard [news@hippopress.com](mailto:news@hippopress.com)

This year marked the 25th anniversary of the inaugural FIRST Robotics Competition, which took place in the Manchester Memorial High School gymnasium. And over the years, many athletic automatons built by New Hampshire high school students have competed in what has since become an international phenomenon with thousands of teams in the U.S. alone. Several rookie teams from New Hampshire have assembled in just the past year, with their robots making impressive debuts.

To celebrate the boxy, ambulatory machines and their makers, the Hippo has created an unofficial Hall of Fame for the best robots of southern New Hampshire. Each team that contributed to this selected its own top bot; here are their picks, in no particular order.

#### Spray and Pray

**Year:** 2017 (Steamworks)

**Team Name:** PowerKnights

**Team Type:** 4-H affiliated, with students from Goffstown High School and Manchester High School West

**Awards:** Excellence in Engineering Award: Southern NH Event in Bedford

**About the robot:** Spray and Pray looked like a box on wheels with a tube-frame chassis, but there was more than met the eye. According to team mentors Stu Lewin and Adam Martin, the robot was designed



Steam Phoenix  
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#### Dover Mini-Maker Faire

You can check out robot-like inventions and more at the Dover Mini-Maker Faire, happening Saturday, Aug. 26. Read the story on p. 26 for more on the event and its makers.

#### What is FIRST?

FIRST (For Inspiration and Recognition of Science and Technology) was founded by local inventor Dean Kamen as a way to get more young people involved in science and technology through mentor-based research and friendly competition.

The FIRST Robotics Competition is the flagship program geared toward high school kids, while other programs are offered to younger children. The FIRST Lego League is offered to kids in

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and built to be modular so students could make constant upgrades throughout the season and easily add and remove subsystems for the shooter mechanism. The robot was fast on the field and could climb a rope quickly. The three ways to score points in the Steamworks game were to shuttle large plastic gears and place them on a spring, shoot wiffle balls into a target that looked like a furnace or climb a rope. While the team hoped to do more with shooting balls initially, according to Martin, they ended up focusing primarily on shuttling gears and climbing ropes. Ultimately it worked out: The team finished eighth at the District Championship and qualified to compete at World's, though they couldn't afford to compete there. At the District Championship, they teamed up with two Manchester teams: CHAOS from Central High and FUSION from MST. There were about 25 students on the team. Leaders on the team included Josh Heger, Matt Dodge, Pat Dodge, David Gibson, Alex Rudolph and Christian Pribyl.

**Incendio****Year:** 2014 (Aerial Assist)**Team Name:** Cardinals**Team Type:** Affiliated with Bishop Guertin High School**Awards:** Chairman's Award: District Championship in Boston, Chairman's Award: Granite State Event in Nashua

**About the robot:** Incendio gets its name from the Harry Potter fire spell. The robot excelled in the Aerial Assist game, which involved grabbing two-foot-diameter balls and moving them from one side of the field to another. Robots would gain extra points by handing the balls off from one robot to another allied team's robot. Part of the game involved shooting the balls a great distance over a bar in the middle of the field.

"It had a pair of tennis racket-shaped arms to pick up the two-foot-diameter ball from the field and it had a very powerful catapult to throw the ball," said Tom Indelicato, the lead mentor.

What made this robot so successful was the clutch used to throw the balls. In earlier versions, Indelicato said, the clutch was made of aluminum or cast iron, but they settled on stainless steel when it gave the best results. In the design process, the team played with the idea of using a pneumatic piston to shoot the ball, but abandoned the idea because it wouldn't be powerful enough. One of the challenges they encountered during competition was with faulty Mecanum wheels — a type of drive that allows a robot to move in any direction, something the team had never worked with before — that would lose bearings constantly.

"One wheel lost eight of 10 bearings ... during a match. We were limping horribly," Indelicato said.

But it didn't slow them down. Incendio made it all the way to the World Championship in St. Louis.

There were about 55 students on the team that year and more than half were girls. The student leaders were Luke Yost and David Grossman.

**Chaos 6****Year:** 2000 (Co-Opertition)

grades 4-8, where they create a robot using Lego Mindstorms. FIRST Lego League Jr. is for kids aged 6-10, grades K-4, using Lego Education WeDo 2.0.

Baked into of the foundational ethos of the program is a concept called "Coopertition," which encourages kindness and respect even as teams compete. One of the ways it encourages this environment is by having each team create alliances with others (usually with two other teams) for the main competitions.

