2022-2023 POWER PLAY Season

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A MESSAGE OF APPRECIATION

“We are grateful for your generous support of our team and our mission.”

About FTC ENIGMA 16265

Enigma 16265 is an 8yr First Tech Challenge Robotics team in Albuquerque, NM. We are a community team working out of the Manzano High School Teen Tech Center,

By the Numbers

4 Team Members	**7** Engineering Mentors	**6 Weeks** Vroomba Build Time	**6 Cone** Autonomous
4 Official Events	**21–15–1** Overall Match Record	**3** Event Finals	**1-1** Inspire Award / Winning Al-liance

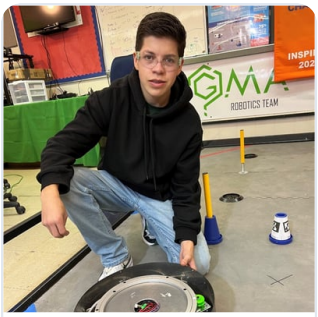
Connect with the team

Team Instagram: https://instagram.com/enigma.robotics
Team Facebook: https://www.facebook.com/enigma.robotics.program
Team YouTube: https://www.youtube.com/channel/UCziMRJj5j_hRYlwlJgXOjoQ
Team Website: https://enigmaftc.com/

Students

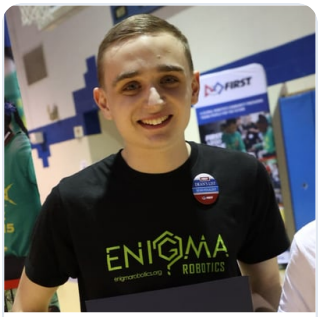
Callie W.

- Builder
- Wiring & Soldering
- Electronics
- Drive Team
- Human Player
- Assembly
- Outreach
- Fundraising
- Portfolio / Notebook
- Drive Coach



Felix M.

- Team Co-Captain
- Drive Team
- Driver Mechanisms
- Builder
- Fabricator
- Wiring & Soldering
- Electronics
- Skilled 3D Prints
- Design & Prototype
- Team Spirit
- Game Manual Expert
- Judging Awards
- Outreach
- Fundraising
- Skilled CNC Mill
- Skilled Bandsaw
- Alumni



Gray S.

- Team Co-Captain
- CAD Designer
- Builder
- Drive Team
- Driver Chassis
- Skilled 3D Prints
- Wiring & Soldering
- Electronics
- Skilled CNC Mill
- Founding Member
- Team Spirit
- Skilled Bandsaw
- Design & Prototype
- Game Manual Expert
- Judging Awards
- Portfolio / Notebook
- Assembly
- Fabricator

Luke C.

- Team Captain
- CAD Designer
- Builder
- Fabricator
- Assembly
- Wiring & Soldering
- Electronics
- Portfolio / Notebook
- Outreach
- Skilled Bandsaw
- Design & Prototype
- Game Manual Expert
- Judging Awards
- Team Spirit
- Skilled CNC Mill

Coaches and mentors

LEIDOS

Renzo D.
Sponsor Liaison

D

Denise L.
Sponsor Liaison

- Systems Mentor
- Quality Control

FTC ENIGMA 16265

Russell M.
Coach #1

- Shop Admin
- Build & Fabrication
- Java Programming
- Wiring and Electronics
- Quality Control
- Machine Training
- Systems Mentor
- Design
- Game Strategy
- 3D Prints Mentor
- Media Production
- Robotics Ambassador
- CAD Training
- Mechanical Engineering

Dan C.
Coach #2

- Team Administrator
- Safety Coordinator
- Quality Control
- Game Strategy
- Robotics Ambassador
- Media Production
- Design
- 3D Prints Mentor

Renzo D.
Mentor

- Systems Mentor
- Electrical Engineering
- Build & Fabrication
- Wiring and Electronics
- Quality Control
- Robotics Ambassador
- Game Strategy
- Mechanical Engineering
- Design
- Robotics Control Systems

Isabel M.
Mentor

- Robot Driving
- Build & Fabrication
- Java Programming
- Quality Control
- Game Strategy
- Robotics Ambassador
- Robotics Control Systems
- Applied Mathematics
- Computer Science
- Systems Mentor
- Design
- FIRST Alumni

Dave C.
Mentor

- Java Programming
- Game Strategy
- Computer Science
- Quality Control
- Applied Mathematics

Matt W.
Mentor

- Systems Mentor
- Quality Control
- Applied Mathematics
- Mechanical Engineering
- Game Strategy
- Design
- CAD Training
- Robotics Control Systems

Robot showcase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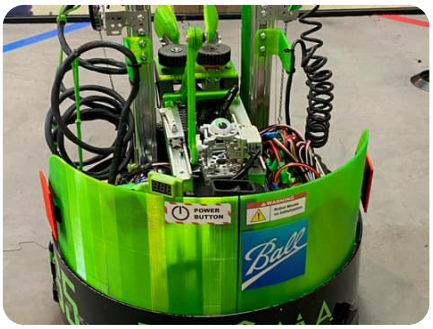
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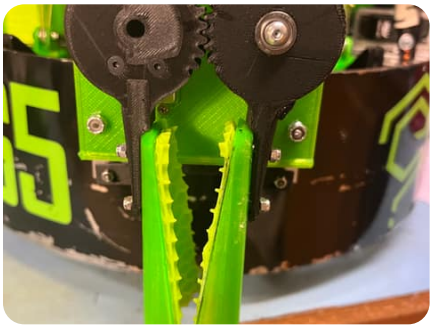
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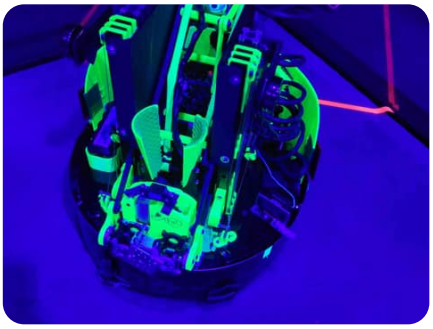
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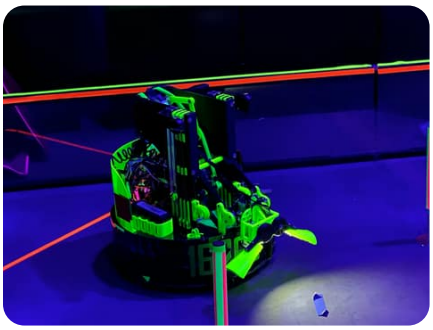
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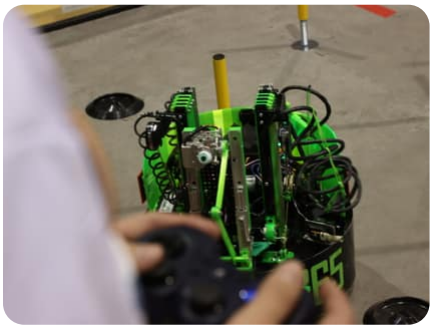
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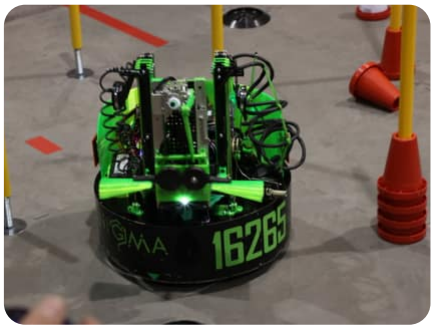

