
# 2021-2022 FREIGHT FRENZY Season

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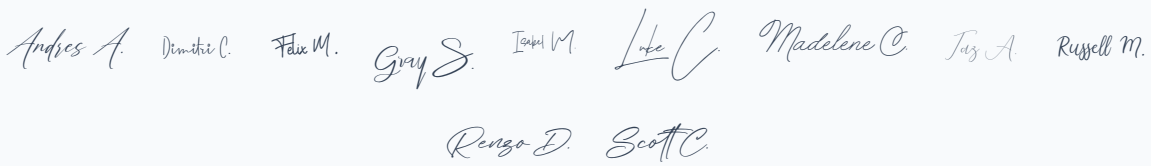
Learn more: https://www.firstinspires.org/robotics/ftc

## 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

**1000s**
of Students Reached

**100s**
of Team Members

## 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

### Andres A.

- Builder
- Human Player
- Wiring & Soldering
- Outreach
- Portfolio / Notebook

### Dimitri C.

- Builder
- Electronics
- Wiring & Soldering
- Fabricator
- Skilled Bandsaw
- Outreach
- Assembly
- Learning Java Code
- Portfolio / Notebook


### 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

### Gray S.

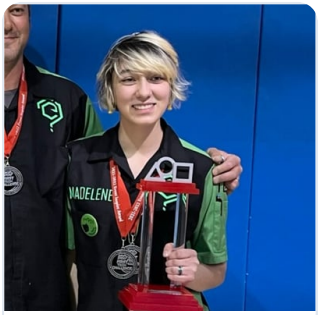
- Team Co-Captain
- CAD Designer
- Builder
- Drive Team
- Driver Chassis
- Skilled 3D Prints
- Wiring & Soldering
- Electronics
- Skilled CNC Mill
- Founding Member
- Team Spirit
- Skilled Bandsaw
- Design & Prototype
- Game Manual Expert
- Judging Awards
- Portfolio / Notebook
- Assembly
- Fabricator

### Isabel M.

- Builder
- Drive Coach
- Drive Team
- Skilled Java Coder
- Skilled Autonomous Pathing
- Founding Member
- Design & Prototype
- Team Spirit
- Team Media
- Graphic Designer
- Social Media
- Portfolio / Notebook
- Judging Awards
- Game Manual Expert
- Skilled Vision Coder
- Outreach
- Fundraising
- Wiring & Soldering
- Skilled CNC Mill
- Team Co-Captain
- Electronics
- Alumni

### Luke C.

- Builder
- Assembly
- Wiring & Soldering
- Electronics
- Portfolio / Notebook
- Outreach
- Fundraising
- Design & Prototype
- Team Spirit
- Game Manual Expert
- Judging Awards
- Rookie Year



### Madelene C.

- Team Co-Captain
- Builder
- Fabricator
- Wiring & Soldering
- Graphic Designer
- Founding Member
- Team Spirit
- Social Media
- Alumni
- Drive Coach
- Drive Team
- Safety Captian
- Outreach
- Fundraising
- Skilled CNC Mill
- Skilled Bandsaw
- Assembly
- Team Photographer
- Team Media
- Design & Prototype
- Game Manual Expert
- Judging Awards
- Portfolio / Notebook

### Taz A.

- Outreach
- Fundraising
- Portfolio / Notebook
- Team Spirit
- Team Media

# Coaches and mentors

## 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

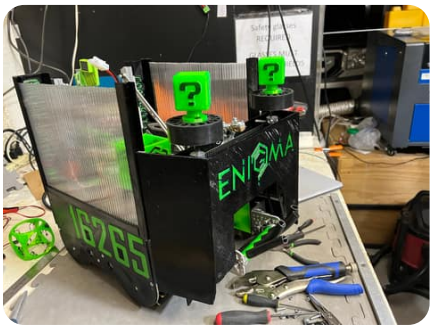
### Renzo D.
Mentor

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

### Scott C.
Coach

- Team Administrator
- Game Strategy
- Quality Control

# Robot showcase



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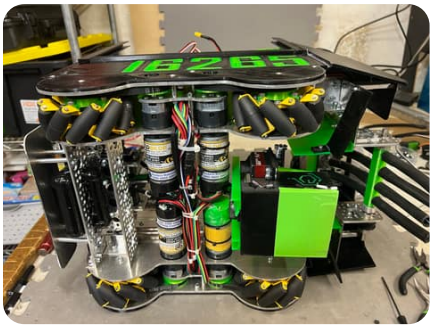

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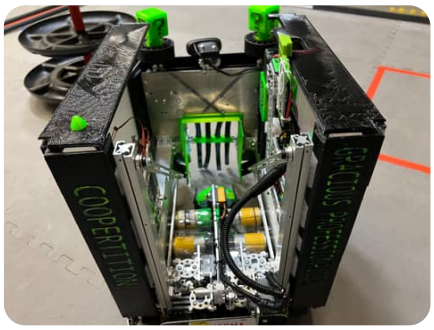

