

## Chairman's Award - Team 3132

### Team Number

3132

### Team Name, Corporate/University Sponsors

Macquarie University/BAE Systems/Google/Rockwell Automation/Ford/Boeing/Salesforce/AndyMark/Aarnet/United Airlines/Optus/Blackbird Ventures/NewsCorp Ltd/National Instruments/Hilti/Smile Like Drake Foundation/CSIRO/Anritsu/T-Shirt Printing Australia/CSC/Ullrich Aluminium/Silverwater Crate&Greater Sydney Area High Schools&Global Student Network

### Briefly describe the impact of the *FIRST* program on team participants with special emphasis on the 2016/2017 year and the preceding two to five years

TDU takes students from high schools literally around the world and creates a family. We are transformed from the 1 or 2 outcasts at each school to helping each other set the bar and then exceeding it. Grateful for our *FIRST* opportunity, we return over 5000 hours of community volunteering each year. TDU's program yields alumni 5x more likely to get a scholarship, nearly 100% still involved with *FIRST* while pursuing STEM careers.

### Describe the impact of the *FIRST* program on your community with special emphasis on the 2016/2017 year and the preceding two to five years

TDU's community is the world, striving toward our goal of STEM for Everyone, Everywhere with media reaching 200,000,000+ people. Our 1st priority, *FIRST* in Australia, is now in nearly 10% of schools. This year alone, we started teams in the inner-city, Navajo Nation, and outback. Our RoboCamps supercharges STEM in Sydney by starting FLL teams and creating the FRCers of tomorrow. We have donated time, talent, and funds to Oxfam, Cancer Council, the University of Papua New Guinea and more.

### Team's innovative or creative method to spread the *FIRST* message

Innovation is a part of our team's motto, and underpins our efforts. We've founded 2 microbanks, trained retirees in STEM, started a small business, introduced FTC as a college sport, leveraged FLL to teach water safety, brought *FIRST* to 150-person towns and more. This year we created *FIRST* Help Now, a 24/7 call center in partnership with teams around the globe. We partnered with First Updates Now to expand the program with a weekly show answering questions live from the *FIRST* community.

### Describe examples of how your team members act as role models and inspire other *FIRST* team members to emulate

TDU members are ready-resources for others. Besides the 24/7 call center, Jaye regularly helps a local team with Chairman's, Hayley is a resource for a team on mechanical, and Mark fields software calls around Australia. With Team 4613, we host bi-weekly webinars. Team 1678 lead mentor, Steve Harvey, came as a speaker to our Mentors Without Borders conference and went home utterly transformed by our can-do attitude, breaking down all barriers to create a *FIRST* Progression explosion.

### Describe the team's initiatives to help start or form other FRC teams

Our Duel Down Under off-season taster event, our Microbank and a low-entry point 2-day build seasons, initiated massive FRC team growth from 5 to 60+ in the last 5 years; nearly all of them with a TDU-trained mentor and Microbank funding. We have spread this model to India, Poland, the Navajo Nation and elsewhere traveling 400,000 kms in 3 years with our Mentors Without Borders program. We have been instrumental in introducing FRC in 11 countries including China, Dominican Republic, and India.

### Describe the team's initiatives to help start or form other *FIRST* teams (including Jr.FLL, FLL, & FTC)

We brought FTC in Australia in 2012, and FLLJr in 2015 simply by showing *FIRST*'s impact on us via school visits and teacher workshops. This grassroots recruitment efforts quickly built into a standard approach leveraging the Progression. Working with our partners, we have been able to transform our program to have a larger reach. We worked with Queensland Libraries to bring FLL to rural towns, with Bechtel to kick-start FTC in Queensland using a 2-day build season model, and so much more.

