



**7407**

# Chairman's Award Submission

The Wired Boars

2022 Season

Choate Rosemary Hall  
333 Christian Street  
Wallingford, CT 06492

## Executive Summaries

**Describe the impact of the FIRST program on team participants within the last 3 years. This can include but is not limited to percentages of those graduating high school, attending college, in STEM careers, and in FIRST programs as mentors/sponsors.**

The Choate Robotics program has proven massively successful in its goal to promote STEM education. Of the 24 Advanced Robotics Concentration (ARC) graduates, 100% enrolled in a 4-year college, 86% of whom attended a top 50 university or college, and 96% continued studying STEM. While on the team, students are exposed to a rigorous curriculum revolving around *FIRST*—not only do they compete in FRC, they also use *FIRST* concepts to learn engineering in a hands-on project-based learning environment.

**Describe your community along with how your team addresses its unique opportunities and circumstances.**

Due to the fact that Choate is a boarding school, our robotics program is a unique community made up of 48 students from all over the world. As part of our robotics program, we have a 23-student specialized academic program, called ARC, dedicated to integrating FRC into the classroom through projects and collaboration. ARC students come from 12 states and 2 countries, with each member bringing a diverse range of thoughts and skills to our close-knit team.

**Describe the team's methods, with emphasis on the past 3 years, for spreading the FIRST message in ways that are effective, scalable, sustainable, and creative. How does your team measure results?**

Being hosted through an institution with many privileges has made Choate Robotics cognizant of the impacts we can make on the communities around us. The team reaches out by showcasing our projects outside of our community, volunteering through local STEM organizations, undertaking service projects, sponsoring *FIRST* Lego League teams, partnering with other school clubs to spread STEM awareness, and sharing both technical and non-technical resources with other *FIRST* teams in the Open Alliance.

**Please provide specific examples of how your team members act as role models within the FIRST community with emphasis on the past 3 years.**

This year, 7407 started 3 FLL teams, with the goal of inspiring young kids to pursue robotics. Within them, we wanted to create the foundation that robotics has no gender and can be pursued by anyone. Through this ideology, we were able to provide girls a space where robotics could be girly and they could wear lipgloss and princess dresses yet also learn FLL. We dedicated 149 hours to mentoring these impressionable young minds to make a lasting impact on the future of robotics.

**Describe your team's initiatives to Assist, Mentor, and/or Start other FIRST teams with emphasis on activities within the past 3 years.**

To spread the mission of *FIRST*, we at 7407 mentor Team 8604, work with the New England Innovation Academy Independent School to build a sustainable robotics program, and partner with Team 6328 to assemble rookie kits to send to new teams. In 2021, we started 3 FLL teams at all 3 levels and developed an FLL starting guide for teams to facilitate their own FLL programs. Additionally, we joined the Open Alliance to share our knowledge and materials we create.

**Beyond starting teams, what initiatives have you done to help inspire young people to be science and technology leaders and innovators? What results have you seen from your efforts in the past 3 years?**

This season, we initiated a program where students can pursue a self-guided research project as part of ARC. We have 3 students pursuing personal projects, focusing on biomedical, environmental, and nuclear engineering. Additionally, our students are working with Team 8604 to design a public school curriculum that incorporates FRC. We push what it means to innovate in STEM both within and outside our team, focusing on making STEM accessible to all.

**Describe the partnerships you've created with other organizations (teams, sponsors, educational institutions, philanthropic entities, etc.) and what you have accomplished together with emphasis on the past 3 years.**

Since our team's founding, Choate has been our sole sponsor. They provide all funding and ensure team members do not encounter any costs within the program. Additionally, we have formed partnerships with five teams this season (2168, 6328, 8604, 7594, 1868, and 8728), the Wallingford STEM Center, and we will be menstruation equity reps at all events we attend. With Choate's support, we've also worked with 6328 to create starter kits for all 2022 rookie teams.

**Describe your team's efforts in the past 3 years to promote equity, diversity, and inclusion within your team, FIRST, and your communities.**

7407 is making an active effort to become a more inclusive and equitable community. In past years, we've struggled with gender inequality. We don't want to reflect today's STEM workforce. Instead, we want to mold our team to cultivate diverse STEM cohorts of tomorrow. For example, to combat DEI issues on our team and in STEM as a whole, we recruited two female mentors. Our team has become more inclusive and comfortable since, helping us to learn and grow as a team.

**Explain how you ensure your team and the initiatives you have created will continue to run effectively for the foreseeable future.**

The sky's the limit for 7407 due to the strong foundation we have laid within our school and community. Because FRC at Choate is a selective program, we have an incredibly dedicated student base that learns CAD, manufacturing, and CNC machining all before their first build season. ARC has plans for major growth in 2022 and beyond, with the restructuring of our Autonomous Robotics course as well as plans for adding an Advanced Design and Manufacturing course to our robust curriculum.