Every team needs two adult mentors and about 10 high school-aged students and a place to meet and build their robot, usually with the help of community sponsors. The season kicks off in January, when the parameters of the game, which change each year, are announced. Competitions at the district and regional level start in late February and continue through April, leading up to the World Championship at the end of April.

In the 2017 competition season, there were about 460,000 students participating.

Teams can be formed by high schools or as community clubs with students from multiple schools or homeschoolers. While most are after-school programs, some school-based teams are structured as actual classes.

Visit [firstinspires.org](http://firstinspires.org) for more.

**Where to make robots**

Kids don't have to have all the fun.

Makerspaces throughout the state offer places where people of all ages can tinker, invent and even build robots of their own — just for the heck of it. With a regular monthly membership, folks can use the space and the available community tools and machines to design and develop their own creative constructions.

**MakeIt Labs** (25 Crown St, Nashua, (978) 226-3266, [info@makeitlabs.com](mailto:info@makeitlabs.com),

[makeitlabs.com](http://makeitlabs.com)) hosts the Nashua Robot Builders group ([nashuarobotbuilders.org](http://nashuarobotbuilders.org)) on the third Sunday of every month at 6 p.m. They also host the New Hampshire Robot Operating System meetup on the second Sunday of every month at 6 p.m.

**Manchester Makerspace** (36 Old Granite St., Manchester, [contact@manchestermakerspace.org](mailto:contact@manchestermakerspace.org), [manchestermakerspace.org](http://manchestermakerspace.org))

**Port City Makerspace** (68 Morning St., Portsmouth, 373-1002,

**Team Name:** CHAOS**Team Type:** Affiliated with Manchester Central High School**Awards:** 1st Place Winners: Regional Competition in Connecticut. 2nd Place Finalist: National Competition in Epcot Center, Florida**About the robot:** CHAOS 6 is the oldest robot in this hall of fame. As such, it earned many of its achievements in a different era for the FIRST Robotics Competition that veteran mentor Dave Kelso likes to think of as the "good old days" when there were fewer teams nationally and everyone knew everyone else. Still, CHAOS 6 has a hard reputation to beat. In a game that involved placing balls in a trough that was about six feet high in order to score points, the robot was one of the very rare ones that could also remove the balls from an opposing team's trough. That skill led them all the way to the National Competition in Florida.

"There were like 270 teams at the event and there had to have been less than 10 that could in any way successfully remove a ball," Kelso said.

Most balls were yellow, which were worth one point each, and there were also two black balls on the field worth five points each. Kelso said collecting those black balls was a critical part of their strategy.

CHAOS 6 moved quickly on the field in its default position, during which it was no taller than one's knees. But it had the ability to extend upward, which enabled it to remove balls as easily as place them. There were about 25 students on the team that year. The drive team included Keith Liadis, Justin Bourque and Dave Carter.

**Miss T****Year:** 2017 (Steamworks)**Team Name:** FUSION**Team Type:** Affiliated with Manchester School of Technology**Awards:** Winner of Greater Boston Event in Revere, Highest Rookie Seed: Greater Boston Event, Rookie All Star Award: Greater Boston Event, Rookie Inspiration Award: Granite State Event in Windham**About the robot:** For a rookie year, FUSION's inaugural robot, Miss T, performed admirably. Miss T is a phoneticization of the Manchester School of Technology's acronym, MST, according to head mentor Andrew Nicholas. At Miss T's first district event in Windham, she experienced some issues with her climbing mechanism getting stuck, but the students learned quickly from their mistakes during that game.

"The kids learned a ton. They were drinking from the fire hose, essentially," Nicholas said.

After a few adjustments that included arms that guided the rope away from the sides where it would snag, the bot became one of the best climbers in subsequent events, such as the Greater Boston Event, where they won, and in the District Championship, according to Nicholas.

"We did great actually. As an individual robot, we scored enough points to be one of the alliance captains," Nicholas said. "Which is a big deal."

The robot scored enough points from that to enter the World Championship.

There were about 20 team members. Team leaders included Alycia Ashby, Nick Carrero, Megan Michaud and Dylan Bleau.

