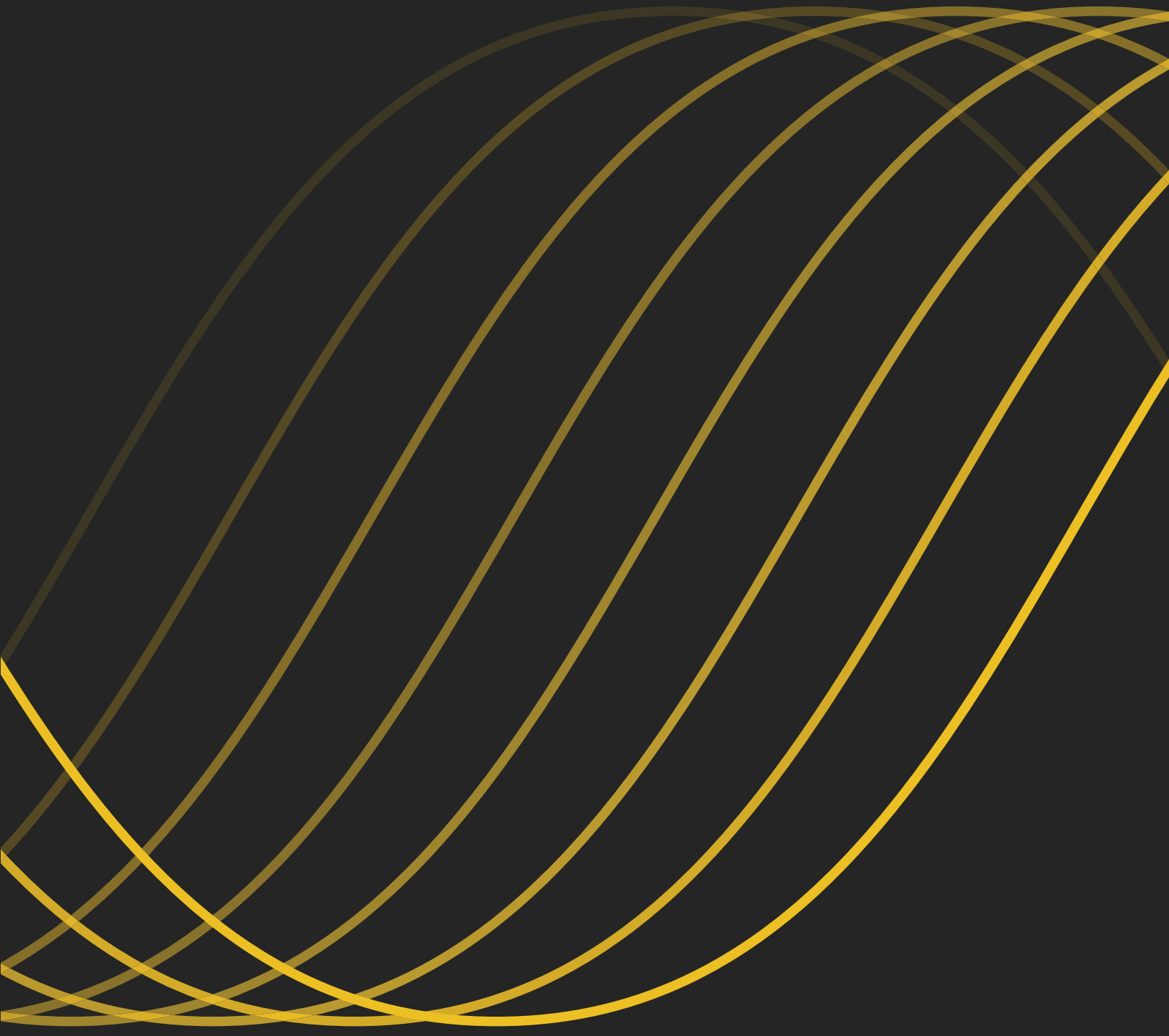