**Describe your team's innovative strategies to recruit, retain, and engage your sponsors within the past 3 years.**

Team 7407 is fortunate enough to have a privileged institution like Choate Rosemary Hall to be our sole sponsor. Through collaborative effort with Choate, we have been able to accomplish everything we have: FRC-focused classes, sports credits for the afternoon activity, and a state-of-the-art workshop equipped with everything the team needs to succeed. Choate's support has also extended into the future, with plans to build a dedicated building for robotics on Choate's campus to bolster the team.

**Highlight one area in which your team needs to improve and describe the steps actively being taken to make those improvements.**

Because 7407 is still relatively new to FRC, we are still trying to find our identity as a team. The team struggled to form intimacy and camaraderie, and in the past a divide existed between the girls and boys. To combat this issue, we have recruited two women mentors for the 2022 build season and created a tighter-knit group through honest and vulnerable communication. By bridging this divide, we are well on our way to creating a more familial team.

**Describe your team's goals to fulfill the mission of FIRST and the progress you have made towards those goals.**

Team 7407's primary goals are to give those who are enthusiastic about robotics an outlet for their passion and to promote diversity, equity, and inclusion within the greater FRC community. Through our offered courses and robotics activities, students are able to explore previously unknown fields of engineering and robotics. Our team also works heavily with STEM outreach, so our impact spreads outside of our laboratory walls. We are happy to utilize *FIRST* as a tool to develop students' interest in STEM.

**Briefly describe other matters of interest to the FIRST Judges, including items that may not fit into the above topics. The judges are interested in learning about aspects of your team that may be unique or particularly noteworthy.**

Choate Robotics students are able to immerse themselves into the *FIRST* Robotics experience in a residential setting. As a team, we are able to spend hours in the lab on weekends and late into the evenings since over 80% of team members live on our school's campus. We are one of the few FRC teams located at a boarding school and we hope to inspire our peer boarding schools to launch their own robotics programs.

## Essay

As Angela Davis once said, “I am no longer accepting the things I cannot change. I am changing the things I cannot accept.” Team 7407 has been personally inspired by her words, and we’re striving to make a difference in our community through innovating new course curricula, pioneering new standards of diversity, and focusing on outreach projects to proliferate the missions of both *FIRST* and our team. We’ve coined the phrase “educational revolution” for 7407’s groundbreaking work towards reshaping the landscape of STEM education through FRC. We’re proud to compete in FRC as a unique team—in our position of being hosted by a private boarding school, we hope to use our privilege and resources to make robotics more accessible for all.

Choate Rosemary Hall is one of the first NEPSAC member schools and private boarding schools to implement FRC directly into our curriculum. Choate offers 6 courses in our robotics department that students can take as electives for course credits. This year, 69 students are enrolled in courses within the robotics department; of these students, 23 are part of the selective academic signature program called the Advanced Robotics Concentration (ARC).

Established in 2018, ARC gives students the opportunity to develop a strong educational foundation for a career in STEM. Within this program, students learn skills like CAD, fabrication, coding, and outreach through hands-on learning, real-world applications, and FRC. The program involves 3 terms of honors-level courses and a winter afternoon activity that meets 6 days a week. All new ARC students are required to take Robotics Fabrication and Design (CS450) during the fall term of their first year in the program, arming them for the FRC competition season with quintessential robotics knowledge and experience. With the 2021 hiring of an additional head advisor came a reform of the ARC curriculum—especially shown in CS450. This fall, students were tasked with designing, prototyping, and manufacturing a 2017 FRC gear intake subassembly in pairs. In addition, students gained foundational knowledge from other areas of FRC, such as wiring and drivetrains, through the use of resources such as the NASA Robotics Alliance Project. The crowning jewel of ARC occurs in the winter term, where students prepare for and compete in FRC as both a class and their required afternoon activity. In total, during competition season, ARC meets for nearly 20 hours a week.

ARC is recognized as an incredibly rigorous yet fulfilling experience—truly, it is a cornerstone of the academic offerings at Choate. In fact, some students are even

drawn to apply to and attend Choate solely because of this program. Our strong academic reputation is proven by the post-program success of our members: 100% of ARC graduates have enrolled in college, and 96% of them have continued to study STEM. Since 2019, 26 students have graduated from ARC, going on to study at prestigious institutions like MIT, Yale, Northeastern, and more. Overall, 86% of ARC graduates have matriculated to top 50 universities and colleges. Choate's robust robotics offerings have cultivated a team full of students dedicated to pursuing a STEM career.

