University of Puerto Rico – Mayagüez Campus
College of Engineers

DART-UPRM
FUNDING PROPOSAL 2015-2016

D.A.R.T.

Content

Cover Letter

From: University of Puerto Rico – Mayaguez Campus
Mechanical Engineering Special Projects
Dynamic Aerospace Rocketry Team 2015-2016

Date: September 2015

Dear Company:

The **Dynamic Aerospace Rocketry Team (DART)** proudly invites you to be the pivotal piece in our team's success by becoming a sponsor. By sponsoring us you will be giving us the opportunity to compete at the **Honeywell PRCLS Competition**, a competition between various universities from Puerto Rico. Also, you will be one of the main contributors to the academic and professional development of each one of the members that compose the team.

The **Honeywell PRCLS Competition** is an opportunity for university students to develop different skills of interest, either in the technical or/and management areas. The members will be able to develop leadership, teamwork skills and will put to practice knowledge learned in classes such as, fluid dynamics, thermodynamics, and heat transfer. Also, they will be learning various computational tools.

It should also be acknowledged that your contribution would not only be utilized to compete at the **Honeywell PRCLS Competition**, but will also aid our hopes of being able to compete at the **IREC Competition**, a competition where we would face the nation's top universities.

The **Dynamic Aerospace Rocketry Team (DART)** was the first team to take on **NASA's Student Launch**, and proudly obtained the **Rookie of the Year Award**. Now on our third year of competition, we wish to continue a standard of excellence and forge a path that enables the field of rocketry to expand in Puerto Rico, allowing future generations to see rocketry and aerospace as an option. But to be able to complete our goals we need your help.

The estimated cost for the whole project, taking into account the possibility of competing in both competitions, is **$25,000.00**. The total includes materials, air travels, transportation and rocket components. Of course without your help this project would be impossible to complete. Therefore, the **Dynamic Aerospace Rocketry Team** thanks you for your interest.

Cordially,

Natalie Rivera	Leonardo Mendoza	Edwin Espinell
Captain	Co-Captain	Project Manager

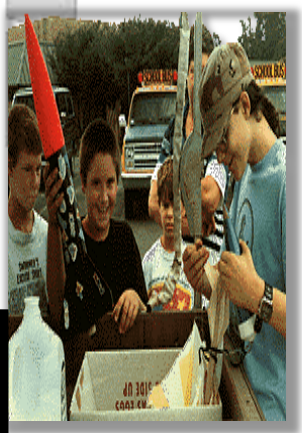
Pioneers of Rocketry

The University of Puerto Rico-Mayaguez Campus, along with the Polytechnic University of Puerto Rico, has established the first Rocket Club of Puerto Rico with the **National Association of Rocketry (NAR)**. With our NAR section, known as the **Puerto Rico Rocket Society (PRRS)**, we have certified a launch location in order to test our rockets for the competition and spread the field of rocketry in our community. The launch site is located at the Mayaguez airport "Eugenio Maria de Hostos."

What is the National Association of Rocketry?

The National Association of Rocketry is a non-profit tax-exempt scientific organization dedicated to consumer safety, youth education, and the advancement of technology in the hobby of sport rocketry in the United States.



NSPE-DART

National Society of Professional Engineers
UPRM Chapter

National Society of Professional Engineers

As a National Organization, the **National Society of Professional Engineers (NSPE)** is the University of Puerto Rico at Mayaguez (UPRM) leading professional organization. This organization is also one of the largest in campus, being composed by student of all engineering disciplines.

NSPE-DART

The UPRM's **National Society of Professional Engineers (NSPE)** is associated with the **Dynamic Aerospace Rocketry Team (DART)**. The association was made in order to support DART during its establishment and for the professional support of its members.

Since the DART is a new team and it's an innovator, the NSPE and the team will have benefits, as members of the association and/or members of the team. The NSPE will help us advertise our project with publicity regarding special events and will help in our recruiting efforts.