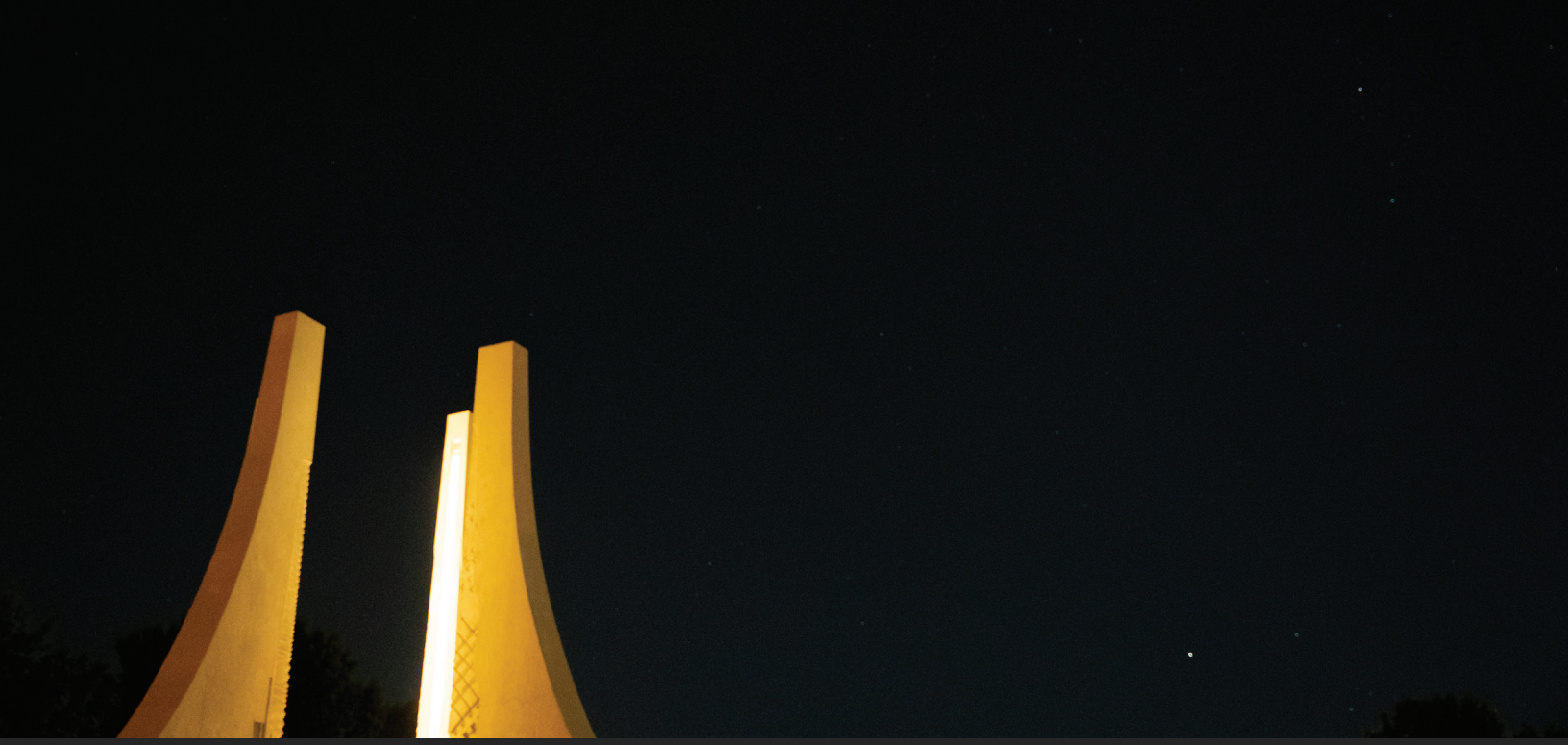
PROPEL