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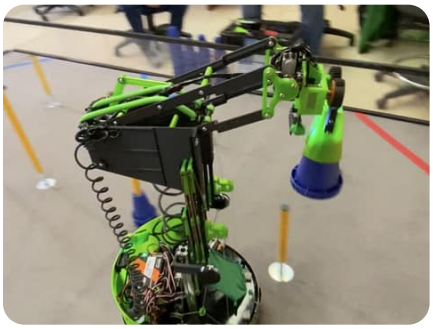

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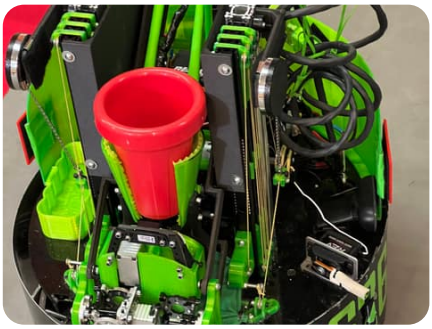

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Year in review

Power Play · Robot: Vroomba

Total hours invested: 3,300

OUR SEASON

Our Season HighlightsThe 2022–2023 POWERPLAY season was one of the most ambitious and unusual seasons in ENIGMA's history.

ENIGMA entered the year with only four students, supported by two coaches and seven mentors. The smaller roster was partly intentional. Rather than keeping every available student on Team 16265, we created and mentored a new rookie sister team, ENIGMA Too 22743, to provide additional students with meaningful technical and leadership roles.

For approximately the first 12 weeks of the season, experienced ENIGMA students helped the rookie team design, build, wire, program, and prepare its robot, Scorpion. That investment left Team 16265 with only about six weeks to complete its own competition robot.

The choice undoubtedly limited the amount of development time available to ENIGMA 16265, but it reflected a larger priority. FIRST is ultimately about student development, not simply collecting trophies. Helping four new students become capable FTC competitors was worth more than protecting every possible competitive advantage for the veteran team.

The robot that emerged from that compressed build period was named Vroomba.

Vroomba was immediately recognizable because of its circular chassis. Round FTC robots were extremely uncommon, and only a small number appeared across the league that season. The design was selected to improve maneuverability around POWERPLAY's closely spaced junctions and allow the robot to approach scoring positions without relying entirely on precise chassis orientation.

Above the circular chassis was a full-deck rotating turret. The turret allowed the scoring mechanism to turn independently from the drivetrain, meaning the robot could collect or position itself in one direction while delivering a cone in another.

A four-bar delivery mechanism carried cones from the robot toward junctions of different heights. The combination of a rotating deck, lifting slides, and four-bar geometry gave Vroomba the ability to score on ground, low, medium, and high junctions while adapting to different field positions and alliance strategies.

The design reflected ENIGMA's established philosophy:

Simple. Rigid. Linear. No unnecessary motion. Measured in seconds.

The goal was always to move the game piece from its starting location to its scored location as quickly and directly as possible. Every mechanism was evaluated not only by whether it worked, but also by how long it took, how reliably it

repeated, and how effectively it connected to the next action.

Vroomba also became ENIGMA's most sophisticated autonomous robot to that point. The programming team used three dead-wheel odometry encoders for localization, Road Runner motion profiling, PID correction, right-triangle trigonometry, OpenCV AprilTag recognition, distance sensing, and magnetic limit switches.

Because Vroomba was round and could move in any direction, it was not always obvious which side of the robot should be considered the front. The team solved that problem with a simple visual detail tied directly to ENIGMA's identity: the small question-mark "e" emblem was placed on the front of the robot, while the complete ENIGMA logo marked the back.

This gave the drive team an immediate visual reference while preserving the clean, symmetrical appearance of the circular design. It also became one of the memorable personality traits of Vroomba. Even with its rotating turret and unconventional chassis, students could quickly determine the robot's orientation by looking for the question mark.

Vroomba's story also extended far beyond FTC competition. The robot accompanied Ixchel Valentino, also known as The Nerdy Ninja, during her appearance connected with American Ninja Warrior Season 18.

Ixchel brought Vroomba onto the production stage and personally drove the robot as part of the experience. A student-built FTC robot that began in an Albuquerque workshop was suddenly being demonstrated in a major national television production environment.

The opportunity gave ENIGMA extraordinary visibility beyond the traditional robotics community. Vroomba helped introduce competitive robotics and hands-on STEAM education to a potential audience of millions.

Vroomba's unusual design also earned ENIGMA an appearance on FUN's Behind the Bot during the POWERPLAY season. The feature gave the team an opportunity to present the robot's circular chassis, full-deck turret, cone-handling system, and engineering approach to a broader FIRST audience.

Being selected for Behind the Bot was meaningful because Vroomba was unlike most robots competing that season. The interview allowed students to explain not only what the robot could do, but also why they chose such an unconventional design and how the mechanisms worked together.