**Describe the team's initiatives on assisting other *FIRST* teams (including Jr.FLL, FLL, FTC, & FRC) with progressing through the *FIRST* program**

TDU uses the *FIRST* Progression as a culture-changing unit, extending into university. The programs assist each others with students in upper programs mentoring in lower ones; our alumni stay and mentor FRC. We have run FLL to FTC transition workshops with FLL teams and created "Lightening Bolts", enabling FLLers to join 3132. We've taken the Progression to the next level, and done things in reverse. We converted FRC-only outback communities of 2016 into FLLJr, FLL, FRC communities of 2017.

**Describe how your team works with other *FIRST* teams to serve as mentors to younger or less experienced *FIRST* teams (includes Jr.FLL, FLL, FTC, & FRC teams)**

We've trained FLL students to become FLL Jr. mentors, partnered with FLL teams to create FRC teams, and worked with FTC teams to bring advanced workshops to Australia. Our partnerships to support FRC teams extend through *FIRST* Help Now, Mentors without Borders, and pool *FIRST* Choice parts for young teams. Leveraging our successful model to start FRC in new countries, we are working with and mentoring teams 4911 and 4950 to mentor the first team in Vietnam.

**Describe your Corporate/University Sponsors**

As our operations are self-funded, our corporate/university sponsors mainly work jointly with us in broad local and global STEM outreach. Macquarie University has been transformed by TDU, helping showcase the university's growing engineering program through broad, nationwide and international outreach. Salesforce had us as a tradeshow STEM centerpiece, flying us to Melbourne. Our two dozen sponsors work with us to bring STEM to Everyone, Everywhere.

**Describe the strength of your partnership with your sponsors with special emphasis on the 2016/2017 year and the preceding two to five years**

We view our sponsors as partners, we work together to further STEM in Australia and beyond. Instead of asking them to help with our needs, we work together to solve other teams' needs. With Rockwell, we have worked to get their nationwide staff engaged with local *FIRST* programs. Google asks us to demo robots and speak at conferences. AndyMark bulk ships Australian team orders to us and stocks parts on-shore. Macquarie University sends us to China, Vietnam, and India as STEM ambassadors.

**Describe how your team would explain what *FIRST* is to someone who has never heard of it**

*FIRST* is the STEM program that every parent, teacher and principal wishes they could have done as kids. It gives "Everyone, Everywhere" the opportunity to access science and technology by opening doors that students might have never thought possible. Working together, students and professionals create an environment where everyone can do something amazing, empowering students to become world leaders in all fields. *FIRST* enables today's students to become tomorrow's Nobel Laureates.

**Briefly describe other matters of interest to the *FIRST* judges, if any**

Our Robocamp program operates as a small-business. Except for our basic entry fees from Macquarie University, all other events and operations are funded by RoboCamps. Providing vital "holiday daycare with smarts" to our community, RoboCamps also creates a steady stream of new FLL teams to feed area FRC teams and raise *FIRST* awareness. This is more than entrepreneurship; it has changed our community's culture when it comes to the role of STEM and *FIRST*.

**Team Captain/Student Representative that has double-checked this submission.**

Jaye Heimlich

**Essay**

FRC Team 3132, Thunder Down Under (TDU), at Macquarie University (MQ), Sydney Australia, began with hopes, wishes and dreams. TDU is no longer hoping to change the world, wishing we could inspire millions, nor dreaming to connect Everyone, Everywhere--we ARE changing the world, inspiring millions and connecting Everyone, Everywhere. These hopes, wishes and dreams have transformed into reality--changing the world of the underprivileged and neglected schools of Australia and around the globe, inspiring not just ourselves but millions through our travels to India, Vietnam, China, America and beyond. We are connecting Everyone, Everywhere by creating and implementing the blueprint to change the face of STEM in Aus, the Asia Pacific (AP) and the world.