2021 Chapter Report



PROPEL

is the annual report for Purdue Space Program, highlighting the achievements of the organization in the past year. *Propel* aims to connect alumni, sponsors, and friends of PSP and Purdue University. Written and designed by Andrew LaPrade and Bryce Castle.



Contents

FROM THE PRESIDENT

Eric Williamson
AAE 2022

As 2021 comes to an end, it is impossible not to reflect on the projects and accomplishments of PSP as a whole. In the face of an unprecedented challenge which forced many of our meetings to move online and heavily restricted our ability to conduct in-person operations, all of our members rose to the occasion and worked tirelessly to ensure that their planned tests and flights would be able to continue while ensuring that they followed the safety guidelines laid out by the university. Despite these challenges, PSP has seen an incredible amount of growth over the past year with nearly 400 students across six of the university's schools now being a part of our organization.

In the last year, our chapter has seen two successful tests of one of the first undergraduate developed liquid bipropellant rocket engines in the world, one of our teams place within the top five of a national competition, the development and successful test of the first carbon composite rocket for the organization, successful solid rocket motor tests, and countless students impacted both at the collegiate as well as at the elementary level. In addition to the growth of students in the organization, 2021 saw PSP interacting with more members of our community than ever before; from local elementary schools to groups of retired professionals, our outreach has helped inform and inspire a wide variety of generations about the current status and excitement of the space industry.

At the time of our previous report, PSP was proud to host five technical teams under our organization; in the time since, we have added a high altitude rocket project as well as a team focusing on active controls of aerospace systems to bring a total of seven teams operating under the PSP name. These teams are helping to ensure that we are able to offer all those who are interested in space have projects readily available to join no matter what their interests might be. At its core, PSP aims to lower barriers of entry to space industry for all and the addition of these projects is a small step in helping to realize that goal.

Looking back on the year, I am filled with nothing but pride and excitement to see how far PSP has come in the last several years. This progress would be impossible without the passion, ingenuity, and motivation from our students as well as the support from our partners in the AAE, ME, and ECE departments at the University in addition to the faculty and staff of Zucrow Labs and those who are unaffiliated with Purdue. Without this support, we would not be able to offer the opportunities to our members that we currently do. I have the deepest gratitude for all of you and your support in helping to inspire and equip the next generation of rocketeers, engineers, and scientists. It has been a privilege to help guide this organization over the last year and I couldn't have asked for a better executive board with which to do so.

"2021 saw PSP interacting with more members of our community than ever before"

Protect Purdue

PSP took steps to ensure that official events adhered to the Protect Purdue Pledge throughout 2021, which includes the following safety measures:

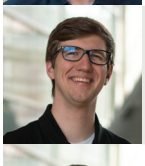
- Attendance tracking and check-in process.
- Space dedensification and social distancing based on Tippecanoe County guidelines.
- Wearing face masks indoors and outdoors when physical distancing is not possible.
- Wearing face shields indoors when physical distancing is not possible.
- A designated safety officer to ensure compliance and contacting the Protect Purdue Health Center.
- A virtual option for students learning remotely.

All events were reviewed and approved by the office of Student Activities and Organizations (SAO) to ensure adherence to Protect Purdue guidelines.

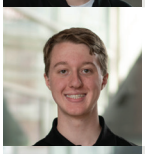
EXECUTIVE BOARD

75+ Leadership opportunities across the executive board and teams.

Eric Williamson
President
Aeronautical & Astronautical Eng. 2022



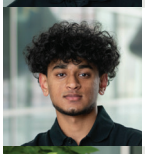
Nathan Gurgens
Vice President
Aeronautical & Astronautical Eng. 2021



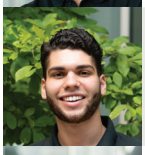
Andrew Darmody
Treasurer (Spring)
Aeronautical & Astronautical Eng. 2023

Griffin Hentzen
Treasurer (Fall)
Class of 2024

Ayush Srivastava
Secretary
Class of 2024



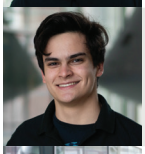
Kush Patel
Technical Director
Class of 2024



Maor Gozalzani
SEDS-USA Representative (Spring)
Aeronautical & Astronautical Eng. 2022

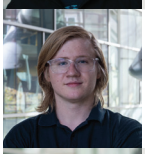
Omkar Kerkar
SEDS-USA Representative (Fall)
Aeronautical & Astronautical Eng. 2022

Bryce Loging
Social Chair
Class of 2024

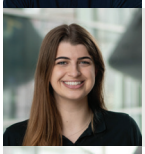


Stefan Lazaroae
Outreach Chair (Spring)
Class of 2024

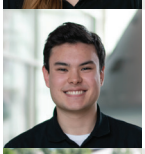
Vebjørn Moskvil
Outreach Chair (Fall)
Aeronautical & Astronautical Eng. 2023