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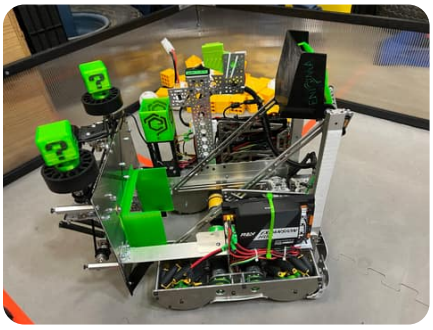
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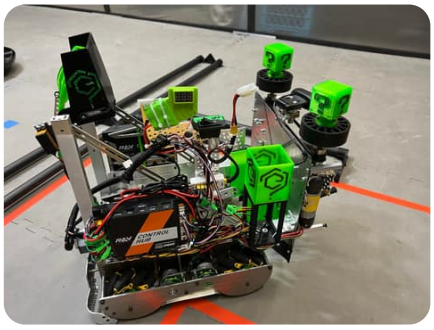
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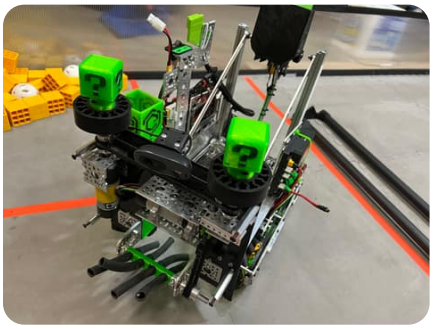
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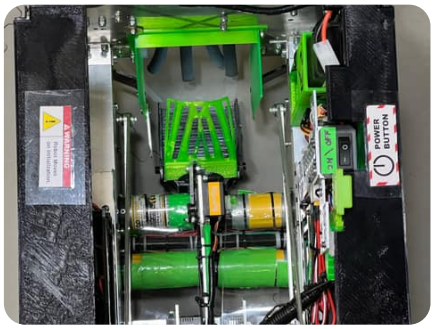

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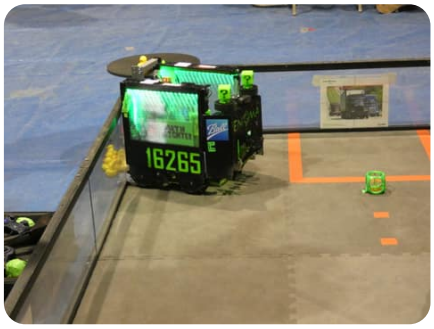

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# Year in review

Freight Frenzy · Robot: Darth Freighter

Total hours invested: 2,125

### OUR SEASON

Our Season HighlightsThe FREIGHT FRENZY season began with one of the greatest challenges ENIGMA had faced since its founding: we lost our workshop.

Our dedicated shop had been central to the team's identity and success. It gave students regular access to tools, equipment, practice space, materials, and one another. Losing that space meant that most of our robotics equipment, supplies, previous robots, and field components had to be packed and placed into storage.

We preserved the resources that were most essential to continuing the program. Our CNC router, laser cutter, tools, and approximately two-thirds of a competition field were moved into Coach Russ's garage. The space was much smaller and required careful organization, but it gave the team a place to continue meeting, designing, fabricating, programming, and practicing.

The experience demonstrated the value of being a community-based team. ENIGMA was not dependent upon a school building or district schedule, and the commitment of our families and coaches allowed the program to continue even after losing its original home.

FREIGHT FRENZY challenged teams to collect different types of freight and deliver them to shipping hubs. Robots could score freight on alliance-specific hubs or on the shared hub in the center of the field. Teams also delivered ducks and team shipping elements, completed autonomous tasks, and attempted to balance their alliance shipping hub during the endgame.

The game required speed, accurate placement, strong game-piece control, dependable autonomous routines, and strategic decisions about which scoring areas offered the greatest value.

ENIGMA began the season with two remote qualifiers conducted from Coach Russ's garage. Like the previous ULTIMATE GOAL season, remote competition allowed us to demonstrate robot performance, but it did not recreate the complexity of sharing a field with alliance partners and opponents.

Remote matches naturally encouraged teams to focus on maximizing individual scoring. For ENIGMA, that meant prioritizing efficient freight cycles to the alliance shipping hub. That approach worked well during remote qualifiers and remained effective at the New Mexico Championship, but it would later reveal an important strategic weakness at the FIRST Championship.

The team continued applying the engineering philosophy established during ULTIMATE GOAL: mechanisms should be simple, rigid, linear, and measured in seconds. Each mechanism should perform one clear action quickly and pass the game piece to the next stage with as little unnecessary movement as possible.

We also continued believing that our primary competition was against ourselves, the clock, and our previous best performance. Every practice run gave us a new benchmark for cycle time, autonomous consistency, freight placement, and endgame execution.

