

Hyperloop Engineering at the University of Texas at Austin (Texas Guadaloop)
Green Fund Application 2019

Guadaloop



Project Description

Hyperloop Engineering at the University of Texas at Austin (Texas Guadalupe) is a collaborative and interdisciplinary, sustainable transportation project involving undergraduate students and graduate student advisors from a diverse range of majors. This initiative acts as an incubator and fosters a combination of university disciplines to collaborate together and work towards researching and advancing Hyperloop technologies - with the aim of contributing towards a greener and more efficient transportation infrastructure. With the support of the Green Fund, our organization will be able to expand our possibilities and further our innovation in advancing towards our goal. We will be able to continue to research this eco-friendly alternative technology and give our students an opportunity to grow in their knowledge. They also get hands-on experience with collaboration and teamwork while working on a real-world initiative towards supporting green solutions. The background of involved students include, but are not limited to:

- **Mechanical Engineering:** Students from this major gain hands-on experience in a manufacturing environment with an in-depth exposure to workshop tools, metals, welding, SolidWorks and ANSYS design, pneumatic systems, and air levitation.
- **Computer Science:** Students interested in computer science create code and program systems which control the pod's functionality wirelessly.
- **Marketing/Advertising:** Marketing and advertising students develop our marketing campaign to increase interest in Texas Guadalupe. They aim to raise greater awareness around campus about our mission towards researching future sustainable transportation technologies that result in eco-friendly infrastructure.
- **Finance/Accounting/Economics:** Our finance and accounting majors support the team's engineering operations and maintain the finances of the organization. They also manage sponsorship outreach and maintain corporate relations.
- **Public Relations/Corporate Communications:** Public Relations students support and maintain strong relationships with FOX 7 Austin, KXAN, Daily Texan and other news organizations. They also keep all corporate sponsors up to date on the work the organization is doing through a newsletter.

- **Electrical Engineering:** Students interested in electrical engineering design and develop critical electrical systems that support all of the pod's operations.
- **Chemical Engineering:** Our chemical engineering students work on testing and researching new propulsion and braking methods to advance the development of the pod.
- **Civil Engineering:** Civil Engineering students help support the development and refinement of our pod's frame and suspension technology.

Our organization encourages the sharing of ideas and strong cross-collaboration between multiple disciplines, with our team members united towards working on overcoming problems and advancing the development of our Hyperloop pod. In addition to hands-on experience and out-of-classroom learning, students gain exposure to exciting, cutting-edge technology in transportation. Our students develop crucial teamwork skills while working on an incredible cross-functional eco-friendly project.

We have several measures of progress, such as successfully building and testing a Hyperloop pod with working propulsion and levitation systems by the end of this semester. For the Spring 2019 semester, we plan on completing a prototype pod capable of reaching 30 mph on our JJ. Pickle test track. Our other major measure of success is being accepted into the 2020 SpaceX Hyperloop Pod Competition and racing inside the SpaceX pressurized tube.

Our project ties into the UT Austin push for cleaner and more efficient ways of consuming. More specifically, Texas Guadalupe strongly supports the "Sustainable Mobility Initiative." Our organization positions UT Austin as one of the leading Hyperloop research institutions in the world, demonstrating the commitment UT has towards sustainability and innovation in the transportation sector. An additional UT initiative that we support is the "Green On the Go" campaign which aims to decrease the use of single occupancy vehicles. We directly tie in with this initiative by researching a future, highly efficient, mass transportation technology.

Ultimately, our project falls right in the center of the Green Fund program diagram: environment, equity, and economy. Our project not only aims to bring awareness about the eco-friendly technology of the Hyperloop, but actually takes a hands-on approach and leads in

innovating and furthering the reality of this green infrastructure solution. Our organization will benefit the broader campus community by advancing UT's eco-friendly initiatives and giving students an unparalleled opportunity to gain in-depth experience in developing sustainable technology. Texas Guadaloop spearheads innovation in this field and leads students to overcome challenges and change the world for the better.