Cameron McCoy
Fundraising Chair
Class of 2024

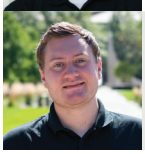


Brynne Hunt
Social Media Chair
Electrical Eng. 2022

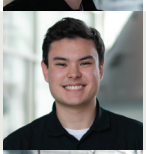


Andrew LaPrade
Branding & Web Chair (Spring)
Computer Eng. 2022

Bryce Castle
Branding & Web Chair (Fall)
Aeronautical & Astronautical Eng. 2023



Jack Costello
Midwest Rocketry Forum & Podcast Chair
Multidisciplinary Eng. 2022



Andrew LaPrade
Midwest Rocketry Forum Chair (Fall)
Computer Eng. 2022

Celia Parker
Podcast Chair (Fall)
Electrical Eng. 2023

TEAM LEADS AND ADVISORS

ACTIVE CONTROLS

Pavit Hooda	Project Manager
Faaiz Memon	Asst. Project Manager
Maya Haven	Technical Director
Dylan Towle	Avionics Lead
Davis Bradstreet	Controls & Modeling Lead
Joseph Turcotte	Structures & Propulsion Lead
Paul Kelson	Guidance & Navigation Lead

HIGH ALTITIUDE

Jeffrey Kaji	Lead Engineer
Amanda Petty	Project Manager
Ayush Srivastava	Project Engineer
Harry Amadeo	Project Engineer
Robert Sammelson	Project Engineers
Evan Ritner	Avionics Lead
Jacob Perata	Recovery Lead
Benjamin Schafer	Payload Lead
Alex Suppiah	Simulation Lead
Noah Linderman	Propulsion Lead
Steven Huang	Systems Lead
Tim Osifchin	Manufacturing Lead
Enrico Setiawan	Build-Integration Lead
Frances O'Leary	IT Lead
Josh Bailey	Business Lead

HYBRIDS

Elvin Garayev	Chief Project Engineer
Jan Balk	Chief Design Engineer
Matt Mader	Aerodynamics Lead
Austin Nightenhelser	Avionics Lead
Dylan Graulich	Business Coordinator
William Gardner	Ground Systems Lead
Stephen Grabowski	Launch & Recovery Lead
Scott Creger	Manufacturing Lead
Cole Nielsen	Payload Lead
Austin Keck	Propulsion Lead
Arpit Agarwal	Structures Lead

FACULTY/STAFF ADVISORS

Scott Meyer	Managing Director, Zucrow Labs
Chris Nilsen	DBT Engineer, Zucrow Labs

LIQUIDS

Brynne Hunt	Project Manager
William Ipsen	Chief Engineer
Cameron Williams	Avionics Lead
Andrew LaPrade	Business Lead
Nathan Gurgens	Controls Lead
Andrew Ross	Fluid Systems Lead
Maor Gozalzani	Launch Operations Lead
Jeremy Casella	Manufacturing Lead
Ben Worrell	Propulsion Lead
Aidan Powers	Simulations Lead
Ryan Jacobowitz	Structures Lead

SATELLITES

Utkarsh Sayini	Project Manager
Griffin Hentzen	Chief Engineer
Connor Gregg	Lead Systems Engineer
Conner Phillips	Lead Systems Engineer
Vincent Haight	Lead Systems Engineer
Trey Stroupe	Structures Lead
Megan Figler	Experimental Payload Lead
Einar Pederson	Power Lead
Josiah Campbell	Avionics Lead
Sarah DeVito	Avionics Co-Lead
Matthew Agnew	Communications Lead

SPACEPORT

Alyssa Lear	Project Manager
Nathan VanDam	Chief Engineer
Jack Hastings	Structures Lead
Nicholas Fava	Manufacturing Lead
Aakarsh Sahay	Payload Lead
Hunter Wellens	Propulsion Lead
John Carrington-Warren	Avionics & Recovery Lead

STUDENT LAUNCH

Skyler Harlow	Project Manager
Lauren Smith	Asst. Project Manager
Katelin Zichittella	Avionics Lead
Natalie Keefer	Business Lead
JJ Bagdan	Construction Lead
Luke Hecht	Payload Lead
Andrew Darmody	Safety Lead
Jason Hickman	Outreach Lead

Podcast hosts Jack Costello, Maor Gozalzani, and Braden Grossfeld prepare for the teaser 'Episode 0" with the help of Hall of Music Productions following Protect Purdue guidelines.