The most significant moment of the season was our return to live competition at the New Mexico State Championship. It was ENIGMA's first traditional in-person tournament since the COVID-19 shutdowns.
Individual student achievement was also recognized at the New Mexico Regional Championship when Felix M. was selected as a New Mexico Dean's List Finalist. The Dean's List Award honors students who demonstrate leadership, technical ability, dedication to FIRST, and a commitment to strengthening their team and community. Felix's recognition reflected both his personal growth and the important role he played in ENIGMA's success throughout the FREIGHT FRENZY season.

Returning to a live event reminded us how much had been missing during remote competition. Students again experienced alliance strategy, scouting, judging interviews, field queues, pit activity, repairs between matches, interaction with volunteers, and the excitement of competing in front of other teams and spectators.

ENIGMA performed exceptionally well. The team finished the event as the Winning Alliance Captain, demonstrating not only a capable robot but also the strategic leadership required to build and lead a successful alliance through elimination matches.

The team also earned the Inspire Award, the highest overall judged honor in FIRST Tech Challenge. Receiving both the Inspire Award and Winning Alliance Captain represented success across the complete FTC program: engineering, robot performance, outreach, documentation, presentation, leadership, and team culture.
ENIGMA also received Think Award second-place recognition for its engineering process and documentation, Design Award second-place recognition for the robot's thoughtful and functional design, and recognition of one of our students as a Dean's List Finalist.

By winning both the Inspire Award and the tournament as Alliance Captain, ENIGMA earned the opportunity to represent New Mexico at the FIRST Championship in Houston.

Before Worlds, the team also attempted to qualify for the Maryland Tech Invitational. MTI is one of the most competitive and respected FTC offseason events, and qualification required a demanding robot-performance score. ENIGMA missed the required score by only one point.

That single point was disappointing, but it also showed how close the team had come to reaching another elite competition. It reinforced the reality that at the highest level, small improvements in autonomous consistency, scoring strategy, cycle time, or endgame execution can determine whether a team advances.

At the FIRST Championship, ENIGMA encountered another painful lesson during its opening match. The robot disconnected and did not move at all.

The failure had never occurred before and did not happen again afterward. Even the lead Field Technical Advisor at the Championship was unable to determine a definitive cause. Losing an entire opening match to an unexplained failure placed the team at an immediate disadvantage in an event where every match mattered.

The remainder of the Championship also exposed a strategic limitation. During remote qualifiers and the New Mexico Championship, scoring heavily on the alliance shipping hub had been enough to succeed. At Worlds, however, the shared hub played a much larger role in high-level match strategy.

ENIGMA had not invested enough development and practice into scoring effectively on the shared hub. Against the strongest teams in the world, that missing capability limited our strategic flexibility and made it harder to complement different alliance partners.

Although the Championship did not unfold as we hoped, qualifying for Worlds was a major achievement. The students had built a state-championship robot in a residential garage, after losing their shop, with much of the team's equipment inaccessible in storage.

FREIGHT FRENZY proved that ENIGMA's strength did not come from a building. It came from the students, mentors, families, engineering process, culture, and determination that continued regardless of where we met.
Teaching Robotics Through FLLFreight Frenzy was not only a year of competitive growth. ENIGMA also continued building the next generation of robotics students through two seven-week FIRST LEGO League programs.

The team taught classes through Abundant Homes and the Parent Led Academic Network Team, completing nine class sessions during the season.

Using the FLL Mission Moon challenge materials, participants were divided into teams of three and assigned one or two missions. ENIGMA students introduced age-appropriate engineering concepts, FIRST Core Values, and block-based programming before guiding each group through the complete design process.

The younger students did not receive finished robots or predetermined solutions. They brainstormed, built, programmed, tested, and revised their own machines. At the conclusion of the programs, each team ran its robot and attempted the missions it had prepared.

Teaching FLL gave ENIGMA members an opportunity to become mentors rather than only competitors. Explaining engineering concepts to younger students required them to organize their own understanding, communicate patiently, and help others solve problems without taking control of the project.

The programs were conducted while COVID-19 precautions were still in place. Although the host organizations established the safety requirements, ENIGMA members wore masks throughout the classes.
Building a Robot for LearningThe team also introduced a separate practice robot during Freight Frenzy.

The competition robot carried deadlines, performance expectations, and the pressure of qualifying for State and Worlds. Newer students needed a place where they could learn without worrying that every mistake might delay the competition build.

The practice robot provided that environment.

Younger and less-experienced members designed and built the simpler machine with guidance from veteran students.

They learned to use tools safely, develop basic mechanisms, solve construction problems, and program with blocks.

The robot also gave ENIGMA a safer platform for outreach demonstrations. Instead of risking damage to the primary field robot, the team could bring a durable learning machine that younger visitors could examine and eventually interact with.

The project reflected ENIGMA's long-term mission: the purpose of building robots is not only to win matches, but to develop students who can eventually teach and mentor others.
Learning From Professional EngineersFreight Frenzy also strengthened ENIGMA's professional engineering connections.

Mechanical engineer Kim introduced the students to manufacturing quality, repeatability, and design of experiments. Her guidance helped the team approach its Team Shipping Element as an engineering study rather than a series of guesses.