The appearance preserved a detailed look at Vroomba and gave other teams an opportunity to learn from ENIGMA's design, programming, and iterative development process.
The robot eventually developed a six-cone autonomous routine, allowing it to place the preload and continue collecting and scoring cones from the autonomous stack before parking in the correct signal zone.

Achieving six cones in autonomous required far more than writing a long sequence of commands. The drivetrain needed repeatable localization, the cone stack needed predictable alignment, the turret and slides needed to reach precise positions, and the claw needed to detect and capture cones consistently.
The team began official competition at the Albuquerque Qualifier. ENIGMA ranked fifth out of 14 teams and joined its rookie sister team, ENIGMA Too, in the elimination rounds. Together, the two teams advanced to the event finals and finished as the Finalist Alliance.

The moment represented the purpose of creating the second team. ENIGMA 16265 had spent much of the season helping ENIGMA Too become competitive, and the two teams were now competing together for a tournament championship.

ENIGMA also earned the Design Award and second-place recognition for the Connect Award at the Albuquerque event. The Design Award was especially meaningful for a robot as unconventional as Vroomba, validating the thought and engineering behind its circular chassis, turret, lifting system, and game-piece delivery.

At the New Mexico Regional Championship, the competitive environment was unusually difficult.

At that time, New Mexico events still allowed significant participation from experienced teams outside the state. For a younger and comparatively small region, the presence of highly developed visiting programs raised the level of competition considerably and created added pressure around the limited advancement opportunities.

Although this made the path to Worlds more difficult for local teams, it also provided a valuable opportunity. New Mexico students were able to see advanced robots, autonomous routines, strategy, and team organizations that they might otherwise have encountered only at the FIRST Championship.

ENIGMA finished qualification matches ranked 11th out of 21 teams and was selected for the elimination rounds. The team also earned second-place Connect Award recognition, and one ENIGMA student was selected as a Dean's List Finalist.

The season could have looked very different had the team spent the full build period only on Vroomba. More time might have produced greater reliability, more driver practice, and additional mechanism refinement. However, the success of ENIGMA Too demonstrated that the time had not been lost—it had been invested in other students.

ENIGMA then received an invitation to compete at the Hurricane High School Qualifier in Utah.

Competing outside New Mexico exposed the students to a different regional culture, a larger pool of experienced teams, and unfamiliar alliance strategies. ENIGMA ranked fourth out of 17 teams and was selected by the first-ranked team to join the top alliance.

That alliance went undefeated through the elimination rounds and won the tournament. ENIGMA finished as the first team selected on the Winning Alliance.

The team also earned the Inspire Award, the highest judged award at the event. In addition, ENIGMA received second-place recognition for the Design and Innovate Awards and third-place recognition for the Connect Award.

Winning the Inspire Award and the robot competition at an out-of-state qualifier demonstrated that ENIGMA could compete successfully beyond its home region.

The Hurricane performance qualified the team for the Utah State Championship, one of the strongest and most difficult events ENIGMA had attended.

Utah State was a rough competition day. Mechanical problems, match circumstances, and inconsistent execution left ENIGMA ranked 21st out of 35 teams after qualification matches.

A ranking that low would normally make playoff participation uncertain. However, the first-ranked alliance recognized what Vroomba could contribute and selected ENIGMA as its first partner.

That selection was an important form of validation. A knowledgeable top-ranked team saw beyond the qualification record and valued Vroomba's scoring capability, turret design, autonomous potential, and strategic compatibility.

The alliance advanced through the semifinals and reached the Utah Championship finals. Although it did not win the event, ENIGMA finished as a Finalist Alliance member in one of the strongest competitions of the season.

The team also earned the Innovate Award and third-place recognition for the Design Award at Utah State.

Across four official events, ENIGMA reached three finals, won one event, earned the Inspire Award, received multiple engineering and outreach awards, and completed an overall record of 21 wins, 15 losses, and one tie.

Gray S., Dean's List Finalist

Individual student leadership was also recognized during the POWERPLAY season when Gray S. was selected as a New Mexico Dean's List Finalist. The Dean's List Award honors students who demonstrate outstanding leadership, technical ability, dedication to FIRST, and a commitment to strengthening their team and community.

As a finalist, Gray represented ENIGMA and New Mexico at the FIRST Championship in Houston. Attending Worlds gave Gray the opportunity to meet other Dean's List students, experience the scale of the international FIRST community, and represent the values, technical growth, and leadership developed through ENIGMA Robotics.
The season was about much more than results. ENIGMA designed one of the league's few round robots, developed a six-cone autonomous routine, created a rookie FTC team, helped launch an FRC team, taught younger students, mentored other rookies, and competed successfully in two states.

POWERPLAY demonstrated that investing in other students may reduce the time available to perfect your own robot—but it can multiply the impact of the program.

GOALS

NIGMA's goals for POWERPLAY were organized around three major areas: Individual and Team Building, Community Engagement, and Robotics Engineering.
Building a Sustainable TeamThe first goal was to strengthen ENIGMA as a sustainable, student-led organization.

With only four students, every member needed to carry multiple responsibilities. Students participated in building, programming, CAD, driving, outreach, judging, fundraising, media, and team management.

The team also recognized that experienced students would eventually graduate. Knowledge needed to be distributed, documented, and passed to younger members rather than remaining with only one programmer, builder, or captain.

Creating ENIGMA Too was one of the clearest expressions of that goal. Instead of concentrating every student and resource on Team 16265, we created another place where students could gain ownership and leadership experience.
Growing FIRST in New MexicoAnother central goal was to grow FIRST throughout New Mexico.

The team wanted to start and mentor new teams, collaborate with other programs, host or attend STEM events, share resources, and make robotics accessible to more students.

During POWERPLAY, ENIGMA helped create two new FIRST teams:
FTC Team 22743, ENIGMA Too
FRC Team 9080, ENIGMA Robotics
Three ENIGMA 16265 students also participated in the new FRC team, creating a pathway for students to progress into large-scale high-school robotics.