**Steam Phoenix****Year:** 2017 (Steamworks)**Team Name:** Team Phoenix**Team Type:** Regional club hosted by the Academy for Science and Design in Nashua**Awards:** Innovation and Design Award: District Championship in Durham, Entrepreneurship Award, District Championship, Entrepreneurship Award: Southern NH Event in Bedford, Innovation in Control Award: Worcester Polytechnic Institute Event**About the robot:** Steam Phoenix was basically "a big tub," according to the team's current student leader, Ben Brockway. He said the rectangular robot's most prominent feature was a hopper that held balls or gears that needed to be shuttled. But the team is most proud of its control board inside the machine. It was

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**MAxT Makerspace** (1 Jaffrey Road, Peterborough, info@monadnockartxtech.org, maxtmakerspace.org) hosts a workshop called "Arduino, Pi and Pizza" every Thursday from 6:30 p.m. to 9 p.m.

**Claremont MakerSpace** (46 Main St., Claremont, claremontmakerspace.org). This makerspace just began construction on Aug. 14. Visit the website for more info.

contained by a 3D-printed box that held the battery inside and all the components around the battery. This proved to be a super-compact way to house the electronics, especially in contrast to laying it out flat as most teams do. But it was also easy to replace. The team had two control boxes built and ready to go so if something ever happened to the primary box, they could swap it out quickly and easily. Steam Phoenix was designed to earn points in all three ways allowed by the game, but it had problems with the camera that helped the ball shooter aim. But the climber worked well, especially after mid-season upgrades with Velcro. Brockway said this is the first year the robot had a lot of 3D-printed parts. The robot didn't ultimately qualify for World's and the team's 2015 robot got further in the competition, but they selected the 2017 bot because they were proud of the innovations with the control box and the Innovation and Design Award they won at the District Championship, something the team had never earned before. There were about 60 team members. Team leaders included Sabra George, Aasha Krishan, Ben Frothingham, Erik Christensen, Ben Nichols-Farquhar and Liam Bewley.

### **Hungry Toaster**

**Year:** 2017 (Steamworks)

**Team Name:** Tidal Force

**Team Type:** Affiliated with Concord High School

**Awards:** Judge's Award: District Championship, Creativity in Control Award: Southern NH Event in Bedford,

**Creativity Award:** District Event in Reading, Mass.

**About the robot:** This year's robot was named Hungry Toaster, just as the previous robot was named Flat Toaster.

"It's a bit of a theme that we have going with toasters," said Emily Soule, a team member who provides public relations support.

The team has been around since 2006, but this year's bot stands out competitively.

"This was the first year that we had major success," Soule said. "We went all the way to World's."

The bot focused on shuttling gears and climbing ropes. It grabbed gears using a passive V-shaped slot.

"There's no moving parts on it, which made it a lot easier to design and build with the time constraints that we had," Soule said.

It was very efficient with the gears, according to Soule. During a match, they were able to deliver about six or seven gears, one time as many as eight, which Soule said is on the high end.

Soule said the Hungry Toaster had the best climbing mechanism in New England. The climbing motor — a gypsy motor like the kind used to lift anchors — can lift an entire metric ton without backdriving.

This year, the team had to deal with rapid growth. Last year it had five members, but that grew to 30 by the start of this season, about 15 of whom were active members.

"We had a lot of newbies who didn't know what was going on, including myself," Soule said.

Leaders on the team included Brennan Macaig, Caleb Marcel, Zach Samenfeld, Zach McMenemy, Josh Shamash and Abby Maynard.

### **Two-Face**

**Year:** 2017 (Steamworks)

**Team Name:** Crusaders

**Team Type:** Affiliated with Manchester Memorial High School

**Awards:** Winner of Southern NH Event in Bedford, Imagery Award: Southern NH Event, Imagery Award: Granite State Event in Windham

**About the robot:** As with this year's bot, the Crusaders like to name their bots after things or characters from the Batman universe, Two-Face, of course, being one of the villains. The color scheme of the robot, black and yellow also fit the Batman theme. Lead technical mentor Jonathan Bryant said the students build two robots, one for competition and another for practice. They named the practice bot Harvey, after Two-Face's alter-ego. Like many bots in the Steamworks competition, they were able to shuttle gears and climb ropes, but they went the extra mile by being able to shoot "fuel," the game name for wiffle balls that are meant to be shot into a target that looks like a steam furnace.

"It takes in these balls and ... it can hold about 50 of these five-inch wiffle balls," Bryant said.

Then it shoots the balls at a rate of about five balls per second. The shooter mechanism can also turn 180 degrees, which was the inspiration for the name.

Bryant said the shooter had an accuracy rate of about 60 percent, but it helped boost their points enough to make it to World's. The team chose this bot because it got further than past robots were able to get in the competition.