Research engineer Renzo helped solve one of the season's most confusing reliability problems. The robot was experiencing electrostatic-discharge issues that disrupted connectivity. Renzo identified that a box dragging on the floor was collecting charge and acting like a capacitor.

His recommendation to add a copper plate gave the students a practical lesson in electrostatics, grounding, and systematic failure analysis.

These mentors showed the team how professional engineers approach uncertainty: observe the failure, gather evidence, identify possible causes, test a solution, and verify whether the change improves the system.

### GOALS

Our first goal for FREIGHT FRENZY was to preserve the team after losing our workshop.

We needed to prove that ENIGMA could continue operating with less space, limited access to equipment, and many of our resources packed away. That required us to establish a functional workspace in Coach Russ's garage, decide which tools and machines were truly essential, and use the available area efficiently.

The goal was not merely to survive the season. We wanted to remain a thriving, competitive, and meaningful program for our students.

From a technical perspective, our goal was to design a robot capable of efficiently collecting freight, transporting it across the field, placing it accurately on the shipping hubs, completing autonomous tasks, and contributing reliably during the endgame.

The robot needed to handle multiple freight shapes, including cubes, balls, and ducks. This required an intake and transfer system that could accommodate objects with different sizes, surfaces, and handling characteristics.

We continued applying our established design philosophy:
Keep mechanisms simple and rigid.

Use linear, purposeful motion.
Eliminate unnecessary movement.
Measure each action in seconds.
Design every subsystem as part of the complete game-piece path.
Improve against our own previous best performance.
Our competition goals remained ambitious. We wanted to perform strongly in the remote qualifiers, win the New Mexico Championship, earn the Inspire Award, return to live competition successfully, qualify for the FIRST Championship, and attempt to qualify for the Maryland Tech Invitational.

We achieved many of those goals. We became the New Mexico Winning Alliance Captain, earned the Inspire Award, and advanced to Houston. We also came within one point of the MTI qualifying standard.

Another goal was to continue operating as a complete FTC team rather than focusing only on robot performance. We wanted to preserve our engineering documentation, judging preparation, outreach, business planning, fundraising, and professional presentation even while working from a smaller and less convenient space.

The Inspire Award validated that ENIGMA continued to demonstrate strength across the full program.

At Worlds, we discovered that one of our goals had been too narrow. We had focused primarily on maximizing alliance-hub scoring because that strategy was effective in remote qualification and regional competition. We did not place enough emphasis on developing a strong shared-hub capability.

A more complete strategic goal would have been to build a robot capable of contributing to every major scoring area, even when a particular task did not appear essential at the regional level.

This became an important long-term objective for ENIGMA: design not only for the competition immediately in front of us, but also for the level of play we hope to reach.

Most importantly, our central goal remained student development. We wanted students to learn that difficult circumstances do not eliminate opportunity. A smaller workspace, stored equipment, a missed qualification score, an unexplained disconnection, or a disappointing Worlds result could all become opportunities to grow.

Success was measured not only by banners and awards, but also by whether students became more capable engineers, programmers, fabricators, strategists, presenters, leaders, and teammates.

## Lessons learned

The greatest lesson of FREIGHT FRENZY was that a strong team is not defined by its workspace.

Losing our shop could easily have ended or greatly reduced the program. Instead, the team packed most of its equipment into storage, retained the most important fabrication tools, moved a reduced field into Coach Russ's garage, and continued working.

Students learned how to adapt their workflow to the space available. Organization became more important because every tool, part, and unfinished mechanism competed for limited room.

We learned to distinguish between equipment that was useful and equipment that was essential. The CNC router, laser cutter, hand tools, programming equipment, and reduced field gave us enough capability to continue building at a high level.

The season also taught us that remote competition and live competition reward different capabilities.

Remote matches emphasized isolated performance, repetition, and maximizing individual scoring. Live competition added alliance compatibility, defense, field congestion, communication, scouting, and strategic tradeoffs.

A robot that performs extremely well alone may still need additional flexibility to succeed as part of an alliance.

Our largest strategic lesson concerned the shared hub.

Because the shared hub did not matter greatly during our remote qualifiers or New Mexico Championship strategy, we did not devote enough design, programming, and practice time to it. At Worlds, the shared hub became much more important.

Top-level teams could use the shared hub to create scoring advantages, control match flow, and complement alliance partners. Our inability to contribute as effectively in that area narrowed the roles we could perform.

We learned that teams preparing for Worlds must study how the game is evolving beyond their own region. The strategy that wins locally may not be the strategy required internationally.

Scouting videos, event data, discussions with other teams, and analysis of high-level matches should influence development throughout the season, not only after qualification.

Missing the MTI qualifying score by one point provided another important lesson. At a high level of competition, there are no meaningless points.

A slightly faster cycle, one additional freight item, a more consistent autonomous routine, a successful endgame task, or one avoided penalty can determine whether a team reaches its next goal.

That one-point margin reinforced our philosophy of competing against our last best performance. Continuous improvement matters because the final difference may be very small.