As the first Australian team, our goal for sustainability meant striving to include all and any diversities despite barriers. Aiming to give Everyone, Everywhere a *FIRST* experience, first in Australia and now globally, our team is more than ?

girls and roughly half of our mentors are women. We have members from 50+ high schools. In the past year, we have started 17 new Australian FRC teams and are coming close to having FIRST in 10% of the schools in Australia. Nearly 100% of our alumni go on to STEM-fueled careers. Our international media has reached over 200,000,000 people on 7 continents, from millions on global TV to 65,000 at Aus's biggest rock festival. TDU runs over 10 official FIRST events each year, including FLL/FTC Australian & International

Our first year was a struggle: a dying 20-team FLL program, 5000 miles to the closest regional, and travel costs pushing our budget high enough to fund 20 teams. Our solution to sustainability was to create an entire FIRST culture across the Progression within our community, Australia, and the Pac-Rim, if necessary. FLL immediately doubled in size. Then, we started 5 FRC teams in Aus by founding the innovative off-season "taster" event, the Duel Down Under, and our Microbank program (0% registration loans). The results are astounding: 50+ FRC teams started by TDU, nearly all Aus FRC teams with at least 1 TDU-trained mentor, a second regional this year added to our first in 2015, & 600 FLL teams feeding into FTC & FRC programs nationwide. TDU now supports teams with quick-shipping, onshore AndyMark parts, a biweekly, nationwide webinar (with Team 4613), modeled on our FIRST Step YouTube training videos, and our new 24/7 FIRST Help Now follow-the-sun, global call centre, serviced in partnership with championship-winning teams like 254, 359, and others.

TDU has brought the full FIRST Progression (FLLJr, FLL, and FTC "feeder" teams) to Aus. Partnering with National Instruments we worked to start FTC in 2012 as well as "season in a day" with Bechtel, therefore starting 30 teams around Australia. FTC AndyMark kits were beta tested by us, and provided to new teams this year revitalising FTC after the last year's control system change. We piloted FLLJr in 2015 with it now growing annually. We have extended the Progression to university students, including them as "junior mentors", and introducing the FTC game into Aus university sports' UniGames.

Our entrepreneurial spirit is grounded in a strong financial model. A \$50K NSW government grant seeded the Microbank, which loaned \$250K this year alone to 3 countries' teams for registration with 100% repayment of the \$500K loaned the last 5 years. The nearly \$1M of cash and in-kind we raised from sponsors goes to fund teams in Aus, FIRST outreach in the AP, and charities in our community. As of this year, our team self-funds our \$100K operations (including FRC event travel) by our Robocamps program (robotics daycare workshops) providing a service to our community, training ourselves in important life-skills, and providing a stream of FLL/FTCers into local FRC teams. Sharing the Robocamps "playbook", we have helped other teams become self-sustaining as well.

Providing the full-on FRC experience to other Aussies impacts us as well as the world. Our Robots In The Outback program started in 2015 simply as a fun road trip to give Aboriginal kids the opportunity to build robots. Nearly 30 communities later, the impact is outrageous; FIRST progressions spanning K-12, more schools electing to end summer holiday early to build their robot, families in rural towns, like Narrabri and Ulladulla, choosing to stay with STEM-enhanced businesses. We've now grown it to Robots Around The World. The methodology we've honed has gone global. We transplanted it this year into the Navajo Nation, inner-city schools and teen homeless population.

We started Mentors Without Borders (MWB) simply for our mentors to help new Aus teams, and it too has grown to be a global phenomenon. This year, we not only flew in USA Einstein-winning mentors for an MWB conference for all Aus teams to bolster skills, but also sent out mentors to teams in India, Vietnam, China, and USA. Our Global Student Network flips this idea and lets any student in the world without FRC access join TDU, giving Katie in Alaska a chance to write FRC software.