The team also set longer-term goals of increasing FIRST participation in New Mexico, converting the nonprofit into a resource center for regional teams, introducing more underserved students to FIRST, and helping establish FIRST programs in more schools.
Building a Distinctive and Competitive RobotFrom an engineering perspective, the goal was to create a quick, efficient, maneuverable robot capable of placing cones on every type of junction.

The team wanted Vroomba to be:
Fast and easy to maneuver
Capable of scoring on all junction heights
Adaptable to multiple alliance strategies
Equipped with a strong and reliable autonomous routine
Light enough to move efficiently
Precise enough to navigate the crowded field
Simple enough to repair under competition conditions
The round chassis and rotating deck were intended to separate drivetrain orientation from scoring orientation. Rather than forcing the entire robot to turn toward every junction, the turret could rotate the delivery system independently.
Maximizing Autonomous PerformanceA major goal was to capture every reasonable autonomous scoring opportunity.

ENIGMA developed a six-cone autonomous routine using odometry, Road Runner, PID correction, AprilTag recognition, sensors, and carefully sequenced mechanisms.

The goal was not simply to create the most ambitious routine possible. It needed to remain repeatable under competition lighting, field tolerances, battery variation, and the pressure of official matches.
Competing Beyond New MexicoThe team wanted to test itself against stronger competition and learn how its robot compared outside the home region.

The invitation to Utah provided that opportunity. ENIGMA’s goals expanded from performing well locally to proving that its engineering, presentation, and robot performance could succeed in another established region.

Winning the Inspire Award and joining the Winning Alliance at the Hurricane Qualifier achieved that goal, while reaching

the finals at Utah State showed that Vroomba could contribute at a much higher level of competition.
Awards and Complete-Team ExcellenceAs in previous seasons, ENIGMA studied the FTC award criteria.

The Inspire, Think, Connect, Innovate, Design, and Promote criteria served as guides for building a complete program. The goal was not to chase awards as isolated prizes, but to understand what a healthy, sustainable, technically strong, and community-minded FTC team should look like.
Student DevelopmentThe most important goal remained the same: develop students.

Competitive success mattered, but it was not more important than helping students learn to design, code, manufacture, teach, lead, present, mentor, and recover from setbacks.

ENIGMA might have achieved a more polished robot by focusing only on Team 16265. Instead, students helped create another FTC team and a new FRC program.

That choice reflected the true goal of the season: not simply building the best robot possible, but building more capable young people and expanding the number of students who could benefit from FIRST.

Lessons learned

POWERPLAY produced some of ENIGMA's most important lessons in engineering, strategy, mentorship, and program priorities.
Mentorship Requires Real InvestmentCreating ENIGMA Too showed that meaningful mentorship requires more than occasional advice.

ENIGMA 16265 students devoted approximately 12 weeks to helping the rookie team develop its robot and program. That time reduced the veteran team's own build schedule to roughly six weeks.

There was a real competitive cost. Vroomba had less time for refinement, testing, autonomous tuning, and driver practice.

However, ENIGMA Too became an award-winning and competitive team. The lesson was that effective outreach sometimes requires giving away time and resources that could have benefited your own results.
Winning Is Not the Only Measure of SuccessWith more time devoted exclusively to Vroomba, ENIGMA might have performed better at the New Mexico Championship or entered Utah with a more refined machine.

But the season's impact cannot be measured only through Team 16265's rankings.

Four additional students completed a full FTC season. A second FTC team was formed. A new FRC team was launched. Younger students were taught, rookie teams were supported, and 11 students were recruited into FIRST.

The season reaffirmed that student development is more important than maximizing one team's competitive record.
Innovative Designs Carry Additional RiskThe round chassis and full-deck turret offered significant strategic benefits, but they also introduced challenges that more conventional robots did not face.

The weight and rotational force of the turret could cause the chassis itself to turn. The turret belt could slip. Bevel gears

needed additional support. The slides needed greater rigidity. Lift strings could tangle during retraction, and the turret could overshoot its target.

An unusual design must justify its complexity by providing a meaningful competitive advantage.
Weight Has System-Wide EffectsThe original turret and lifting assembly were too heavy. The weight affected acceleration, stability, turret control, and the interaction between the turret and chassis.

The team redesigned the mechanism and removed nearly six pounds.

Students learned that weight is not simply a number checked during inspection. Mass affects motor load, stopping distance, center of gravity, structural stress, control tuning, and battery consumption.
Friction Must Be Managed IntentionallyThe team compared ball-bearing drawer slides with aluminum moving against plastic extrusion.

Ball-bearing systems produced much less resistance because rolling friction is significantly lower than sliding friction. The team used bearings extensively in rotating joints and moving mechanisms to improve speed and consistency.

Students learned that small friction losses across several mechanisms can significantly reduce overall cycle speed and repeatability.
CAD Must Represent the Whole SystemVroomba was extensively modeled in Fusion 360 and TinkerCAD.

The round chassis, deck, turret, lifts, delivery system, and custom-manufactured parts had to function as one coordinated assembly. A change to one system could affect clearances, balance, wiring, sensor placement, and access elsewhere.

Students learned to evaluate the robot as a complete system rather than as several independent mechanisms.
Autonomous Depends on Mechanical ConsistencyThe six-cone autonomous routine required accurate odometry and programming, but software alone could not guarantee success.

If the cone stack moved, the claw approached at the wrong angle, a slide flexed, the turret overshot, or the intake distance changed, the routine could fail.

Autonomous performance depends on reliable mechanics, repeatable starting conditions, correct sensor readings, and careful code working together.
Strong Robots Can Be Hidden by Difficult Competition DaysAt Utah State, ENIGMA finished qualifications near the lower half of the field. The ranking did not fully represent Vroomba’s capability.

The first-ranked alliance recognized that and selected ENIGMA for the elimination rounds.

Students learned that scouting must look beyond wins, losses, and rankings. Teams should evaluate autonomous routines, scoring potential, reliability, compatibility, and whether a robot can fill a specific alliance role.
Stronger Competition Accelerates LearningThe presence of experienced visiting teams in New Mexico made advancement more difficult, especially for a younger region.

At the same time, those teams demonstrated advanced mechanisms, strategy, programming, and organizational standards.