"We wanted to perform on a higher level," Bryant said.

Its climbing mechanism enabled them to climb about 75 to 80 percent of the time, according to Bryant.

Still, it was difficult to make two robots. Harvey, the practice bot, helped the team fine-tune its software and experiment with possible upgrades while their main bot was bagged and sealed after the six-week design period ended.

There were about 25 team members. The leaders included Matthew M., Camryn A. and Sara B.

### **Lexy**

**Year:** 2016 (Stronghold)

**Team Name:** The Metal Vidsters (currently The Big Red)

**Team Type:** Affiliated with St. Paul's School in Concord

**Awards:** Winner of UNH District Event, District Championship Points Qualifying Team: Pine Tree Event in Lewiston, Maine

**About the robot:** Named after how much Lexan polycarbonate was used to make the bot, Lexy was a multi-purpose robot. Lead mentor Will Renaud said it was originally designed to be an offensive robot that would shoot balls into castle windows. The Stronghold game that season was modeled after medieval siege warfare. But later, Lexy was redesigned to be more defensive, with a shield to block shots from enemy robots. Other allied teams asked them to make the switch in order to change up the team dynamic, so they dismantled the shooter they originally built.

"It was a defensive robot that would climb," Renaud said.

The climbing mechanism was powered by a big pneumatic cylinder with eight air tanks.

Some of the students even had to learn sewing in order to create a reversible bumper and a banner for the driver's station, according to Renaud.

At St. Paul's School, the FIRST Robotics team is organized as a class rather than a club, Renaud said. As such, each year is like a rookie year because it's constantly getting replaced with new blood.

That can be a challenge when it comes to competing, but they were still able to walk away with the first-place prize at the UNH District Event that year.

There were about 50 students on the team. The captains included Karlee Koswick, Sam Caccavale and Makale Camara.

### **Torque-Nado**

**Year:** 2017 (Steamworks)

**Team Name:** Morpheus

**Team Type:** Regional club based in Concord

**Awards:** District Championship Finalist: District Championship in Durham, Creativity Award: Southern NH Event in Bedford

**About the robot:** Torque-Nado was a jack of all trades in the Steamworks competition. It was able to shoot balls into the boiler, carry gears and climb ropes. But on top of it all, it was able to pick up the gears that had been dropped onto the ground by other players along the way. This was an uncommon ability as many robots had passive catch-and-release systems for taking gears off their racks and placing them on the objective. Team captain Daler Kang thinks the mechanism they used to pick up gears was the most creative aspect of the robot. It had wheels that sucked the gear into the robot and stood it upright so it could be placed properly.

Another difficult feature to master was the shooter. Kang said it took a lot of trial and error to get it right, but eventually it had achieved about 80 percent accuracy.

At one point there was a crisis involving a climbing attempt when the rope the robot was climbing snapped mid-climb and the bot came tumbling down and the climber broke.

Despite the challenges, the team got second place in the District Championship. It was only the second time the team has made it to World's, where it placed 12th in its division.

"If we had one more match, we would have been in the top eight and we would have moved on," Kang said. "It was pretty close."

Morpheus is a relatively small team with about seven team members. Besides Kang, team leaders included Will Spear, Ajay Kancherlapalli, Isaac Miskoe, Nick Gagne, Julie Meisser and Srilekha Nuli.

### **Wingman**

**Year:** 2014 (Aerial Assist)

**Team Name:** Windham Windup

**Team Type:** 4-H affiliated club with students from Windham and Salem.

**Awards:** Winner of Archimedes Division of World Championship in St. Louis, Missouri, Winner of UNH District Event, Winner of Northeastern University Event, Chairman's Award: UNH District Event

**About the robot:** At the center of Wingman was a sort of cradle on a spring that could be used to shoot two-foot-diameter balls from the right or left side. It was named Wingman because of the mechanisms on its sides that would pick up the balls on its sides with rollers. When the mechanisms were extended outward, they had the appearance of wings. The tricky part of the robot's design, according to lead mentor Scott Kukshel, was figuring out how to shoot it with just the right power.

"The interesting thing about it was ... how to impart energy into the ball to get it to fly as far as we wanted and still do that within a small area," Kukshel said.

Ultimately, the team decided to make Wingman push the ball out, but they needed to devise a strap that would tighten underneath the ball as it pushed up so it would pop out at just the right speed.

"The secret weapon was that strap," Kukshel said.