PRCRC Competition Overview

Honeywell Corporation will partner with colleges and universities throughout Puerto Rico to sponsor the Collegiate Rocket Competition (PRCRC) competition during the 2015 calendar year. The PRCRC is being held to engage teams to design, construct, and successfully fly a high power rocket to the highest altitude and fastest speed possible within the established competition parameters. PRSCL provides a learning opportunity that involves design, construction, test, and flight of a reusable launch vehicle. By participating in the PRCRC, students will get a hands-on, inside look at the science, technology, engineering, and mathematics involved in high power rocketry (HPR).

PRCRC requires an 8-month commitment to design, construct, test, launch, and successfully recover a reusable rocket capable of reaching relatively high altitudes and undergoing significant structural stress. The program involves much more than simply designing and building a high power rocket. It involves diverse aspects, such as scheduling, purchasing, performing calculations, financing the project, and coordinating logistics.

IREC Competition Overview

The Experimental Sounding Rocket Association (ESRA) is a non-profit organization founded in 2003 with the purpose of fostering and promoting engineering knowledge and experience in the rocketry field.

ESRA hosts an **Intercollegiate Engineering Competition** for rocket teams from all over the country and around the world. With a payload size of 10 pounds and target altitudes from 10,000 ft to 23,000 feet above ground level. Multitask rockets and all chemical propulsion types (solid, liquid and hybrid) are allowed.

Community Outreach

One of our main objectives is to expand the field of rocketry and aerospace science in Puerto Rico. We intend to make an institution out of the team, make the team known not only to the students but to the general public.

We also wish to generate an interest in young minds and give them the tools they might need if interested in a career in aerospace. In today's world, where there are so many distractions, we want to show the amazing world of STEM to young people as a way to ensure a better future.

During the semester, the team will be visiting middle and high schools, teaching them the basics of rocketry and conducting small competitions to capture young people's attention. Also, a pilot plan will be set into motion, where two high school students will complete a two month rotation program with the team, as if they where part of it. The goal is to, eventually, create a team at a high school that is able to participate at the **Team America Rocket Competition (TARC).**

The team's goals extend beyond winning our competitions, we also want to develop the field of rocketry in the entire island.

Overview

DART is a team composed of the brightest minds that our college has to offer, future engineers from different departments like Mechanical, Chemical, Industrial, Civil, Computer, and Electrical engineering have come together to form a team with one goal, to compete in the NASA SL Rocket Competition. Nevertheless, DART have decided to be part of every aerospace competition possible. This is a team full of innovators and leaders, individuals that have decided to carry out a complex challenging project no matter the circumstances.

The diversity in years and engineering departments encourages and promotes our members to learn from multiple disciplines and from those who have more experience in advanced courses. Thus, providing our team with the ability of implementing knowledge and experiences from multiple disciplines into the design and construction of our rocket.

Rookies of the Year

Two years ago **DART** was able to compete in the **NASA SL** Rocket competition winning the **Rookie Award**. Award given to the most dedicated and overall best rookie team of the year. Although the team was unable to attend the competition launch site at Utah, due to transportation funding shortages, we were still able to regroup, compete, and successfully launch the team rocket at the **Intercollegiate Rocket Engineering Competition (IREC)** at Utah that same year of 2013-2014.

The IREC was an international competition where the team competed against teams from all around the world like Canada, Turkey, and Brazil.

By winning the Rookie Award and participating on the IREC International Rocket competition as our backup plan we have demonstrated that DART is able to move forward against all unprecedented odds and beat all obstacles that stand in our way. Qualities of a top class team and top class students all companies desire for their employees.

NASA SL Competition

The NASA Student Launch (SL) is a research-based, competitive, and experiential exploration project that provides relevant and cost effective research and development. Additionally, NASA Student Launch connects learners, educators, and communities in NASA-unique opportunities that align with STEM Challenges under the NASA Education Science, Technology, Engineering, and Mathematics (STEM) Engagement line of business. NASA's missions, discoveries, and assets provide opportunities for individuals that do not exist elsewhere. The project involves reaching a broach audience of colleges, universities, and non-academic teams across the nation in an 8-month commitment to design, build, launch, and fly a "Mars Sample" and vehicle components that support the MAV on high-power rockets to an altitude of 3,000 feet above ground level (AGL)

DART had the opportunity to participate in last year Competition held in Huntsville, Alabama. As part of the requirement, DART approved NAR Tests and represent the University of Puerto Rico – Mayaguez Campus and the University of P uerto Rico – Arecibo Campus being that DART have an alliance with UPRA. As a result, the rocket obtained an altitude of 3,376 feet and was recognized by the excellence in the rocket design, construction and flight.