Competing in Utah extended that lesson. ENIGMA saw how teams from a mature region approached POWERPLAY and learned what was required to contribute at a championship level.
Continuous Improvement Is More Important Than Defending a DesignThe team repeatedly changed Vroomba:
Retraction pulleys and tensioners were added to prevent tangled lift strings.
Nearly six pounds were removed from the scoring assembly.
An idler was added to keep the turret belt tensioned.
Support bearings were added to the bevel gears.
Steel washers and tighter mounting improved slide rigidity.
A servo-operated brake reduced turret overshoot.
Fabric was added to prevent cones from falling into the robot and creating penalties.
Each change came from observing a specific failure and responding with a targeted solution.

The lesson was not to defend the original design. It was to improve the machine continuously.

Skills and growth

Skills & GrowthPOWERPLAY was one of ENIGMA's most technically advanced seasons and required students to combine mechanical engineering, CAD, programming, sensors, control systems, strategy, and mentorship.
Systems EngineeringStudents learned to treat Vroomba as an interconnected system.

The drivetrain, turret, slides, four-bar mechanism, claw, sensors, wiring, and software could not be developed independently. Every subsystem affected the weight, balance, timing, and performance of the others.

The round chassis made this especially important because nearly every mechanism shared the same central structure.
Circular Chassis DesignBuilding a round robot required students to work beyond the standard rectangular FTC chassis.

They needed to plan curved deck plates, component placement, drivetrain geometry, service access, and structural support while maintaining enough room for the rotating turret.

The circular form helped Vroomba maneuver around junctions and made the robot less dependent on one fixed front-facing scoring orientation.
Full-Deck TurretThe rotating deck introduced lessons in bearings, belt tension, bevel gears, inertia, braking, weight distribution, wiring management, and rotational control.

Students learned that rotating a heavy scoring mechanism could create an equal reaction in the chassis. Reducing mass and controlling acceleration were necessary to prevent the turret from moving the entire robot.

The team added support bearings, belt tensioning, and a servo-operated brake to improve precision and reduce overshoot.
Four-Bar Delivery MechanismThe four-bar mechanism allowed the cone to move outward while maintaining a controlled orientation.

Students learned about linkage geometry, pivot placement, leverage, range of motion, and how small changes in arm length or pivot location affected the delivery path.

The mechanism needed to work with the slides and turret so cones could be positioned accurately at several junction heights.
Linear Slides and RetractionThe lift system introduced practical lessons in string routing, tension, pulley alignment, rigidity, and synchronized motion.

When the strings tangled during retraction, students added pulleys and tensioners to create better geometry and maintain tension.

When the slides flexed, the mounting system was tightened and reinforced with steel washers.
Weight ReductionThe turret and scoring assembly initially placed too much mass above the chassis.

Students redesigned the system and removed nearly six pounds. This improved the robot's balance, responsiveness, and ability to control the turret without rotating the chassis.

The process taught them to evaluate every component according to the value it provided relative to its weight.
CAD and Digital ManufacturingStudents used Fusion 360 to model the robot and TinkerCAD for simpler parts.

CAD helped them identify spacing problems, visualize assemblies, manufacture custom components, and coordinate the round chassis with the turret and lifting system.

The robot incorporated both 3D-printed and CNC-machined parts, connecting digital design directly to physical manufacturing.
Bearings and FrictionStudents studied the difference between rolling and sliding friction.

Ball bearings were used throughout the robot's rotating joints and slides because rolling resistance was far lower than the friction produced by aluminum sliding against plastic extrusion.

This improved speed, reduced motor load, and made motion more consistent.
Three-Wheel OdometryVroomba used three dead-wheel odometry encoders to track its position independently from the powered drivetrain wheels.

Two tracking wheels measured movement in one direction while another measured lateral movement. Combining these measurements allowed the robot to estimate its location and heading on the field.

Odometry enabled more accurate paths and made the six-cone autonomous routine possible.
Road Runner and Motion ProfilingThe programming team used Android Studio and the Road Runner open-source library.

Road Runner allowed students to create controlled trajectories rather than relying only on timed motor commands. Motion profiling regulated acceleration and deceleration so the robot could move quickly without overshooting every target.

Students learned that the fastest possible movement is not always the quickest complete cycle. A controlled path that stops accurately can be more valuable than a faster path requiring correction.
PID Control and TrigonometryPID control was used to correct drift and improve positional accuracy.

Students worked with right-triangle trigonometry to calculate robot movement and correction. They learned how proportional, integral, and derivative terms could influence responsiveness, accumulated error, and overshoot.

These mathematical concepts became practical tools rather than abstract classroom exercises.
AprilTag VisionAn OpenCV camera identified the AprilTag mounted on the custom signal sleeve.

The tag determined which parking zone the robot needed to enter at the end of autonomous. Students learned about camera positioning, lighting, image recognition, tag identification, and transferring vision results into robot behavior.
Sensors and AutomationA distance sensor measured the position of the cone relative to the claw. When the cone reached the desired distance, the robot could automatically complete the pickup action.

Magnetic limit switches homed the turret and prevented the lift system from traveling too far downward.

These systems reduced driver workload and helped protect mechanisms from overextension.
Six-Cone AutonomousThe six-cone autonomous routine represented the integration of nearly every skill developed during the season.

The robot needed to:
Read the AprilTag.
Establish its field position.
Score the preload.
Navigate to the cone stack.
Align the claw.
Detect and collect a cone.
Rotate the turret.
Raise the slides.
Deliver the cone.
Repeat the sequence.
Park in the correct signal zone.
Each additional cone increased the number of opportunities for positional or mechanical error. Completing the routine required precise sequencing and extensive testing.
Strategy and ScoutingStudents analyzed the scoring values for autonomous, tele-operated play, ownership, circuits, terminals, and endgame beacons.

They learned that the highest junction was not always the most strategically valuable location. Junction ownership and completing circuits could change the value of each cone.

At Utah State, being selected by the first-ranked alliance reinforced the importance of scouting and role compatibility. Vroomba’s value was recognized even when its ranking did not fully show it.

Judging and Professional CommunicationStudents presented an unconventional robot to judges and needed to explain why the circular chassis, full-deck turret, and four-bar mechanism were selected.