CHAPTER UPDATE

Reaching Higher and Farther

PSP launches the Purdue Space Podcast and live-streamed workshops in midst of COVID-19

With the vision of hosting a live conference during the Fall 2020 semester, PSP was set to organize the Midwest Rocketry Forum in March 2020.

However, as COVID-19 caused the Purdue campus to lock down and pivot to studying online, conference chair Jack Costello and his team had to pivot as well. "We were hoping that everything would be back to normal in the fall," Costello said, "but as the situation worsened and guidance from Purdue about hosting events emerged, we had to rethink how we would do this."

The Midwest Rocketry Forum originally planned to be a two-day conference hosting several keynote speakers, workshops, and networking sessions in rocketry and aerospace. Themed "Footprints," the Forum aimed to celebrate past achievements in space exploration to step toward the future.

In order to provide an experience of hearing from distinguished guests for a variety of topics, the planning team decided to change the keynote events into a podcast, called the Purdue Space Podcast. "We loved the idea of turning it into a podcast, as it was a way for people to hear from special guests while we were all stuck at home," Costello said.

Started in late August 2020, the Purdue Space Podcast had a total of ten episodes, with guests including:

- Tory Bruno, president and CEO of ULA
- Joe Barnard, space YouTuber and founder of BPS.space
- CuriousMarc, YouTuber focusing on vintage computers who helped restore an Apollo Guidance Computer

Eric Williamson, who was the Vice President for PSP and now President, hosted the episode with Tory Bruno. "Reaching out to him was a complete shot in the dark," Williamson said. "We we had absolutely no idea that he would be willing to join us for an episode."

One of the benefits with the podcast format included bringing in more guests without the need for them to travel, which Williamson believes is why Bruno was more receptive to participate.

Alongside the podcast, the Midwest Rocketry Forum included several live-streamed workshops hosted on PSP's YouTube channel, with topics ranging from starting a rocket team to rocket photography. It also included a joint workshop with Purdue's Women in Aeronautics and Astronautics (WIAA) student organization to discuss diversity and inclusion in the aerospace industry.

The Purdue Space Podcast is expected to continue through the 2021-2022 academic year. Celia Parker, who now leads the podcast team, is eager to begin the planning for the next season. "We submitted our activity plans to Purdue and will begin considering possible episodes and guests throughout the summer," Parker said. "We have already invested in equipment and are looking into renting a new space or repurposing our office space into a studio."

The team hopes to make the Purdue Space Podcast a mainstay for PSP and for Purdue. "There are a lot of stories to tell about space and space-tangential fields, and that's always evolving as more things go into space," Williamson said. "I don't think we will run out of material anytime soon."

PSP would like to thank the Purdue University Student Fee Advisory Board (SFAB) for financial support and Hall of Music Productions for providing recording and editing services during the Fall 2020 semester.

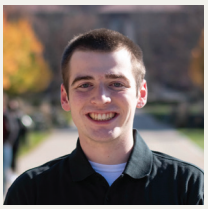
Fall 2020 Hosts

Jack Costello
Episodes 2, 8, and 9

Braden Grossfeld
Episodes 1 and 9

Maor Gozalzani
Episodes 3 and 9

Brynne Hunt
Episodes 7 and 9



Mark Paral
Episodes 5 and 6

Eric Williamson
Episode 4

Fall 2020 Invited Guests

In Order of Appearance

Joe Barnard, YouTuber, BPS.space
Amy Comeau, The Boeing Company
Nate Simpson, Private Division
Paul Furio, Private Division
Simon Moffatt, Rocket Lab
Scott Meyer, Purdue U. Zucrow Labs
Pau Pineda Bosque, Virgin Orbit
Tory Bruno, United Launch Alliance
Mike Stewart, Capella Space
Carl Claunch, Vintage CPU Museum
Ken Shirriff, Blogger
Marc Verdiell, YouTuber, CuriousMarc
Pádraig Lysandrou, SpaceX
Robert Bayt, NASA Johnson Space Center
Jose Guzman, Aerospace Corp.
Steve Tragesser, UCCS
Ian Murray, Independent Consultant
Cindy Mahler, The Boeing Company
Tim Buzza, Virgin Orbit
Madison Telles, Virgin Orbit

