

## Chairman's Award - Team 5985

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2021 - Team 5985

### Team Number

5985

### Team Nickname

Project Bucephalus

### Team Location

Wollongong, New South Wales - Australia

### 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.

Limits overcome, abilities expanded and opportunities ahead. Statistics from the last 3 years show that for 5985, *FIRST* is: -A passion: 57% in multiple programs -A community: 69 students from 21 schools in 2 countries -A commitment: 51% mentoring *FIRST* teams -A future: 100% planning tertiary education and 94% seeking STEM careers -A dedication: 42% of alumni returning as mentors -An inspiration: 100% of alumni in tertiary education or STEM careers -A lifestyle: an average *FIRST* career of 5 years

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

PB's home is Wollongong (pop. 305,000) with a declining steel industry. Neither rural nor urban, funding is restricted. Here, PB has built: -links to formal funding sources, opening STEM/*FIRST* access to others -a major *FIRST* Hub accessible to rural teams, with a powerful FLLC community of 155 teams (83% mentored by PB) -a teaching network reaching 37% of city schools -a business model serving tourists, locals and rural areas -a diverse team, with homeschool (18%) and low-income (30%) families

### 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?

PB's Teaching Program funds the team and inspires youth to engage with STEM and *FIRST*. 3 years of statistics show the impact: -Run year-round for 2,774 children in 24 venues and online. Engaged students attend for up to 6 years, whilst 84% of PB members learn to teach -Incentive from PB has seen 30% of students use personal robotics kits, freeing PB resources for 13 new locations -Students are engaged by 60 PB-designed robotics challenges, including 1:5 scale FRC games for LEGO robots!

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

GP is built into PB culture. Within 3 years, members have: -Taught in 2,368 hrs of STEM classes, representing *FIRST* to students and inspiring 7583 to start a partner program -Travelled up to 150km to be head-referees and judges at 39 *FIRST* events -"Saved" FLL teams at 10 competitions, fixing dropped robots and calming panic -Helped 7707 build a robot at a Regional when theirs was stuck in Customs -Valued coopertition over winning at 9 FRC events, sharing match data with opponents in the finals

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

PB builds teams worldwide. Over 3 years PB has: -assisted teams via 28 published resources, 4 official programs and 7 Kickoff events -started 17 FLLE teams through My Maker's Space in the USA -started 27 and mentored 63 FLLC teams globally in the Teaching Program, donating LEGO to 11 -started 5 FTC teams, aided outreach and spoke at 2 international conferences -run 2 FRC programs teaching strategy and GP to 12 teams from 2 countries Working from this base, PB started 2 FRC teams in 2018-19

**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?**

In 3 years, PB-created STEM opportunities have: -Spread weekly classes to 15 venues, growing overall attendance 40% and female participation by 20% -Reached all ages in 250 display hours -Created Australia's first SWENext club, linking 12 girls with International engineers -Produced CAD lessons for middle-schools, used to train 16 PB recruits -Run a Scouts Australia STEM program, reaching 75 youth and creating a National activity format -Started 2 robotics "Master Classes" for 27 high-schoolers

**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**

PB thrives on collaboration. 2021 marks: -6 yrs bringing STEM to rural areas with the University of Wollongong -6 yrs delivering 2 STEM programs with the Rotary Club of Corrimal -4 yrs teaching design, creating training material for IronCAD -4 yrs mentoring 7583, donating space and helping build an integrated STEM program -4 yrs supporting 6035, twice saving them from collapse -2 yrs promoting tertiary education options with TAFE NSW to 807 students, creating a shared workspace for *FIRST* teams

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

PB strives for accessibility. Efforts in the last 3 years include: -a free all-girl STEM program for 183 girls starting 3 FLL teams and pushing PB to 48% female membership in all roles -remaining financially accessible. 84% of PB teach in lieu of fees -earning government accreditation. 408 students access PB classes via funding programs -providing vocational STEM training to 20 youth and adults with disabilities -making STEM relevant to ages 3-109 in visits to preschools and nursing homes

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

The Teaching Program is PB's base, providing: -88% of income -83% of recruits -Community visibility Sustainability comes from: -a scale able to endure setbacks, mitigate risk and power new ventures -flexibility, 4 new venues in 2020 -engaging new (52%) and retained (48%) students -earning a COVID-safe rating and working with 4 official programs In addition, PB: -is student-led, giving members a personal stake -runs a network of 6 FRC teams, giving year-round mutual support in calm and crisis

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

PB has seen 40% sponsor growth in 3 years, building partnerships that include: -special access to season insights in a Build Blog -award plaques featuring "used" FRC Game pieces -running robotics classes for sponsor employees/members -creating excitement at sponsor events, such as robots dancing at K-6 discos -protecting property, even finding and fighting a school fire! 90% of sponsors met PB through the Teaching Program, engaged by team members and class quality - and the fun had by children!