Mission & Vision

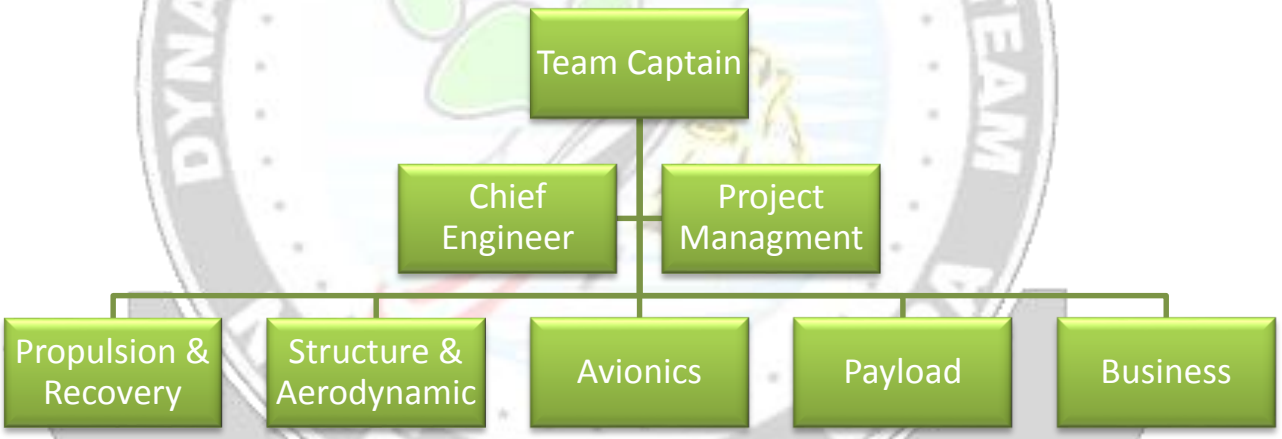
Our Mission is to design, build & launch a reusable high power rocket with a scientific or engineering payload to compete in the NASA's USLI Rocket Competition. At the same time, promote the development of rocket science and the hobby throughout our university and the community.

Our Vision is to develop future professional engineers and leaders by giving our members the opportunity to work on a competitive and complex project, while providing them with hands on, organized, team structured experience that requires them to implement their engineering knowledge, and allow them to further develop their communication, time management, and technical skills.

As part of our commitment to the Space Program development we intend to compete in every competition related to aerospace. In addition, DART is going to implement a Research and Development section for members of DART to investigate and improve our futures projects.

Team Organization

The team will be organized in order to optimize technical skills while improving leadership among members. The team will have a Captain and Chief Engineer. The remaining students will be divided in departments, each of which with its leader: Aerodynamics and Structure, Payload and Avionics, Project Management, Propulsion and Recovery.



This organizational design has several purposes. Every member will have a specific task and responsibility to carry out in their respective departments, which will distribute the work more efficiently. Less experience members will be distributed across the departments in order to transmit knowledge. Every team member will be required to collaborate before, in and future Marketing/Recruitment/ Fund Raiser events in order to acquire the projects full experience. This will help people develop leadership in order to become the leaders in the upcoming years. With this organization, the DART resembles a real team in industry were each department has to communicate with each other to develop ideas and reach our goal. Thus, the DART can provide the experience of a research, an internship and an association at the same time.

Team Goals

The team will be organized in order to optimize technical skills while improving leadership among members. The team will have a Captain and Chief Engineer. The remaining students will be divided in departments, each of which with its leader: Aerodynamics and Structure, Payload and Avionics, Project Management, Propulsion and Recovery.