We have not received any previous monetary support from UT. However, we have been given a space at the J.J. Pickle Research Campus where we consistently get around 20 members to meet every weekend and work on building and testing our Hyperloop pod systems. We have Dr. Christian Claudel as our official university advisor. He has a Ph.D. in Electrical Engineering and is one of our leading mentors. Additionally, we have the support of Ben James, who will be graduating with an MBA this May, has a B.S. in Electrical Engineering. Ben will also be leading a Hyperloop class at UT starting this fall. Ben advises the team throughout most decisions and serves as a mentor.

- Dr. Christian Claudel can be contacted at christian.claudel@utexas.edu or at his office which is located in ECJ 6.208
- Ben James can be contacted at benjaminpjames@gmail.com or by phone +1 (404) 401-5883

We currently do not have any partnerships with other organizations, but we do receive money from corporate sponsors for funding. Even though we receive donations from corporate sponsors, they do not get any input on what we do as a student organization. We have recently received monetary donations from Cirrus Logic and HomeAway, as well as non-monetary donations from Bumperactive, SolidWorks and Ansys. Our current organization is the result of a merger between the previous Hyperloop teams of 512 Hyperloop and Texas Guadaloop.

Students are at the core of our project. At Texas Guadaloop, students do everything from researching and developing Hyperloop technology, designing and fine-tuning new methods and procedures, and actually building and testing the Hyperloop pod on our track at the J.J. Pickle Research Campus. Additionally, we have a dedicated external affairs team that supports the operations of the engineering team and takes care of the other facets of running the organization,

such as fundraising and marketing. Given the diverse amount of roles to fill, our team has students from a large variety of majors. This demonstrates that our project involves students from a broad range of disciplines and with many different perspectives. With our diverse multi-major team, Texas Guadaloop becomes a dynamic space where students from all university colleges get the opportunity to collaborate and use their specific skills to research and advance sustainable transportation technology, while tying in strongly with UT's eco-friendly initiatives and mission.

To publicize our project, one thing we plan to do is display our old Hyperloop pod around campus. Some examples include in/near engineering buildings, at the Center for Transportation Research Symposium, and before sporting events. We plan on collaborating with the Cockrell School of Engineering and other various colleges to maximize exposure and hear any advice. We will also be maintaining and increasing our online presence to a high level. Throughout our social media accounts, we have a combined 3000+ followers. We will also be constantly updating our website, which captures an average of 514 visits per month. Additionally, we will be participating in the podcast "Phil the Fixer", a local sustainability podcast, which will give us further exposure and audio/visual material to use for promotional purposes. We plan on taking part in the March 2019 edition of the HornRaiser, with the hope we will bring more widespread awareness to our project within the UT community and our team members' friends and family. Our plan is to participate in this crowdfunding project every year.

To support our project, we require ongoing funding to sustain the research and development of our Hyperloop technologies. Each year the external affairs team is responsible for securing sponsorships and funding, including sponsorships from local and engineering companies located here in Austin. We would love to work with the Green Fund to help further our mission in bringing awareness to this sustainable transportation solution around the UT community, as well as advancing our research into developing this technology for use in the real world. The Green Fund has the opportunity to play a crucial role in promoting green research on campus, while allowing us to develop the best possible hyperloop system, leading to a revolution in the way we travel.

Project Timeline

February 2019	<ul style="list-style-type: none">● Finalize propulsion and braking system decisions<ul style="list-style-type: none">○ Completed by February 22nd● Purchase propulsion system and braking system<ul style="list-style-type: none">○ Completed by February 28th● Begin working on HornRaiser media<ul style="list-style-type: none">○ 1 week
March 2019	<ul style="list-style-type: none">● Shoot video for HornRaiser<ul style="list-style-type: none">○ 1 workday, to be done on Saturday, March 2nd○ 2 days to edit● Finalize all HornRaiser media