They also communicated the team's outreach, mentorship, sustainability, and decision to devote much of the season to ENIGMA Too.

The Inspire, Innovate, Design, and Connect recognition demonstrated that students could explain both technical work and program impact.
Mentorship and LeadershipTeam 16265 students moved beyond learning skills for themselves and began teaching those skills to others.

They helped build and program ENIGMA Too, assisted other rookie teams, taught 14 FLL classes, shared code and portfolios, and helped launch FRC Team 9080.

Teaching required students to explain processes, diagnose someone else's problem, and allow newer students to retain ownership.

That transition from learner to mentor was one of the most important areas of growth during POWERPLAY.

Competitions

NM Albuquerque FTC Qualifier

Jan 14, 2023 · La Academia de Esperanza Charter School

Finalist Alliance 1st Pick, Design Award, 2nd Connect Award

The Albuquerque Qualifier was ENIGMA 16265's first official competition of the POWERPLAY season and Vroomba's first opportunity to compete on a live field. Despite having only about six weeks to complete the robot after helping establish and mentor ENIGMA Too, Team 16265 finished qualifications ranked fifth out of 14 teams.

ENIGMA Too selected Team 16265 as its alliance partner, bringing the veteran and rookie sister teams together for the elimination rounds. The alliance advanced through the semifinals and reached the championship matches, finishing as the Finalist Alliance.

ENIGMA also earned the Design Award for Vroomba's distinctive circular chassis, full-deck turret, and purposeful scoring design, along with second-place recognition for the Connect Award. The event demonstrated that the unconventional round robot was both competitive and worthy of engineering recognition.

New Mexico Regional Championship

Jan 28, 2023 · La Academia de Esperanza Charter School

2nd Place Connect Award

The New Mexico Regional Championship brought together 21 teams in an unusually competitive field that included several experienced programs from outside the state. ENIGMA completed qualification matches ranked 11th and was selected to compete in the elimination rounds.

Although the team did not advance beyond the semifinals, the Championship provided valuable experience against robots and strategies operating at a higher competitive level. ENIGMA also received second-place recognition for the Connect Award.

Individual student leadership was recognized when Gray S. was selected as a New Mexico Dean's List Finalist. Gray later attended the FIRST Championship in Houston as a Dean's List Finalist, representing ENIGMA and New Mexico within the international FIRST community.

UT Hurricane High School Qualifier

Feb 4, 2023 · Hurricane High School, Hurricane, Utah

Inspire Award Winner, 2nd Design & Innovate, 3rd Place Connect

ENIGMA was honored to receive an invitation to compete at the Hurricane High School Qualifier, giving the team its first POWERPLAY competition outside New Mexico. The event featured 17 teams and offered ENIGMA an opportunity to test Vroomba against programs from a more established FTC region.

ENIGMA finished qualifications ranked fourth and was selected by the first-ranked team as the first partner on the top alliance. The alliance remained undefeated throughout the playoffs and won the tournament, making ENIGMA a member of the Winning Alliance.

The team also earned the Inspire Award, the highest overall judged honor in FIRST Tech Challenge. ENIGMA received second-place recognition for both the Design Award and Innovate Award, along with third-place recognition for the Connect Award.

Winning both the Inspire Award and the robot competition demonstrated that ENIGMA's engineering, outreach, presentation, and competitive performance could succeed beyond its home region. The event qualified the team to attend the Utah Championship.

Utah State Championship

Mar 11, 2023 · Southern Utah University, Cedar City, Utah

Finalist Alliance 1st Pick, Innovate Award, 3rd Place Design

The Utah Championship was the largest and most competitive event of ENIGMA's POWERPLAY season, bringing together 35 teams with only two advancement positions available for the FIRST Championship.

ENIGMA experienced one of its roughest competition days and finished qualifications ranked 21st. Despite the ranking, the captain of the first-seeded alliance recognized Vroomba's capabilities and selected ENIGMA as its first alliance partner.

The alliance advanced through the semifinals and reached the championship finals, where ENIGMA finished as a member of the Finalist Alliance. Being selected by the top-ranked team showed that experienced scouts saw value in Vroomba's scoring ability, autonomous potential, turret system, and strategic compatibility beyond what the qualification ranking suggested.

ENIGMA also earned the Innovate Award for Vroomba's creative engineering and received third-place recognition for the Design Award. The event ended the official season with ENIGMA competing in the finals of one of the strongest tournaments the team had attended.

Outreach

Total people reached: 1,701

Total volunteers: 72

Community engagement was one of the defining elements of ENIGMA's POWERPLAY season.
Fourteen FLL ClassesENIGMA taught two seven-week FIRST LEGO League programs, totaling 14 classes, through Abundant Homes and the Parent Led Academic Network Team.

Students used the 2022–2023 SUPERPOWERED challenge to teach younger participants age-appropriate engineering principles, FIRST Core Values, block programming, robot construction, testing, and teamwork.

During the first session, students were divided into smaller groups and assigned one or two missions. In the second session, participants were organized into two larger teams and worked toward completing five missions.

The younger students brainstormed, built, and programmed their robots from the beginning. At the end of each session, they demonstrated their work by running the robots and completing missions.

Teaching FLL also helped ENIGMA students grow. Explaining programming, mechanical concepts, and problem-solving to younger students required them to understand the material well enough to communicate it simply.
Manzano Teen Tech CenterENIGMA was invited to work at the Manzano High School Teen Tech Center alongside several other FIRST teams, including:
FRC Team 8512, Manzano Monarchs
FRC Team 7540, Timberwolf Robotics
FRC Team 9080, ENIGMA Robotics
FTC Team 22743, ENIGMA Too
The shared space created opportunities for collaboration among FTC and FRC students, coaches, and mentors.

Students could observe different approaches to design, share tools and knowledge, and participate in a larger robotics community rather than working in isolation.
Teen Tech Center Open HouseIn November, the teams hosted an open house at the Manzano Teen Tech Center.

The event introduced families and students to FIRST programs and generated enough interest to recruit 11 new participants into the broader FIRST community.