The robot disconnection during our first match at Worlds taught us about the limits of troubleshooting and preparation.

The robot had never experienced that failure before and never repeated it afterward. Even the Championship’s lead technical personnel could not identify a clear cause.

We learned that not every failure will provide a satisfying answer. Engineering teams must inspect connections, review logs, test hardware, check software, and eliminate possible causes, but sometimes the evidence will remain inconclusive.

The experience also reinforced the importance of protecting every possible point of failure:
Verify batteries and power connections.
Inspect USB and control-system wiring.
Secure cables against movement.
Review software and communication logs.
Test under field-like radio conditions.
Develop complete pre-match checklists.
Avoid making untested changes immediately before competition.
Even when none of those issues can be proven responsible, disciplined preparation reduces the number of possible failures.

We also learned that one bad match does not define the entire season. The opening failure at Worlds was painful, but it did not erase the work required to become the New Mexico Winning Alliance Captain and Inspire Award winner.

The season reinforced the difference between results and growth. The state championship reflected what the team had achieved; Worlds revealed what the team still needed to learn.

Finally, FREIGHT FRENZY taught us that resilience is not simply continuing after something goes wrong. It is continuing while changing the way we work.

We did not recreate our original shop inside a garage. We created a different, smaller system that allowed the team to keep moving forward. That adaptability became one of the season's most valuable accomplishments.

## Skills and growth

FREIGHT FRENZY expanded ENIGMA's skills by forcing students to apply the capabilities developed during ULTIMATE GOAL under more restrictive conditions and in a more strategically complex live game.
Working Within ConstraintsThe loss of the shop gave students direct experience with engineering under constraints.

Workspace, storage, machine access, practice area, noise, time, and organization all affected how work could be completed. Students learned to plan tasks before spreading out tools and materials and to return equipment to defined locations.

They discovered that efficient engineering depends not only on design skill, but also on workspace management.
CAD and Digital FabricationStudents continued using CAD to plan custom parts and assemblies before fabrication.

Because space and materials were limited, mistakes were especially costly. Careful measurement, complete modeling, fastener access, clearances, and material planning helped reduce wasted parts and repeated work.

The retained CNC router and laser cutter allowed students to continue manufacturing accurate, repeatable components despite losing the full workshop.

Students further developed the complete digital-fabrication workflow:
Define the need.

Create the CAD model.
Select material.
Prepare toolpaths or cutting files.
Secure the stock.
Operate the machine safely.
Measure the result.
Test the part in the robot.
Revise when necessary.
Freight Intake and HandlingFREIGHT FRENZY required students to handle objects with different shapes and physical properties.

Cubes, balls, and ducks did not behave the same way when contacted by rollers, guides, belts, or collection mechanisms. Students learned that a successful intake needed to accommodate variation without becoming overly complicated.

They studied compression, grip, surface friction, alignment, and how freight entered and moved through the robot.
Mechanism SequencingThe team continued applying its linear-mechanism philosophy.

The robot's game-piece path needed to move freight efficiently from the floor to the scoring mechanism. Each subsystem had to complete a defined action and transfer the freight cleanly to the next.

Students learned to evaluate not only whether each mechanism worked, but also whether the transition between mechanisms was reliable.
Cycle-Time AnalysisScoring many pieces of freight required fast and repeatable cycles.

Students practiced measuring how long it took to:
Travel to the freight.
Acquire a game piece.
Return to the hub.
Position the robot.
Raise or align the scoring mechanism.
Release the freight.
Reset for the next cycle.
Reducing even a small amount of time from each action could produce another complete scoring cycle during a match.
Autonomous ProgrammingAutonomous performance remained one of the most important areas of growth.

Students continued writing and tuning Java code in Android Studio, coordinating drivetrain movement with freight handling, hub placement, team shipping elements, and parking tasks.

They learned that an autonomous routine must be judged by reliability rather than its best-ever result. A simpler routine completed consistently could be more valuable than an ambitious routine that worked only occasionally.
Drive-Team DevelopmentReturning to live competition required a different level of driver preparation.

Drivers needed to react to alliance partners, opponents, blocked paths, moving hubs, field congestion, and unexpected

freight positions. Communication between the driver, operator, and coach became essential.

The drive team also needed to understand alliance strategy rather than simply execute isolated scoring cycles.
Scouting and Alliance StrategyThe New Mexico Championship gave students experience evaluating other teams and selecting alliance partners.

Winning Alliance Captain required ENIGMA to consider robot compatibility, reliability, autonomous capabilities, scoring roles, and how another team's strengths could complement our own.

At Worlds, the importance of strategic diversity became even clearer. Students learned that scouting should identify not only which teams score the most, but also how they score, which field areas they control, and whether their capabilities fit together.
Reliability and Field TroubleshootingThe unexplained World Championship disconnect became an advanced lesson in system reliability.

Students examined the robot as an integrated electrical, software, radio, and mechanical system. Troubleshooting required separating possible causes and checking each systematically.