	<ul style="list-style-type: none"> ○ 1 day ○ Due on March 7th ● Launch HornRaiser campaign <ul style="list-style-type: none"> ○ Full month ● Take part in “Phil the Fixer” podcast <ul style="list-style-type: none"> ○ 1 workday and 1 afternoon ● Build propulsion and braking systems into current pod <ul style="list-style-type: none"> ○ Two to three workdays ● Fix test track at JJ Pickle <ul style="list-style-type: none"> ○ 1 workday
April 2019	<ul style="list-style-type: none"> ● Begin testing phase <ul style="list-style-type: none"> ○ 3-4 workdays ● Gather data on all tests, analyze and consider design implications <ul style="list-style-type: none"> ○ 3-4 workdays
May 2019	<ul style="list-style-type: none"> ● Begin design phase <ul style="list-style-type: none"> ○ 4 months (not including quiet phase)
June 2019	<ul style="list-style-type: none"> ● Quiet phase (Summer break)
July 2019	<ul style="list-style-type: none"> ● Quiet phase (Summer break)
August 2019	<ul style="list-style-type: none"> ● Green Fund contribution available to the team ● Review previous year’s design and accomplishments <ul style="list-style-type: none"> ○ 1 workday ● Team regroup and goal setting for the Fall 2019 Semester and the new year <ul style="list-style-type: none"> ○ 1 workday ● Prepare marketing campaign <ul style="list-style-type: none"> ○ 1 workday ● Prepare recruitment campaign <ul style="list-style-type: none"> ○ 1 workday ● Continue design phase

	<ul style="list-style-type: none"> ○ 3 months
September 2019	<ul style="list-style-type: none"> ● Launch fall semester recruitment campaign <ul style="list-style-type: none"> ○ 1-2 weeks depending on turnout ● Launch fall semester marketing campaign <ul style="list-style-type: none"> ○ Full semester ● Finalize recruitment and prepare new team structure <ul style="list-style-type: none"> ○ 1 business workday ● Prepare fall semester fundraising campaign <ul style="list-style-type: none"> ○ 1 workday ● Continue design phase <ul style="list-style-type: none"> ○ 2 months
October 2019	<ul style="list-style-type: none"> ● Prepare “Preliminary Design Briefing” <ul style="list-style-type: none"> ○ 4 workdays ● Begin compiling final parts list <ul style="list-style-type: none"> ○ 1-2 workdays ● Launch fundraising campaign <ul style="list-style-type: none"> ○ Rest of the semester ● Continue and finalize design phase <ul style="list-style-type: none"> ○ 1 month
November 2019	<ul style="list-style-type: none"> ● Submit “Preliminary Design Briefing” to SpaceX ● Submit legal agreement to SpaceX ● Display pod at “40 Acres Field Trip”
December 2019	<ul style="list-style-type: none"> ● Receive feedback from SpaceX ● Review and update current design based on SpaceX feedback <ul style="list-style-type: none"> ○ 1 engineering workday ● Prepare “Final Design Briefing” for SpaceX <ul style="list-style-type: none"> ○ 2 engineering workdays ● Finalize parts list <ul style="list-style-type: none"> ○ 1 engineering workday

January 2020	<ul style="list-style-type: none"> ● Prepare spring semester recruitment campaign <ul style="list-style-type: none"> ○ 1/2 workday ● Prepare spring semester marketing campaign <ul style="list-style-type: none"> ○ 1/2 workday ● Begin purchasing frame, suspension, propulsion, electronics, and levitation parts <ul style="list-style-type: none"> ○ Full month ● Launch spring semester recruitment campaign <ul style="list-style-type: none"> ○ 1-2 weeks depending on turnout ● Submit “Final Design Briefing” to SpaceX ● Submit final team member list to SpaceX ● Submit application for March HornRaiser
February 2020	<ul style="list-style-type: none"> ● Finalize purchasing of parts <ul style="list-style-type: none"> ○ 1st week of February ● Begin building phase of new pod iteration <ul style="list-style-type: none"> ○ 2 months ● All Green Fund contribution is spent <ul style="list-style-type: none"> ○ By 2nd week of February ● Begin working on HornRaiser media <ul style="list-style-type: none"> ○ 1 week
March 2020	<ul style="list-style-type: none"> ● Continue building phase <ul style="list-style-type: none"> ○ 1 month ● Shoot video for HornRaiser <ul style="list-style-type: none"> ○ 1 workday, to be done on Saturday, March 2nd ○ 2 days to edit ● Finalize all HornRaiser media <ul style="list-style-type: none"> ○ 1 day ● Launch HornRaiser campaign <ul style="list-style-type: none"> ○ Full month
April 2020	<ul style="list-style-type: none"> ● Begin final testing phase and gather information on current pod