Overall Statistics

Apple Podcasts & Spotify

1,663 total streams

47 countries reached

583 individual listeners

Where to Listen

Apple Podcasts

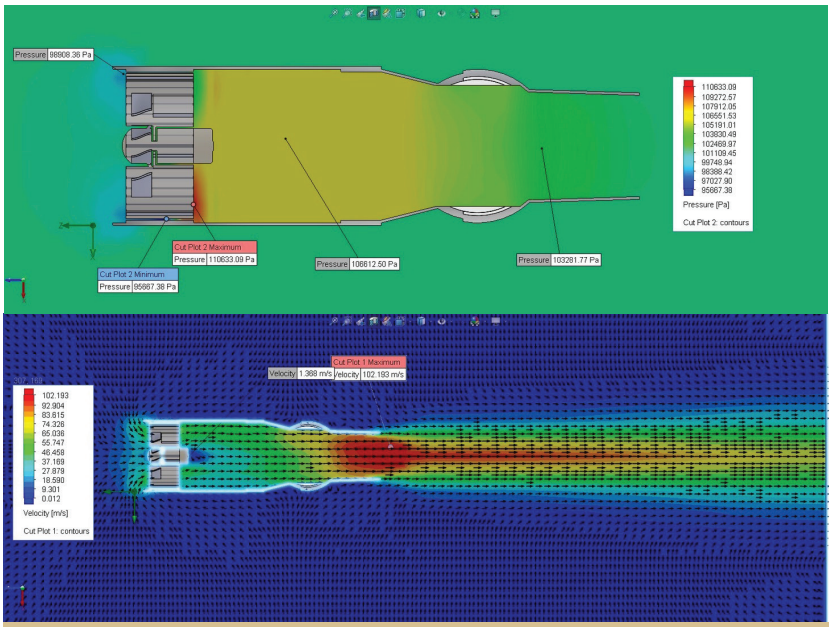
Spotify

YouTube (for workshops)

PSP Active Controls

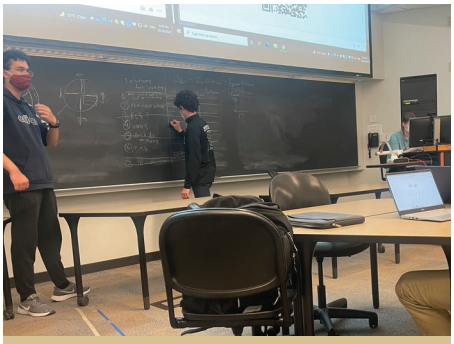
PSP-AC is a research and development team that aims to advance active control technology. With the advent of propulsive landing in the private space sector, actively controlling a rocket's position and orientation has been proven to be vital for the rapid reusability of orbital and suborbital rockets. This team consists of multiple subteams that take on a certain aspect of this multifaceted project. These subteams include Structures & Propulsion, Guidance & Navigation, Controls & Modeling, and Avionics.

In the summer of 2021, the Active Controls team was founded with the mission to propulsively land model rockets. The team caught on early, and has since made a good amount of progress towards that goal. In their first semester, the team has established its existence within the Purdue Space Program, divided into four subteams, and put workflow tools in place. Additionally, a parts list was made for project ASTRA: Aerial Stabilization Through Regulated Actuation. This project is an electric ducted fan (EDF) approach to the solid rocket motor (SRM) propulsive landing system. Using an EDF allows for throttle control and more flexibility in terms of control of the vehicle. This stepping stone would allow the team to gain a better understanding of the control theory and mechanisms involved. In their first semester alone Purdeu Space Program: Active Controls have ran simulations, created a CAD model, and designed a flight computer, for the ASTRA project.

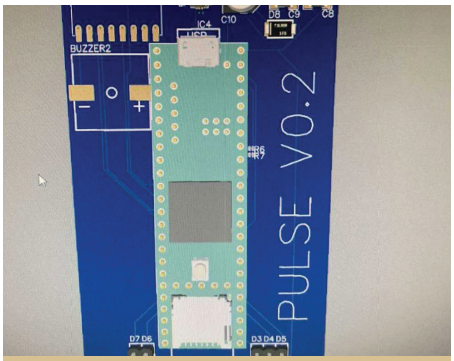


Airflow pressure & velocity simulations of a electric ducted fan

CAD assembly of ASTRA



Thrust vector control system discussion



Prototype control board

PSP High Altitude

PSP-HA is a student team dedicated to the research of experimental high-altitude rockets. This team is determined to launch and recover a two-stage payload-carrying high-altitude rocket beyond the Karman Line. Student subteams are created by student research interest areas, which include avionics, build & integration, business, information technology, manufacturing, payload, propulsion, recovery & staging, simulation, structures, and systems & safety.