They learned that reliability engineering includes cable management, strain relief, connector retention, battery health, software stability, communication testing, inspection routines, and detailed pre-match procedures.
Judging and PresentationWinning the Inspire Award required students to communicate the entire program clearly.

They presented the robot's engineering process, the loss of the shop, the garage workspace, team organization, outreach, sustainability, and season goals.

Students learned that a compelling judging presentation does not hide challenges. It explains how the team responded to them and what was learned.
Competition at the World LevelAttending the FIRST Championship gave students the opportunity to compare their work with the strongest FTC programs in the world.

They observed faster cycle times, broader strategic capabilities, advanced autonomous systems, highly refined mechanisms, and teams that had designed for multiple match roles.

That exposure raised ENIGMA's understanding of what was possible and changed the standard against which future robots would be evaluated.
Growth Beyond the RobotThe greatest growth of FREIGHT FRENZY came from learning to continue despite uncertainty.

Students experienced the loss of their workspace, reduced resources, remote qualifiers, the return to live competition, state-championship success, a one-point missed qualification, an unexplained technical failure, and the strategic demands of Worlds.

They learned that engineering is not a path in which every good decision leads immediately to success. It is a process of preparation, testing, adaptation, failure, analysis, and continued improvement.

FREIGHT FRENZY strengthened ENIGMA’s belief that we compete against ourselves and our last best performance—but it also added an important refinement: our next best performance must be designed for where we are going, not only for where we currently compete.

# Competitions

### Alamogordo Scrimmage Changed to Remote

Jan 22, 2022 · Zoom Recording From Coaches Garage

Top Ranked

The Alamogordo FTC Scrimmage was originally planned as an in-person event for January 22, 2022, but rising COVID-19 cases across New Mexico forced organizers to move it to a remote format. The competition window was extended from January 22 through January 28, allowing teams to complete their official runs from their own facilities.

Teams needed access to a two-thirds playing field and the remote half-field challenge set. For teams without those resources, NM FTC offered access to fields in Alamogordo, Socorro, and Albuquerque, with teams scheduled separately for safety.

At that time, organizers still hoped the New Mexico Regional Championship could remain a hybrid event, with judging conducted remotely and the robot competition held in person.

### New Mexico Regional Championship

Mar 5, 2022 · Sarracino Middle School in Socorro

Winning Alliance Captain, Inspire Award Winner

The New Mexico Regional Championship used a hybrid format. Dean’s List interviews and most team judging were conducted remotely in February, while the robot competition was held in person at Sarracino Middle School in Socorro on March 5, 2022.

The March 5 event marked the return of live FTC competition in New Mexico. Teams completed robot inspection, qualification matches, alliance selection, elimination rounds, and the closing awards ceremony during a single in-person competition day.

For ENIGMA, this was the team’s first traditional live tournament since the start of the COVID-19 pandemic. The team returned to live competition by earning the Inspire Award and becoming the New Mexico Winning Alliance Captain, qualifying to represent the state at the FIRST Championship in Houston.

## Outreach

Total people reached: 124

Total volunteers: 16

FREIGHT FRENZY required ENIGMA to continue rebuilding the public-facing side of the program after the pandemic.

The previous season had limited most outreach to small classes, virtual mentoring, professional connections, and digital communication. As community activity began returning, the team worked to reconnect with supporters and again share robotics in person where circumstances allowed.

Losing the workshop made those relationships even more important. Sponsors, parents, mentors, and volunteers were not simply supporting robot parts or competition fees. They were helping sustain a program that no longer had a permanent operating space.
Nine FLL ClassesENIGMA taught nine FIRST LEGO League classes through two seven-week programs hosted by Abundant Homes and the Parent Led Academic Network Team.

Participants worked in teams of three using the FLL Mission Moon challenge. Each group received one or two missions and learned how to design, build, and program a robot capable of completing them.

ENIGMA taught:
Age-appropriate engineering principles
FIRST Core Values
LEGO robot construction
Block-based programming
Teamwork and communication
Testing and iteration
The students concluded the programs by demonstrating their robots and running the missions they had prepared.

These classes allowed ENIGMA to introduce younger students to robotics through active participation rather than a passive demonstration. Each participant had an opportunity to contribute to a real machine and see code produce physical movement.
Sharing Resources With Other TeamsENIGMA viewed its portfolio, tools, and technical experience as community resources rather than private competitive advantages.

Throughout Freight Frenzy, the team shared its engineering portfolio with other programs, contacted smaller teams that were just getting started, and helped teams troubleshoot robot problems at competitions.

Students and mentors also shared tools and technical knowledge whenever another team needed help.

This work reflected Coopertition and Gracious Professionalism. ENIGMA wanted to perform well, but it also wanted more New Mexico teams to arrive at events with functioning robots and students who felt supported.
A Practice Robot for OutreachThe younger members' practice robot gave ENIGMA a dedicated machine for training and demonstrations.

Because it was separate from the competition robot, students could experiment, make mistakes, and practice repairs without putting the season's primary machine at risk.