	functionality <ul style="list-style-type: none"> ○ 4 workdays
May 2020	<ul style="list-style-type: none"> ● Update pod to reflect findings from final testing phase and to have it finalized for the SpaceX Hyperloop Pod Competition <ul style="list-style-type: none"> ○ 4 workdays
June 2020	<ul style="list-style-type: none"> ● Quiet phase
July 2020	<ul style="list-style-type: none"> ● Quiet phase
August 2020	<ul style="list-style-type: none"> ● Regroup a week before SpaceX competition to finalize packing and travel to Hawthorne, CA. <ul style="list-style-type: none"> ○ 1-2 days to pack ○ 3-4 days of traveling ● Attend the 2020 SpaceX Hyperloop Pod Competition <ul style="list-style-type: none"> ○ 3-5 days ● Completion of project cycle

Budget Justification

To begin, we wanted to explain how we designed the budget sheet. First, we itemized most of the costs within the Materials/Supplies section. All of the costs included in that section will be for the current project cycle pods and will be used by the end of the project cycle. The only item that fell under a longer-term plan, and thus in the Capital Costs section, was the upgrades to our current test track, which will have a life longer than our current project cycle. Second, we subdivided the Materials/Supplies section into our 5 pod subsystems, to give a more detailed view of how the item advances our goals. In order to finish our current pod and have a new full working pod by the 2020 SpaceX Hyperloop Pod Competition, we need to fulfill all items in the section.

For the justification of the major budget sheet items, we decided to focus on the items for which we will be using Green Fund contributions. The highest cost is the battery, which has a

total of 5,000 dollars. Given the speeds that we are trying to reach and the short time we have to achieve them, we need 700V custom made batteries to give our motor enough power. We are considering House of Batteries and Lonestar EV Performance for this purchase. Then, we have the cost of the shocks, which will be 4,000 dollars. We will be using 4 shocks per pod during this cycle for vertical stability. We are considering Fox and DMN for this purchase. Lastly, we have the cost of the motor controllers, which have a total cost of 3,000 dollars. The motor controller is essential to have variable speed on our motor. We are considering Bamocar and Rhinehart for this purchase.

Our project does require ongoing funding in order to continue the next project cycle. With the contribution from the Green Fund, plus external contributions we will be able to have an active project until August of 2020. After that, we will be using proceedings from the 2020 HornRaiser to cover initial costs and afterward, we will rely on contributions from our corporate sponsors and proceeds from grants, such as the Green Fund. All of this will be work the Texas Guadalupe external affairs team will continue to do as leadership positions are passed along.

For the current project cycle, we have secured monetary contributions from Cirrus Logic and HomeAway. Once these contributions have been posted in our university account, we will have a total of \$22,066.41. Given our \$25,000 non-GFC funds costs, we will still need to cover \$2933.59. We plan to cover this cost from proceeds from the March 2019 HornRaiser and contributions from renewing corporate sponsors. These sponsors might include, National Instruments, Lockheed Martin and AirFloat.

Closing Remarks

Texas Guadaloop is an innovative and interdisciplinary project that can help the University of Texas at Austin advance its goal of a more sustainable and eco-friendly future for transportation. This is a project that includes the efforts of students from a great number of disciplines across campus. The collaboration of mostly undergraduate students from this wide range of majors is what drives this project and what makes it a truly unique endeavor on our campus. Students who participate in Texas Guadaloop get the opportunity to learn how to be a part of a team, have hands-on experience in a Research and Development project and advance the future of Texas transportation. They learn technical skills that are only available through projects such as this one and get to interact with accomplished graduates who act as mentors. Through the current fundraising efforts of the team and the contribution from the Green Fund, we are positive that we will be able to run this project until August 2020, achieve all of our major goals as an organization and expand the possibilities of the team, to be able to reach a greater number of students. Given the goals that we are looking to achieve during this project cycle, we believe that after this initial Green Fund contribution we will be able to gain much greater awareness from our community and thus be able to sustain the project without the necessity of relying on the Green Fund for subsequent years. The current Texas Guadaloop leadership team has created a structure designed for success through methodical planning and responsible decision making regarding our finances. We are a team that knows what our objectives are and have a clear plan to achieve them.

Thank you very much for your time and consideration.