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

PB's main weakness is lack of precision machining, denying experience to members. Outsourcing CNC capacity failed. Team income couldn't cover a CNC purchase. Temporary workspace limited tools to those easily moved; a drop saw and drill press being the most complex. PB is solving the issue by: -Tool training to reduce human error -Using designs that require less precision -Seeking (and finding) permanent workspace -A CNC fundraising program PB estimates CNC capability will be achieved by 2022

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

1: Make robotics a familiar activity. Pre-COVID, 250+ students per week learned STEM with PB, a 40% increase in 3 years 2: Create opportunities. To become STEM leaders, youth first need a chance to engage. PB creates chances for all, even starting a program for 56 children with disabilities in 2020 3: Build leaders, creators and thinkers. PB teaches robotics, but also collaboration, patience and more. Health providers now fund student access to PB programs for the Life Skills over STEM learning

**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.**

Independent, self-sufficient and open to all, PB: -members travel up to 120km for meetings -treasures their oldest fans in the IRT nursing home -was vital to FIRST Australia's COVID response, running a national FRC workshop series and supporting 2 global 24hrs of STEM events -turned a disused function centre into workspace, housing 6 FLLC teams, 3 FRC teams and a field -arranged a 20% COVID discount from a national robotics provider for PB students -gained a record 16 recruits during COVID!

## Essay

Create Opportunity, Transform the Community - in normal times, this vision of 5985 Project Bucephalus (PB) underpins sustainable change from beaches to the bush; preschools to nursing homes. PB can now proudly show that this vision also weathers bushfire, flood and pandemic. Amid uncertainty, the team has built on a strong foundation to provide stability, showing that it can adapt - and even expand - as it grows a vibrant FIRST community in the City of Wollongong and beyond.

2020 upended "normal". Australia began the year with brutal natural disasters. Bushfire and flood threatened members' homes, cutting off travel and forcing week-long stays with mentors. Then came COVID-19. PB adapted to virtual activities, aided by prior experience in remote management of members across 2 countries. Earning a government COVID-safe rating, 5985 kept operating, adding stability to an uncertain community. As a result, PB took on 16 new recruits: the largest intake ever.

PB's stability is built on the Teaching Program. These team-run classes teach robotics to anyone, inspiring love for STEM and building life skills whilst generating income. Every opportunity is built on this foundation, powering outreach and growth since 2015. A PB class is in session every day of the school week in an area up to 220km from Wollongong. The logistics are incredible: Each week PB travels 500+km to reach 250+ students in 18 locations! School holiday workshops allow the Teaching Program to run year round, reaching an extra 350+ students yearly. The program caters to all ages, skill levels and learning styles, seamlessly merging newcomers and veterans.

PB extracts many opportunities from the Teaching Program. It is a foundation for new programs, roots PB in communities and builds self-sufficiency - a FY2020 gross income of \$139,763 provided 88% of team funds. 84% of team members enrol as mentors in lieu of fees, making the team accessible to all.

COVID proved the program's resilience. Running as "Robotics Online", 57 remote classes reached nationwide using robotics kits loaned by 5985 or bought from suppliers at PB-negotiated discounts. PB received financial stability whilst giving valuable normalcy to students.

6 years of stability have built PB into the community fabric. Team identity has been shared with 5,437 Australian students, enabling long view recruitment. STEM-minded students are identified early and introduced to FIRST. 83% of all 5985 began their STEM journey in a PB robotics class. These stories define 5985:

Gideon stumbled upon PB at a rural library and his course was set. He devoured every STEM opportunity offered, continuing with classes even after joining PB - despite a 180km daily commute. Over 4 years he drastically gained confidence and new skills, earning the role of CAD team leader. Now graduated, he will study Mechatronics - and become a PB mentor!

Georgie started her STEM journey by sneaking into a PB class. An official student by age 8, her passion for STEM was nurtured over 6 years with PB. FRC was Georgie's goal, the opportunity to join 5985 was a lifeline which she seized. In her first FRC season she mentored 3 FLL Challenge (FLLC) and 1 Explore (FLLE) teams, taught in multiple Teaching Program classes, and became an integral part of the Awards team - dabbling in Controls on the side.

Sustained outreach, opportunity and impact has placed PB at the heart of FIRST in Australia and created a FIRST explosion on the South Coast. This shockwave travels over borders - most powerfully in the Quad Cities (QC) of Iowa and Illinois, USA. In 2020, despite COVID, PB equipment and volunteers globally supported 7 official FLL, FTC and FRC events.

FLL is a 5985 passion; and the team has transformed FLLC in Australia. 77% of PB are FLL alumni, each feeding skill back into the community - building team numbers and quality. Since 2015 PB has mentored 204 FLLC teams globally (starting 114), including 83% of all South Coast teams. PB founded the Wollongong FLL Regional in 2015, running and hosting it ever since - even as a COVID-safe event in 2020.

Working with FIRST Australia, PB delivers the Robot FIRST Aid and National FLL Help Desk programs and assists the Australian Head Referee. Pre-COVID, PB's FLLC Kickoff drew teams from 600+ km away. Now virtual, it has a national audience. In the QC, 5985 builds FIRST in schools and communities, running displays, mentoring and assisting with grants. PB also created and now runs the first FLLC/FLLE Joint Kickoff, reaching 140 QC teams since 2017.