The robot was also intended for outreach events, where visitors could get closer to a working machine without threatening the reliability of the field robot.

This made the practice robot both an internal teaching tool and an investment in future community engagement. Connecting With Professional EngineersOutreach also worked in the opposite direction: it brought professionals into the students' learning environment.

Kim, a mechanical engineer at Sandia National Laboratories, taught the team about manufactured-part quality, repeatability, and design of experiments.

Renzo, a research engineer with decades of testing experience, helped diagnose the robot's electrostatic-discharge problem and recommended the copper-plate solution.

These relationships gave students access to professional engineering practices while giving experienced engineers an opportunity to invest directly in the next generation of STEM students.

Freight Frenzy therefore connected ENIGMA with both ends of the mentorship cycle: the team taught younger students while professional engineers taught them.

Students continued learning how to explain ENIGMA's mission and why community-based robotics matters. They presented the program as a pathway through which students could gain experience in engineering, programming, fabrication, project management, communication, fundraising, and leadership.

The team also maintained the professional relationships developed during previous seasons. Those connections had helped students learn CNC machining, laser cutting, advanced 3D printing, CAD, material selection, mechanical design, and engineering analysis.

Preserving access to the CNC router and laser cutter after losing the shop was especially important. Those machines represented not just equipment, but the support of the community members who had invested in the students' development.

Judging preparation also became an important form of communication. Students needed to explain how the team had continued operating from a garage, how the robot was engineered, how responsibilities were divided, how setbacks were managed, and how ENIGMA remained sustainable.

The Inspire Award demonstrated that the judges saw value not only in the robot's performance but also in the team's complete story.

Representing New Mexico at the FIRST Championship became another form of outreach. ENIGMA carried the work of its students, families, sponsors, and regional robotics community onto an international stage.

At Worlds, students met teams from across the United States and other countries, observed different robot architectures, exchanged ideas, and experienced the scale of the global FIRST community.

Even the team's difficulties at Worlds became valuable stories to share. Future students could learn from the unexplained disconnection, the importance of shared-hub strategy, and the difference between building a robot that can win regionally and one prepared for the strategic demands of international competition.

Through continued sponsor communication, judging, competition, professional relationships, and representation at Worlds, ENIGMA showed that outreach includes every effort to connect students, engineering, and community

### FLL Mission Moon Classes at Abundant Homes

Abundant Homes, Albuquerque-area, New Mexico · 22 reached · 2 volunteers

ENIGMA taught a seven-week FIRST LEGO League robotics program through Abundant Homes. Participants were divided into teams of three and assigned one or two missions from the 2018–2019 FLL Into Orbit/Mission Moon challenge materials used by the team.

ENIGMA introduced age-appropriate engineering concepts, FIRST Core Values, teamwork, and block-based programming. Students brainstormed solutions, built robots, programmed their designs from the ground up, and concluded the program by running their robots through their assigned missions.

The program was delivered while COVID-19 precautions were still in effect. The host organization established the safety requirements, and ENIGMA members wore masks throughout the classes.

### FLL Mission Moon Classes at Parent Led Academic Network Team

Parent Led Academic Network Team, Albuquerque-area, New Mexico · 19 reached · 3 volunteers

ENIGMA taught a second seven-week FIRST LEGO League program through the Parent Led Academic Network Team.

Students worked in teams of three and used the FLL Mission Moon field and challenges. Each group received one or two missions and learned how to move from a problem statement to a working robotic solution.

ENIGMA members taught:
Basic engineering and design concepts
FIRST Core Values
Teamwork and problem-solving
LEGO robot construction
Block-based programming
Testing and iteration
At the end of the program, each group demonstrated its robot and attempted the missions it had designed and programmed the robot to complete.

### FIRST Team Resource Sharing and Competition Assistance

New Mexico FTC competitions and remote team communication · 70 reached · 7 volunteers

ENIGMA continued helping other FIRST teams by sharing technical resources and practical competition support.

The team shared its engineering portfolio with other programs, contacted smaller and developing teams, and helped teams troubleshoot robot problems at competitions. ENIGMA also made its tools and accumulated technical knowledge available to other teams when needed.

This support was less a single scheduled event than a season-long commitment to strengthening the New Mexico FTC community. It reflected ENIGMA's belief that teams can compete seriously while still helping one another build safer, more reliable, and more capable robots.

### Student Practice and Outreach Robot Project

ENIGMA workshop, Albuquerque, New Mexico · 5 reached · 2 volunteers

ENIGMA introduced a new practice-robot project during Freight Frenzy.

The simpler robot was designed and built primarily by younger and less-experienced students. Because it was separate from the competition robot, students could learn without the pressure of completing a field-ready machine on the competition schedule.

Experienced students guided the newer members through:
Safe tool use
Basic robot construction
Mechanism design
Problem-solving
Block-based programming
Testing and revision
The practice robot was also intended for public demonstrations. Using it at outreach events would allow visitors and students to interact with a working robot without risking damage to ENIGMA's competition machine.