Wingman had a bicycle brake installed to keep to keep the launcher locked into place before shooting.

The robot did very well in competition. It won two district events and made it as far as winning its division at World's and competing in the final championship round.

"Getting to play in the final championship round is quite an accomplishment that only a few New Hampshire teams have done," Kukshel said.

There were about 30 team members. Leaders included Jake Mathews, James Bedard, Dan Browne and Eric Chin.

### **Alice**

**Year:** 2016 (Stronghold)

**Team Name:** Red Storm

**Team Type:** Affiliated with Bedford High School

**Awards:** Pit of the Day Safety Award: Granite State Event in Windham

**About the robot:** Alice was able to do it all, from collecting and shooting balls to opening doors and getting past the myriad obstacles that earned the team points in the Stronghold game.

"We wanted to be able to accomplish every task, get around as many obstacles as possible," said Eric Huffman, the team's current student CEO. During the 2016 season, he was the team's documentarian.

He said the drivetrain was built to overcome every obstacle, including jumping over a rock wall with just the right amount of speed. One of its most stand-out features was an "arm" that was able to extend out and gather up balls or open doors. But its most unusual ability, according to Huffman, enabled it to climb up towers for a bunch of bonus points.

"The way we did it was fairly unique," Huffman said.

The climber used 3D-printed pieces, a talon motor on a rod with tape measures around it.

It was especially rare to see that in the early competitions, he said. So, while it didn't get as far as the District Championship, the team was very proud of this robot.

The team had about 30 members and the leaders included Brian Mailhot and Cami Cruz.

### **Wingin' It**

**Year:** 2017 (Steamworks)

**Team Name:** PVC Pirates

**Team Type:** Affiliated with Londonderry High School

**Awards:** Championship Subdivision Winner: World Championship - Archimedes Division in St. Louis, Winner of Granite State Event in Windham, Creativity Award: District Championship in Durham

**About the robot:** According to mentor Mike Pettengill, the goal with Wingin' It was to keep it simple. The fewer complicated things attached to it, the fewer things to go wrong. And that turned out to be a successful strategy, he said.

"Our primary goal was the climbing because we knew it was guaranteed points every single match," Pettengill said.

Second to that on the priority list was the gear shuttling objective. At first the mechanism Wingin' It used was passive, but right before the six-week design season came to a close, the team made a significant alteration to the mechanism that made it more active, enabling it to pick gears up from the floor.

"That was probably the single biggest breakthrough for the season for us," Pettengill said.

He said this was definitely the team's most successful robot when it came to competitive achievement. They won the Granite State Event and when they got to the World Championship they got into the final rounds of the Einstein Division.

There were about 30 to 35 active team members, according to Pettengill. Leaders included Bethany Costello, Amanda Graf, Adrianna Belanger, Andrew Browne and Mackenzie Conner.

### **Bermanator**

**Year:** 2016 (Stronghold)

**Team Name:** Tough Techs

**Team Type:** A regional club based in MakeIt Labs in Nashua with students from Nashua High School North, Nashua High School South and elsewhere

**Awards:** Judge's Award: UNH District Event

**About the robot:** The Bermanator was designed to overcome obstacles and the team had to overcome obstacles of their own to build it. The robot was named after Jerald Berman, a physics teacher at Nashua High School South who died of a heart attack at the end of the previous season, according to team member Harrison Pound.

Bermanator is just under a foot tall, short enough to drive under the low bar obstacle, something Pound estimates only about 40 percent of robots were able to do.

It was also able to use an arm-like appendage to open gates and drawbridges. The arm had a "shoulder" motor and an "elbow" motor to add dexterity.

"We could do everything except for the rock wall," Pound said.

Pound concedes there were some robots made by the Tough Techs team back in the 1990s that made it further in the competition but all the data and pictures from those days were accidentally lost on a school hard drive. Still, the Bermanator stands out among the best recent robots because it was the first time in about a decade they were picked to be an alliance captain. Alliance captains are the top eight teams going into the playoff rounds.

There were about 35 team member on the team that year. Captains included Lauren Ritter and Taylor Frothingham.

### **E.W.T.**

**Year:** 2016 (Stronghold)

**Team Name:** The Wire Clippers

**Team Type:** Affiliated with New Heights and Portsmouth High School

**Awards:** Rookie All Star Award: UNH District Event, Rookie Inspiration Award: Pine Tree Event in Lewiston, Maine

**About the robot:** E.W.T. is pronounced "oot" and stands for "Eh, we tried," according to mentor Wayne Moulton. He said the humbly named robot went through a dramatic transformation over the season. It started out as a plywood box that contained electronics. They later drafted a metal box between the first and second district competitions. All told, the robot did very well as the rookie team's first robot.