PB creates opportunities for all ages. 5985 started 86 FLLE teams, some attending the Wollongong FLL Regional. In Iowa, 42 FLLE teams have attended the joint kickoff since 2017. PB is truly proud of creating "My Maker's Space", a 2019 official season-in-a-day event for 20 marginalised QC youth. Expanding despite COVID, 30+ youth joined from home in 2020.

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PB steadily supports FTC, providing outreach opportunities to teams. 5985 helped plan and assist a FTC Kick-off in Illinois. In Iowa, PB has mentored 8 FTC teams (starting 7) and spoken at coach conferences. During COVID, PB's experience in remote team management was invaluable. 5985 shared this at the Canadian FTC kick-off and a Coach Professional Development conference reaching across North America.

From the USA and Australia, PB has reached Africa, Asia and Europe. NXT kits restored by 5985 were taken to schools in Tanzania, Ethiopia and Kenya - team members officially starting FIRST in the latter. In 2021, PB started the first FLL teams in Mauritania. In China, PB mentored and competed with 3 rookie FRC teams and in 2020 ran online FLLC classes for rural schools. In Germany, PB mentored 3 FLLC teams.

PB's greatest challenge is starting FRC Teams. Despite laying foundations for potential teams since 2015, success was elusive. Persistence saw 5985 start 7583 in 2019 and 8259 in 2020. Validating PB's passion, both teams had roots in FLL outreach.

During this process, 5985 built links to existing teams. PB shares space and knowledge, running scrimmages and National FRC Webinars. PB members speak and moderate at Mentors Without Borders and 24 Hrs of STEM events. Since 2019 PB has helped the Compass Alliance Call Centre, assisting teams globally. Ultimately, this work led 5985 to start 2 programs: The South Coast Alliance (SCA) and the Collaborative Scouting Project (CSP).

The SCA is a collaboration of 6 FRC teams, founded by 5985, 6035 and 5988. In the SCA, PB aided 6035 when it was near collapse by rallying members and securing funds. 5985 helped 7583 start a teaching program complementing PB's. When 7583 lost their workspace, they were welcomed into PB's workshop, sharing space since 2020.

The CSP embodies Coopertition and teaches strategy. It builds alliances that share scouting, data and analysis - even in opposition! Tested in 2017, it is now a full enterprise. PB leads 12+ international CSP teams to produce a system for FRC events worldwide, adding FTC in 2020.

PB targets inequality, by creating opportunities like "Rocketing Girls Into Robotics". Run by girls, for girls, this government-funded STEM program began in 2018, creating FLLC teams and FRC recruits. A FIRST Equity grant is continuing the program in 2021. In 2020 PB founded the first Australian SWENext chapter, linking FRC girls with female engineers. Special PB STEM classes reach remote areas, exchange student classes and community events like the Comic Gong convention and Australia Day festivities, reaching up to 18,000 people.

PB built the "Unlimited" program to reach beyond traditional STEM audiences. The last 2 years have seen PB speak at conferences, visit nursing homes and pre-schools, teach at autism spectrum schools and deliver vocational training to adults with disabilities. In 2020 (amid COVID) PB received a \$125K government grant to fund a major expansion of the program. For 2 years, PB will deliver 3 weekly STEM classes to 36 children with disabilities. PB's stability and COVID-safe programs factored heavily in receiving the grant.

Resiliency and growth also came from PB's "FIRST Scouts" program. In 2020, it spread to city and rural areas - 5 Scout FLLC teams ran up to 220km from Wollongong. PB members took lead roles in shaping STEM in Scouts, from local activities to bases at a state camp. Collaborating with the Scout STEM Commissioner, "FIRST Scouts" is now a National activity template.

Opportunities are valuable, sought before financial aid in every PB partnership. The University of Wollongong has hosted the Teaching Program since 2015. Rotary Clubs donate labour for community events, whilst gaining opportunities to fundraise. IronCAD gives software and support; in return PB tests products and creates tutorials.

Surprisingly, K-6 schools offer 5985 the closest partnerships. Of the 25 schools hosting the Teaching Program since 2015, PB was adopted by Wollongong West, then Mt St Thomas. Trading robotics for workspace, PB's extended presence transformed the schools, building robotics hubs in areas with low socioeconomic status and non-English speaking and refugee families. PB forged lasting links and mentored exceptional FIRST teams and FRC recruits.

These benefits saw institutions approach 5985. In 2020, this led to a major partnership with TAFE NSW (Technical and Further Education) which gained PB a building! Moving in 2 months before the pandemic, 5985 customised the space, arranged guest areas and ran scrimmages. Once restrictions took hold, PB set up a COVID-safe location for FIRST teams, the Teaching Program and the 2020 Wollongong FLL Regional.

Surrounded by uncertainty, PB provides stability. Work of past years has built a foundation to weather literal storms. Come bushfire, flood, or pandemic, PB continues to transform communities regardless of age, gender or location. From the heart of FIRST in Wollongong, 5985 teaches the power of opportunity - building an idea shared by teams across the world.