This demonstrated the value of bringing several teams together in one location. Visitors could see multiple competition levels and understand how a student might progress from an introductory program into FTC and eventually FRC.
Behind the Bot | 16265 ENIGMA | POWERPLAY Robot
FUN Robotics NetworkENIGMA also reached the wider competitive robotics community through an appearance on Behind the Bot, produced by FUN—FIRST Updates Now.

The feature introduced Vroomba to students, coaches, mentors, and robotics supporters beyond New Mexico. It gave ENIGMA a platform to share the round chassis, rotating deck, four-bar cone-delivery system, autonomous capabilities, and the lessons learned while developing such a distinctive robot.

This form of digital outreach extended the value of the season beyond our own competitions. Teams could view the robot, hear directly from ENIGMA, and use elements of our experience to inspire their own designs and engineering discussions.
Creating ENIGMA TooOne of ENIGMA's largest outreach projects was the creation of FTC Team 22743, ENIGMA Too.

Experienced Team 16265 students spent approximately 12 weeks helping the new team design, build, program, wire, and prepare Scorpion for competition.

ENIGMA Too went on to earn the Design Award at its first qualifier and later captained an alliance with Team 16265 as its partner at the Albuquerque Qualifier.

This was mentorship producing a measurable result: a new team became a competitive, award-winning program within one season.
Creating FRC Team 9080ENIGMA also helped launch rookie FRC Team 9080.

Three members of Team 16265 participated in the FRC program, creating a path for FTC students to continue into more advanced fabrication, programming, electronics, and large-scale robot design.

Starting both an FTC sister team and an FRC team during the same season dramatically expanded the program's reach.
Mentoring Other Rookie TeamsENIGMA also supported local rookie FTC teams 21797 Hack City and 21749 Out of the Bot Robotics.

The team provided advice in programming, electrical systems, mechanical construction, and general competition preparation.

For Hack City, ENIGMA demonstrated Vroomba, donated new electronics to help start the robot, and assisted with programming.
Sharing ResourcesThe team continued practicing Coopertition by sharing tools, knowledge, engineering documentation, and code.

ENIGMA made its engineering portfolio available to other teams, shared its GitHub repositories from current and previous robots, helped teams repair problems at competition, and answered technical questions online.

With more than 1,338 Instagram followers, the team also used social media to connect with programs beyond New Mexico. Students responded to questions and shared designs, code, and lessons from previous seasons.
Engineering MentorshipENIGMA expanded from a small mentor base to seven mentors representing research engineering, mechanical engineering, software engineering, program management, and FIRST alumni experience.

The mentor group included professionals from Sandia National Laboratories and Leidos, along with former ENIGMA students attending Johns Hopkins University and the University of New Mexico.

These mentors did not simply provide answers. They helped students understand new approaches, evaluate designs,

connect classroom concepts to professional engineering, and improve their problem-solving process.

Through teaching, team creation, technical mentoring, open houses, resource sharing, and professional relationships, ENIGMA expanded the reach of FIRST while strengthening its own students.
Unique Outreach Opportunity (American Ninja Warrior)One of the season's most unique outreach opportunities came through Ixchel Valentino, known as The Nerdy Ninja, when Vroomba accompanied her during her American Ninja Warrior Season 18 experience.

Ixchel drove Vroomba on the production stage, bringing a student-designed and student-built FIRST Tech Challenge robot into a highly visible entertainment environment. The appearance connected two communities that share many of the same values: discipline, creativity, perseverance, practice, and the willingness to attempt difficult challenges.

The outreach continued beyond the production stage. Ixchel shared Vroomba with many of the other ninjas, giving them opportunities to drive and interact with the robot themselves. For many participants, it was a direct introduction to FTC robotics and the complexity of controlling a machine built by high-school students.

ENIGMA has retained video and photographic documentation of Vroomba on the production stage and being driven by members of the ninja community. These materials preserve one of the most unusual outreach experiences in the team's history and provide a powerful way to show students that robotics can open doors far beyond a conventional competition field.

Through Ixchel's involvement, Vroomba reached an audience that may never have attended a robotics tournament or encountered FIRST. The experience demonstrated how STEAM outreach can happen wherever curiosity, technology, and inspiring people come together.

FLL SUPERPOWERED Robotics Classes at Abundant Homes

Abundant Homes, Albuquerque-area, New Mexico · 16 reached · 2 volunteers

ENIGMA taught younger students using the 2022–2023 FLL SUPERPOWERED challenge. Participants were divided into teams of three and assigned one or two missions to complete.

Team members introduced age-appropriate engineering concepts, FIRST Core Values, teamwork, robot construction, and block-based programming. Students brainstormed solutions, built and programmed their robots from the ground up, tested their ideas, and demonstrated their completed missions at the end of the program.

FLL SUPERPOWERED Robotics Classes at Parent Led Academic Network Team

Parent Led Academic Network Team, Albuquerque-area, New Mexico · 7 reached · 2 volunteers

Sixteen students were divided into two teams of eight and challenged to complete five missions from the FLL SUPERPOWERED season.

ENIGMA taught engineering concepts, FIRST Core Values, block programming, robot construction, testing, and teamwork. Participants brainstormed, built, and programmed their own robots rather than receiving completed designs.

At the conclusion of the program, each team ran its robot and demonstrated the missions it had prepared.

Manzano Teen Tech Center FIRST Robotics Open House

Nov 1, 2022 · Teen Tech Center, Manzano High School, Albuquerque, New Mexico · 60 reached · 24 volunteers

The Manzano Teen Tech Center provided shared workshop space for several FIRST programs, including FRC Team 8512 Manzano Monarchs, FRC Team 7540 Timberwolf Robotics, FRC Team 9080 ENIGMA, FTC Team 16265 ENIGMA, and FTC Team 22743 ENIGMA Too.

ENIGMA joined the other teams working at the Teen Tech Center to host a community open house.

Students and coaches introduced visitors to FIRST, displayed competition robots, explained the differences among FTC and FRC programs, and gave families an opportunity to learn how to become involved.

The open house successfully recruited 11 new participants into FIRST programs, making it one of the season's clearest measurable outreach successes.