"The team did win two awards our first year," Moulton said.

E.W.T. was especially good at overcoming certain obstacles on the field like the sally port and holding them open for allied robots to cross through for additional points. The robot was also good at shooting balls in the lower target windows.

The team opted out of trying to design a climbing mechanism for their robot that year, which was an optional feature in the game that could be deployed for bonus points.

There were 13 team members.

### **King Tote-N-Can-Um**

**Year:** 2015 (Recycle Rush)

**Team Name:** Mechanical Mayhem

**Team Type:** A regional club based in Milford made up principally of home schoolers

**Awards:** Winner of the District Championship in Worcester, Mass., Winner of Northeastern University Event, Winner of Granite State Event in Nashua, Winner of UMass-Dartmouth Event, District Chairman's Award: Northeastern University Event, Innovation in Control Award: Granite State Event, Entrepreneurship Award: UMass-Dartmouth Event, Excellence in Engineering Award: District Championship

**About the robot:** King Tote-n-can-um could stack a bunch of tote-style recycling containers onto itself to score points. Team alumnus David Gray said it was able to do it quickly and efficiently because it was equipped with mecanum wheels that allowed it to move side by side as well as forward and backward. With a long list of awards, including winning three district events and the District Championship that year, the King was one of the most successful robots in the history of Mechanical Mayhem.

Gray said the robot used a pneumatic claw to pick up the totes. At first it could stack as many as four at a time, but later the team upgraded the bot so it could stack up to five.

There were about 30 team members that year. Besides Gray, leaders included Nick Garcia and Kaileb O'Neil.

### **"Tardis"**

**Year:** 2017 (Steamworks)

**Team Name:** The Blue Devils

**Team Type:** Affiliated with Salem High School

**Awards:** District Championship Rookie All Star Award, Rookie All Star Award: North Shore Event in Reading.

**About the robot:** The robot nicknamed "TARDIS" after the space-time-ship used in the popular Doctor Who TV series was not technologically complicated, according to lead mentor John Seeman. But one could say it's figuratively bigger on the inside, with a passive gear-grabbing system and an effective climbing mechanism powered by a single motor.

"We were able to climb in less than 10 seconds," Seeman said.

In fact, the "TARDIS" was able to climb in every match it played in, he said, making this the robot's most favored feature.

While the robot didn't earn enough points to compete in the District Championship, it earned awards at other district events and was able to win the Rookie All Star Award at the District Championship through an interview process. Seeman said they were one of two teams in all of New England to receive that honor.

The team had about 15 members. The team captains included Nick P. and Joe D.

### **Zeppelin**

**Year:** 2017 (Steamworks)

**Team Name:** The Force Team

**Team Type:** Affiliated with Hollis-Brookline High School.

**Awards:** Winner of Southern NH Event in Bedford, Winner of District Championship in Durham, Silver Medal on Carver Field: World Championship

**About the robot:** The robot shuttled balls and gears and was able to climb ropes at the end the match, according to mentor Sue Hay. Zeppelin was on winning alliances at the district level did fairly well at the national level. There were about 50 students on the this this year.



**Bertha****Year:** 2017 (Steamworks)**Team Name:** MV roboPride**Team Type:** Affiliated with Merrimack Valley High School in Penacook**Awards:** Rookie All Star Award: Southern NH Event in Bedford, Highest Rookie Seed: Southern NH Event,**Rookie Inspiration Award:** Greater Boston Event in Revere

About the robot: Bertha's claim to fame, according to lead mentor Jeff Dutton, was how inexpensive she was to build.

"We were pretty proud of ... the simplicity and the budget that we did it on," Dutton said.

Out of an allowed budget of \$4,000, the team only spent \$350 overall. When they would hand in the itemized budget for judges to review, it covered one side of a single sheet of paper, he said.

Bertha even had pieces of old wooden bleachers the high school had removed attached to her. This was the team's first robot as it was their rookie year in the competition.

"It was a very new experience for all of us," Dutton said.

Bertha focused on moving gears and climbing. The team was able to make her climb about 80 percent of the time, Dutton estimates.

The robot also used a passive gear mechanism.

There were about a dozen team members. Captains included Gabe Jaquith and Jasmine Gormley.



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