Integrating the rocket's avionics bay

In the Summer of 2021, PSP-HA was founded to begin research into experimental high altitude rockets with the ultimate goal of recovering a two-stage payload-carrying rocket to the Karman line. The summer team membership became a combination of the PSP-Solids and PSP-K3RC teams which both agreed to form the High Altitude team in the coming semester. Over the summer the initial payload team determined what camera setup and potential downlink methods could be used on flights to obtain live video. In the future this team will be the foundation for live telemetry downlink integrated along side avionics. The initial structures team worked with the leads to determine the best way to teach incoming members the fundamentals of rocketry and solid motor propulsion. To complete this task, a 4 inch Darkstar Extreme fiberglass kit was purchased along with a COTS K-400 motor. This rocket would be designed to fly the preliminary design of the camera bay and the preliminary COTS avionics setup for dual deployment.

Students mounting Dark Matter to rail

Tempting Fate launch

The Purdue Space Program High Altitude team expanded with the start of the Fall semester, starting with over 150 members driven towards the goal of a space shot rocket. The Darkstar Extreme rocket, nicknamed Tempting Fate, was completed and flown in less than 2 months. On September 18th, 2021 Tempting Fate soared to 2883 feet with a top speed of 400 ft/s at Richard Bong Recreational Park in Wisconsin and was successfully recovered using a tender descender dual deployment. The payload bay included the onboard camera and flight computers that were being researched at the end of the summer. Most importantly, the team was given the foundation needed to understand how rockets are designed and flown and the effectiveness of data collection by the avionics.

With the success of Tempting Fate, the team was ready to tackle larger challenges and prepare the methods and designs for future rockets. PSP-HA has 11 subteams, this wide variety allows our members the ability to pursue their individual interests within rocketry while diving our tasks down to a low enough level to develop the space shot vehicle. The next major step for the team was to explore the capability of making a carbon fiber rocket, a task which no PSP team has done before.

This 5.5 inch carbon fiber rocket, nicknamed Dark Matter for its appearance, was designed to test our carbon manufacturing capabilities including airframe and tip to tip fin layup. Following the rapid prototyping philosophy of the team, Dark Matter from design to flight took 7 weeks. Flying on an L-1500 at Indiana Rocketry in Pence, Indiana, Dark Matter climbed to 5456 feet with a top speed of 605 ft/s. The payload contained an upgraded onboard camera system and a Wi-Py downlink test.

PSP-HA is committed to rapid prototype testing of systems and aims to fly higher and soar faster as it continues. The team is working to improve our flight systems, exploring the capabilities of two-stage, making SRAD motors, and have a high mach regime rocket flight next semester. We will fly higher!

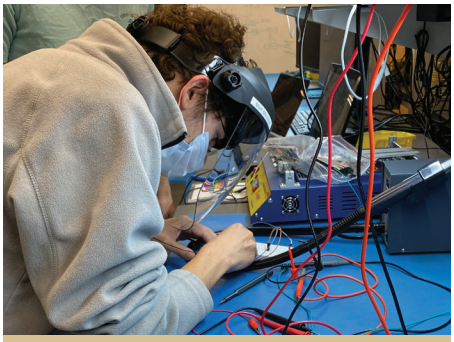
Students posing with Tempting Fate rocket

PSP Hybrids

PSP-Hybrids has been working on HAVOC (Hybrid Ascent Vehicle using Oxidized Candlewax), a student designed and developed Hybrid rocket. Its mission is to conform to FAR 51025 standards and launch to 10,000 feet with a 2.2 lb engineering payload. This competition promotes the development of student-researched and built experimental launch vehicles, along with complex engineering payloads. Because of this, PSP Hybrids puts a major emphasis on training and educating members in the science and engineering behind rockets through training sessions and a library of well documented resources.