Formation and Mentorship of FTC Team 22743 ENIGMA Too

ENIGMA Shop, Manzano Teen Tech Center, Albuquerque, New Mexico · 4 reached · 3 volunteers

ENIGMA Too operated as ENIGMA 16265's rookie sister team within the shared Teen Tech Center workshop.

ENIGMA formed FTC Team 22743 to create additional opportunities for developing students and help grow the New Mexico FTC region.

Team 16265 spent approximately the first 12 weeks of the season mentoring the rookie group and helping its students design, build, wire, program, and prepare their own robot.

This investment left ENIGMA 16265 with a shortened period to finish Vroomba, but it gave four newer students meaningful responsibility for their own competition team.

ENIGMA Too earned the Design Award at the Alamogordo Qualifier and later partnered with ENIGMA 16265 at the Albuquerque Qualifier, where the sister teams reached the finals together.

Formation of Rookie FRC Team 9080 ENIGMA

ENIGMA Shop Manzano Teen Tech Center, Manzano High School, Albuquerque, New Mexico · 18 reached · 6 volunteers

The new Teen Tech Center workshop created enough room for the ENIGMA program to expand from FTC into the larger FIRST Robotics Competition.

ENIGMA helped create rookie FRC Team 9080, establishing a pathway for students to continue from FTC into full-size high-school robotics.

Three members of FTC Team 16265 participated in the new FRC program. During the period covered by the POWERPLAY portfolio, the team had assembled its chassis and was preparing for its first competitions in March.

The creation of FRC 9080 expanded local FIRST opportunities and gave experienced FTC students a place to continue developing in mechanical design, electrical systems, programming, strategy, and leadership.

Rookie FTC Team Mentorship — Hack City 21797

La Academia De Esperanza Charter School · 35 reached · 9 volunteers

Hack City was a developing local FTC team receiving technical and material support from ENIGMA.

ENIGMA demonstrated its robot for Hack City and shared technical knowledge in programming, electrical systems, and general robot development.

The team also donated new electronics to help Hack City begin building its robot and provided direct programming assistance.

Support continued through conversations, demonstrations, shared tools, and help troubleshooting competition systems.

Mentoring Out of the Bot Robotics 21749

ENIGMA Shop, Manzano Teen Tech Center, Albuquerque, New Mexico · 3 reached · 2 volunteers

Out of the Bot Robotics was another local rookie FTC program supported by ENIGMA during POWERPLAY.

ENIGMA shared advice and practical knowledge gained through prior seasons, with particular emphasis on programming and electrical systems.

The mentorship helped the rookie team gain access to experienced students and adults who could answer questions, troubleshoot problems, and explain FTC systems as the team developed its first competition robot.

Remote Team Mentoring Through Instagram

ENIGMA Instagram Channel · 1338 reached · 5 volunteers

ENIGMA used its @enigma.robotics Instagram account to communicate with teams beyond the Albuquerque area.

The team answered technical questions from remote FTC programs and shared resources that other students and coaches could use.

Resources included:
The ENIGMA engineering portfolio
GitHub repositories
Current-season robot code
Code from prior robots
Design and build experience
Answers to programming and engineering questions
This digital outreach allowed ENIGMA to support teams that could not visit the workshop or meet the team at a New Mexico competition.

Competition Assistance and FIRST Resource Sharing

New Mexico FTC events, the ENIGMA workshop, and online · 220 reached · 19 volunteers

This was a season-long initiative rather than one individual event.

ENIGMA shared its engineering portfolio, tools, code, electronics, workshop resources, and technical knowledge with other FIRST teams.

At competitions, students and mentors helped teams diagnose robot problems and offered tools when repairs were needed.

The initiative reflected ENIGMA’s belief that technical knowledge should help strengthen the entire FIRST community rather than remain a private competitive advantage.

Season highlights


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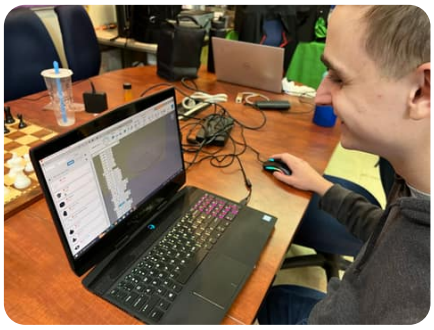
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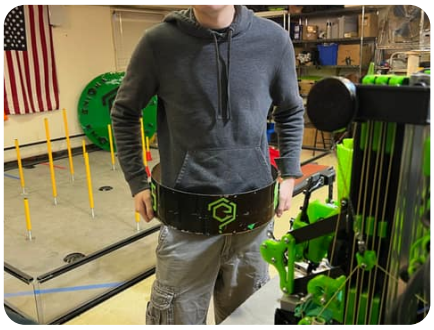
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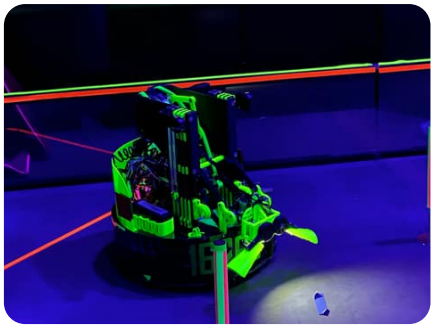
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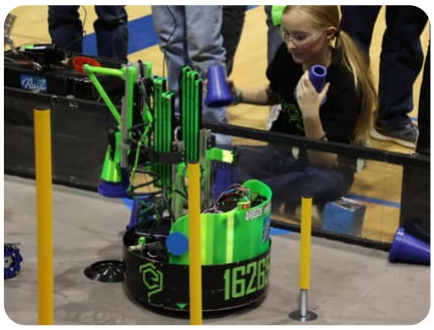
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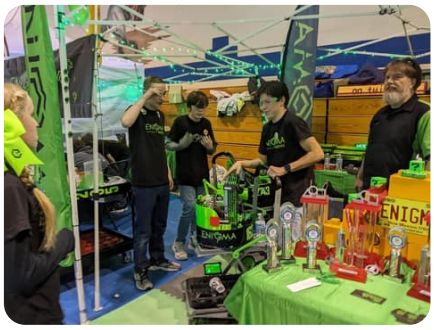

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