### Professional Engineering Mentorship and Design Review

ENIGMA workshop and remote/in-person mentorship in Albuquerque, New Mexico · 8 reached · 2 volunteers

ENIGMA expanded its connection with professional engineers through two mentors associated with Sandia National Laboratories.

Kim, a mechanical engineer recruited by team captain Isabel, taught students how engineers evaluate manufactured parts for quality, reliability, and repeatability. She introduced the team to design of experiments, which students used while prototyping and testing their Team Shipping Element.

Renzo, a research engineer with more than 35 years of experience in energetic-materials testing and more than six years of FTC mentorship, helped the team investigate severe electrostatic-discharge problems.

He identified that a box dragging across the floor was collecting electrical charge and behaving like a capacitor. When the stored charge discharged, it interfered with the robot's connectivity. Renzo recommended fabricating and installing a copper plate beneath the box to reduce the electrostatic problem.

These relationships connected the students' competition work with professional practices in manufacturing quality, experimental design, failure analysis, and electrical reliability.

# Season highlights


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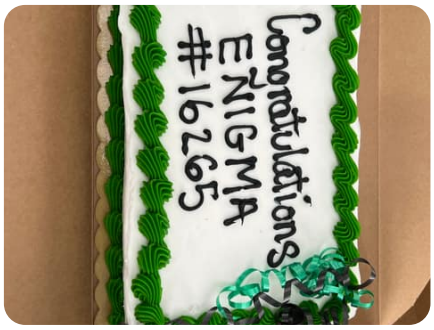

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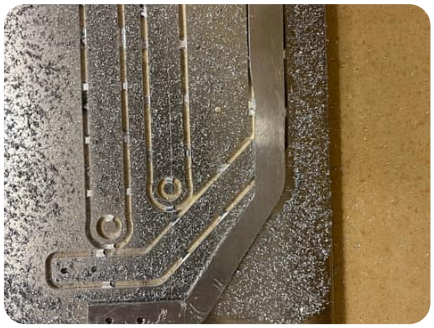
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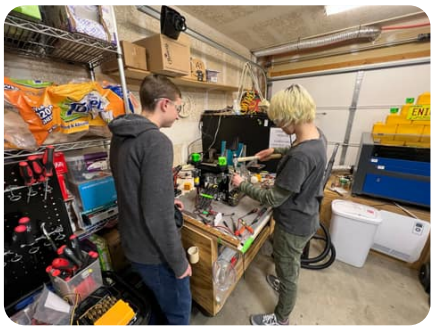
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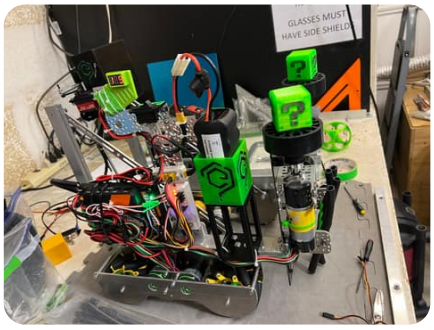

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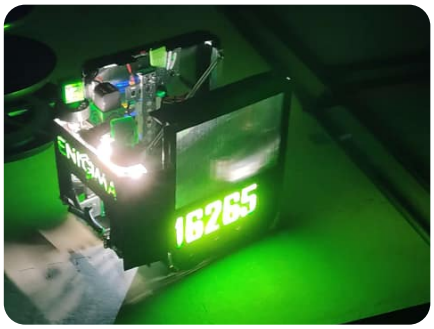

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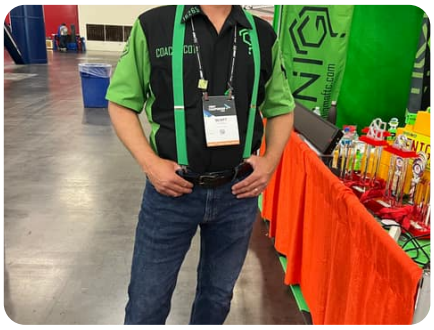
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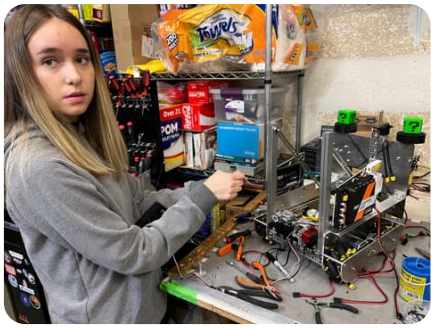
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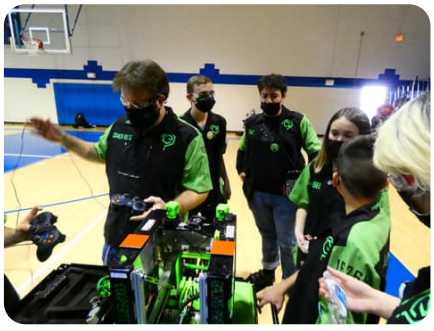
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