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Our alumni are a massive contribution to the team with graduated students, now mentors, in the workforce ranging from Hannes on assignment at Siemens, Germany to Steph working at GoogleX self-driving cars. These role models encourage 98% of us to attend university, to travel to bring FIRST to rural Aus and China, and to volunteer over 5000 hours annually. We reach the very young through RoboCamps, leading to new FLL teams and eventual TDU membership. To foster this, our Lightning Bolts program partners with FLL teams, including them in FRC and TDU year round, forming a strong community bond. For our retirees, we have reached out to Men's Sheds--retiree wood and machine shops--and have them build practice field elements for local teams. We have doubled our student membership since last year, mainly with more girls joining and staying. Women retention is impactful proof of our pioneering FIRST Ladies program, promoting women in FIRST by providing a support network for girls and uniting them through FIRST Ladies Teas held at FIRST events around the world.

Sustaining and growing FIRST in Aus is our primary goal, but we still have passion and resources to grow FIRST internationally. All of our worldwide programs and partnerships started in 2012 with a trip to Dominican Republic to start FRC Team 4091. TDU has since started the first FRC teams in China, Japan, Poland and India, mentored the first teams in Taiwan, UAE, Ecuador and Singapore and travelled to Indonesia, Hong Kong, and Columbia to give workshops

reaching 1000s. This year, we conceived FIRST Help Now and forged a global partnership of nearly a dozen role-model teams to deliver it. TDU traveled to Vietnam, funding their first team while mentoring Teams 4911 & 4950 in international outreach. One of our most successful ventures is the 5-year partnership with FIRST China where we demoed our robot to China's Vice Premier and started 8 new FRC teams. TDU-run workshops in Fujian province resulted in a \$1.5M donation for us to design, install, and train staff for a 2017 Makerspace opening.

Our local charity work has a global flair. We've run Rotary's food booth since 2011 at the 2nd largest Christmas event in NSW, helping fund life-saving surgery in Aus for the AP's poor and raised \$2K for an Idaho USA team who suffered a fire. One of our bigger community projects is partnering with water safety group "Smile Like Drake", delivering FLL workshops that tie in with vital water safety lessons. We are helping develop underwater robots with them to find and rescue distressed swimmers in the ocean. In the past 5 years, we have helped over a dozen charities including Relay For Life, Cancer Council, and Locks of Love.

Relationships with our sponsors has evolved from sources of funding and mentors to partners in global STEM outreach, especially now that our operations are self-funded. Google and NSW government are the primary partners for Robots in The Outback, along with vehicles from Ford. Rockwell provides shipping and shares the costs with AndyMark for our on-shore parts program. Additional government partnering allows us to purchase vital machine tools for low-SES teams. Our government engagement has been strong and growing. With MQ, the Federal and State government have funded our LEAP robotics outreach to low-SES communities the last 7 years, with nearly \$1M getting the entire FIRST progression to many first-generation Aussies. LEAP has funded machine tools in our lab that allow us to make parts for teams around Aus. The NSW government has embraced Robots in The Outback as a way to bolster STEM in rural towns and funds about \$250K/year in logistics. This year, the Queensland government has funded a similar, FLL-based program using regional libraries as TDU-led FIRST hubs.

Our main sponsor, MQ has seen the greatest impact from our team. Since 2010, MQ's engineering program growth mirrors the 30x growth of FIRST. Among the many different projects with MQ, such as global trips to help FIRST teams and a planetary research centre effort based on our Einstein-playing 2015 robot, the most inspiring was a 12-hour drive to Ivanhoe (pop. 150)--hometown of MQ's President Prof. Downton--to start FIRST for their 27 students. We'd like to graciously acknowledge the 20+ sponsors, global and local, who donate time, funds, people and knowledge.

Our team's mission statement is STEM for Everyone, Everywhere and Australia was our focus early on. Our hopes, wishes and dreams for Australia HAVE come true and we are on our way to getting FIRST into 100% of Australian schools. By setting the bar higher than we imagined, we achieve more than we dreamed. We NOW hope to bring STEM to literally Everyone, Everywhere. We ARE creating and implementing the blueprint to change the face of STEM in Australia, the AP and the world.