TeamGoals:

- Compete in the Puerto Rico Collegiate Rocket Competition
  - Reach an altitude over 4,000 feet high
  - Obtain the maximum velocity between competitors
  - Win first place in maximum altitude and maximum velocity
  - Have a successful recovery

- Compete in the IREC Competition
  - Position between the top ten teams
  - Develop an engineer payload with a minimum weight of 10 lb.
  - Position between the top five teams on the payload design
  - Reach an altitude of 10,000 feet (AGL)
  - Have a successful recovery
- Provide each team member with real life industry experience in order to enhance their skills to be successful as an engineer.
- Visit over 10 High School around the island and spread the interest for rocket sciences

Team Schedule

Project Life Cycle

Preliminary Design Review (PDR):

•The PDR demonstrates that the overall preliminary design meets all the requirements with acceptable risk and within the cost and schedule constraint and establishes the basis for proceeding with detailed design.

Flight Readiness Review (FRR):

•The FRR examines tests, demonstrations, analyses and audits that determine the overall system (all projects working together) readiness for safe and successful launch.

Post-Launch Assessment Review (PLAR):

•The PLAR is an assessment of system in-flight performance. It should include all data after the launch like altitude reaches (feet), data analysis & results of vehicle, data analysis & results of payload, scientific value, visual data observed, etc.

Cost Breakdown

Materials & Parts	Cost
Basic Rocket Components for 6 rockets	
Nose Cone	$ 306.00
Airframe	$ 864.00
Fins	$ 252.00
Tail Cone Retainer	$ 45.00
	Total: $1,467
Motor Components for the construction of 6 rockets	
Motors	$ 700.00
Motor Mount	$ 270.00
Motor Casing	$ 420.00
Centering Rings	$ 720.00
Retainer	$ 720.00
Adapter	$ 180.00
Coupler	$ 468.00
Bulk Plates	$ 63.00
Closures (Aft/Fwrd)	$ 85.00
	Total: $3,626
Payload: Electronics & Drone	
Temperature & Humidity sensors	$ 16.00
Dual deployment, altimeters & accelerometer	$ 230.00
Irradiance sensor	$ 22.00
Pressure sensor	$ 100.00
Imagery	$ 220.00
Arduino	$ 140.00
Telemetry	$ 120.00
Electronics Bay	$ 100.00
	Total: $940.00
Recovery System	
Kevlar Drogue Parachute (x6)	$240.00
Main Parachute (x6)	$ 240.00
Shock Cord	$ 9.00
Drogue Parachute	$ 24.00
Tracking Device (GPS)	$ 660.00
	Total: $1,173
Materials & construction Materials	
Adhesive, Measurement Tools, etc.	$ 100.00
Fiberglass Sock	$ 135.00
Blue Tube	$ 155.00
Nylon Shear Pins	$ 6.00
Rail Button & Screw	$ 10.00
Maker Bot ABS Filament	$ 105.00
Plain Steel	$ 53.00

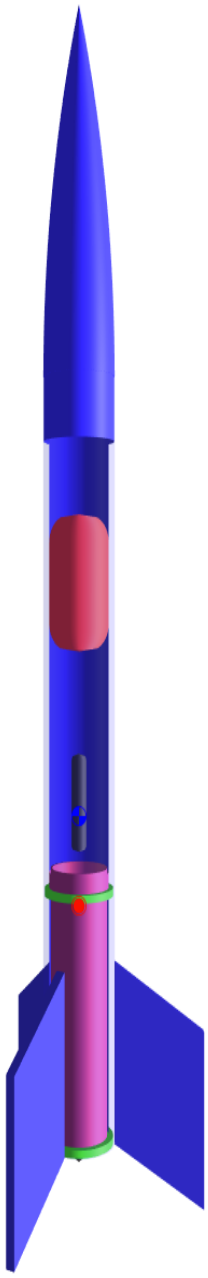
		Total: $564.00
Outreach Program		
Promotional Goods		$ 500.00
Brochures		$ 200.00
		Total: $700.00
Certification Kits		
Merchandise	Per Unit	Totals
(*) Kits (x7)	$ 68.00	472.00+48.00 (shipping)=520.00
(*) Motor Mount Adapter (x7)	$ 5.50	$ 38.00
(*) Rail Buttons (x7)	$ 5.80	$ 40.00
(*) Fire Resistant Blanket (x2)	$ 6.00	$ 12.00
(*) shipping	-	$ 10.00
(*) Motors (x7)	$25.00	$175.00
		Total: $795.00
Team Expenses for 20 team members		
Tickets, Car, Hotel, Shipping, etc.	Cost	
Airplane Tickets	$ 10,000.00	
Train Tickets	$ 840.00	
Car Rental	$ 1,600.00	
Hotel (8 days/7 nights)	$ 3,200.00	
Shipping (FedEx)	$ 800.00	
	Total: $16,400.00	
GRANDTOTAL	**$25,665**	