Possibly the biggest benefit of having a single, high-endowment sponsor such as Choate is that there is no monetary cost to participate in ARC past tuition. Every cost is paid for by Choate, from competitions to team apparel. We are extraordinarily privileged to not have to worry about affording a certain part, tool, or participant cost. We are dedicated to ensuring that those from a lower or underprivileged socioeconomic background can get the full robotics experience at Choate without having to worry about finances. We boast sizable socioeconomic diversity both as a school and a team; 32% of Choate students received need-based financial aid during the 2021-2022 school year, with the average award covering 79% of tuition. This socioeconomic representation spreads evenly onto the team, reflecting the entire student body. As a team, we are keenly aware of the class differences apparent in STEM academia, so throughout the ARC application process, mentors keep these inherent disadvantages in mind.

7407 takes great pride in the diversity of our team as we work to nurture a respectful and inclusive environment. Our team is composed of 43% women and approximately 50% people of color, each person coming from a very unique background. As we are fully integrated within a boarding school, we also possess geographical heterogeneity, with team members hailing from 12 American states and 2 countries.

We have been able to foster amicable and healthy bonds among team members as we have strived to improve our team structure. Throughout the 2022 FRC season, we hope to lead other teams in the path towards equality in FRC. To support underrepresented groups both on our team and in the greater STEM community, we recruited 2 female mentors, one of color. We have also effectively transformed the team into a safe space to set an example of a team that can grow from its past. We host open and vulnerable team community conversations to tackle issues within both the team and the school. Our efforts in diversity, equity, and inclusion have made a clear difference on the team



and at competitions, where there are still stark differences between our team and competitors. At competitions, our members describe the lack of diversity as “uncomfortable” and something we “become incredibly aware of instantly.” Team 7407 doesn’t want to reflect today’s STEM workforce; rather, we strive for our team to reflect what the STEM workforce should represent. We hope to change the demographics of the field to encourage innovation and equal representation.

Team 7407 puts extensive effort into outreach, which is especially important when considering the exclusivity of the ARC program. Within our school, we maintain partnerships with numerous on-campus clubs—Computer Hardware Club and GirlTech Club, to name a couple—to spread the values of *FIRST* and sow a passion for STEM. With the help of GirlTech, we have taken it upon ourselves to pioneer a support system for women in STEM on our campus. Through extensive discussions, we have found that the women on the robotics team enjoy their experience exponentially more than women in STEM off the team due to our dedication to bridging the field’s inherent gender gap. By facilitating a safe space ripe with healthy communication, we hope to help these women develop positive relationships with STEM education. In collaboration with the Computer Hardware Club, we have been able to open the sometimes elusive doors into the robotics stratosphere and stoke new flames of interest in non-ARC students. During one meeting, we taught the club members how to solder and finished the lesson with some power-poleing and pizza. We have also partnered with this club to host a lecture series at the local library to teach adults how to maintain their personal devices.

In fall 2021, we founded 3 FLL (54501, 25421, and a Discover group) and 6 VEX teams mentored by ARC students. The FLL teams were made up of 3 different age groups of students, each mentored by both ARC and non-ARC students. FLL participants learned basic programming and engineering principles, developed collaboration skills, and, most importantly, had fun with robotics. VEX students dedicated time to preparing for the VEX Robotics Competition each Sunday over 4 months, being mentored by our VEX student mentor, a first-year ARC student. By the end, one VEX team went on to compete at the state competition; they finished with 4 wins and 2 losses and ranked 16th overall out of 60 teams. This mentorship gave the VEX students an opportunity to compete in a robotics competition and the ARC student experience in working as a leader and mentor. Overall, our student mentors put in 361 hours of work with FLL and VEX.

Team 7407 recently joined the Open Alliance project to collaborate with other FRC teams from across the country. Every week, we post updates of what our team accomplished—from strategy to programming to CAD to assembly—on the Open Alliance Discord server and the Chief Delphi forums. On the latter, our build thread has 2,100 views. We field questions other teams have regarding any of our concepts or practices to further the collective knowledge of the Open Alliance; additionally, we shared a detailed report on our parametric elevator assembly with the intention of helping other teams with navigating the challenging hangar climb. At the time of writing, this growing community has 540 members representing 37 FRC teams.

Team 7407 proudly encourages the members on the team to go further into STEM with individual engineering projects. Some projects members have undertaken include biomedical engineering with prosthetics, biomimicry with respect to nuclear disaster solutions, and water treatment solutions within environmental engineering. While FRC certainly has direct applications in STEM and engineering careers and education, we wish to also motivate our students to explore their own personal interests.

Team 7407 has strived to set the bar higher than the glass ceiling in the STEM community. We have put forth persistent efforts into our innovative new curriculum and developing inclusivity within STEM, and a deliberate focus on STEM outreach. In the future, we hope to continue to evoke Angela Davis's message and circulate its impacts to other FRC teams. While in FRC and after, 7407 members will continue to fulfill the words of Angela Davis. We refuse the status quo of STEM academia—now that we've started our efforts toward educational revolution, we will not just sit back and accept passive progress. Team 7407 is now and forever will be dedicated to forcing positive change in FRC, STEM, and education in general by any means possible. We hope our efforts will inspire other teams to do the same.