The estimated cost for the entire project is around **$25,665** with a worst case scenario of 20% budget growth, the expected total is of **$30,000**. The cost includes highly technological construction materials for our rocket and payload, spare parts, construction tools, shipping costs for the rocket to and from the competition, air travel, lodging, and ground transportation for all members.

The primary funding goal for our rocket construction project is of **$2,000**, yet six rockets will be built (three for each competition) for a total of **$12,000.**

For all these reasons we are asking for your help and support, without it the project cannot be finished due to the high costs of construction materials and travel expenses. Please make any donations to UPRM-DART, your support will be greatly appreciated by the team.

Sponsorship Benefit



STAGE III: $5,000 or More

- Stage I & II + the opportunity to display the company logo at UPRM-DART's: official documents, brochures, banners, recruitment events, sales, other exposure activities, website and the rocket's airframe

STAGE II: $4,999-$2,500

- Stage I + DVD of the competition including the results of the competition and the opportunity to display the company's logo at one of the fins of the official and competing rocket

STAGE I: $2,499 or Less

- You will receive a sticker of the official DART Team, a plaque and a "shout-out" of the company in the official team's website

As part from the benefits that are included in the Stage Levels, your company will enjoy the following:

- By donating to an educational cause your company can be perceived as a supporter to our community, its future leaders, and its education.
- Your company's name will be promoted on all activities in which that DART is involved. Companies that donate a particular amount as stipulated in the Stage Levels benefits can enjoy greater amount of promotion through DART. This promotion will target not only the competition and activities in our university, but also activities throughout our community in which DART is involved.
- By donating to DART your company will have access to all technological development and innovative findings that our team carries out in the field of rocketry. DART will communicate the advancement and progress of the project to your company throughout the year in the form of technical reports, which are mandatory for the NASA SL Competition.
- Also, your company will have access to great engineering talent. Members of DART are top-notch future professional engineers, and your company will have direct access to reach out and communicate to each member. Not only will you be helping our team and its members develop into great professional engineers, but you will also be helping your company forge the best talent for its future.

Closing Letter

On behalf of the Dynamic Aerospace Rocketry Team (DART), we would like to extend our most sincere gratitude for taking the time to read our proposal and for demonstrating interest in our project.

We are pioneers of rocketry, engineering the path to the sky and beyond by creating the first rocketry team in our college and the first rocketry club in Puerto Rico. We feel as an inspiration not only to our community and ourselves, but to all those who seek to do the same. We have started a legacy that will surely endure the test of time, and thus we exhort your company to become part of this legacy.

Not only will your company be helping our team in achieving our goal of designing, building, and launching a rocket for the competition, but it will enable us to work with a real life research project. Leadership, teamwork, communication, analytical thinking, organization and creativity are only but a handful of the many skills that the students participating in this project are learning.

Therefore, you will not only be investing in a team to carry out a specific project, but you will be investing in the development of engineering students that can potentially work in your company.

Once again, we extend our most sincere gratitude for taking the time to go over our proposal. Your support will be greatly appreciated by the team. Thank you very much.

Sincerely,

Natalie Rivera	Leonardo Mendoza	Edwin Espinell
Captain	Co-Captain	Project Manager

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