This past year, the Hybrids team has worked on finishing their data acquisition (DAQ) and propulsion systems to put them in line for hotfire testing early next year. This team has also been working hard to finish manufacturing of their components, allowing full scale assembly to begin. Along with hotfire, Hybrids plans on performing deployment and payload testing to insure the success of their upcoming test launch in the Spring of 2022 and subsequently the FAR 51025 competition in the Summer of 2022.

The airframe subteam has all electrical components in working order and is conducting tests of the recovery systems to ensure the safety of HAVOC. They are also working on launch rail safety to ensure the correct launch trajectory is achieved. Data acquisition groups work with launch rail saftey during test launches to tune the performance of the rocket in the future. Payload is still developing their autonomous rover and has recently worked on their exit systems and 360 degree camera module. Testing for this will occur early next year. The propulsion sub-team was able to assemble HAVOC's combustion chamber and had it successfully pass hydrostatic testing. They were able to assemble and fully test HAVOC's DAQ to allow it to successfully launch in the future. They are gearing up for a Technical Readiness Review when we return from winter break which will be followed by our first hotfire. We would also like to thank all of the graduating seniors and exiting members for all of the hard work and countless hours they have put into trying to get HAVOC to launch!



Student working on the flight computer

Members with combustion chamber

Dry fit of HAVOC assembly

PSP Liquids

PSP-Liquids is Purdue's liquid bi-propellant rocket team participating in the FAR-MARS competition, which challenges a collegiate team to reach 30,000 feet with a LOx/Methane rocket. PSP Liquids has manufactured and tested their first rocket, Boomie Zoomie (BZ), and are hoping to launch in the near future with their second iteration, Boomie Zoomie B (BZB).

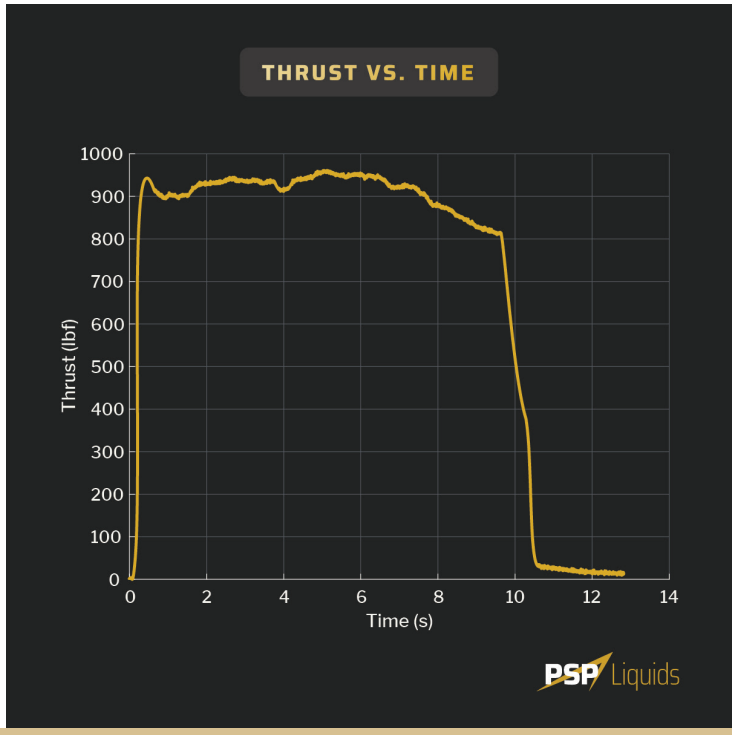
Over the last year, the liquids team has worked tirelessly to design, build, and test the successor to their first liquid rocket. Boomie Zoomie B (BZB) represents a vast set of improvements to the original design which will allow it to soar above 30,000 feet during its flight in the FAR-MARS competition in the Mojave desert in 2022.

With the design of a new rocket comes new sets of tests; to date, the team has completed six coldflows and two hotfires to validate nearly all the systems onboard the rocket with more tests planned in the coming months to confirm that the remaining systems are behaving as expected. To accomplish these tests, the team has built a data acquisition system allowing them to get temperature, force, and pressure data from over 25 sensors. This DAQ is directly integrated to their ground support station, the Black Cat Launch System (BCLS).

Students setup for a courtyard hotfire

Maor Gozalzani with data monitors

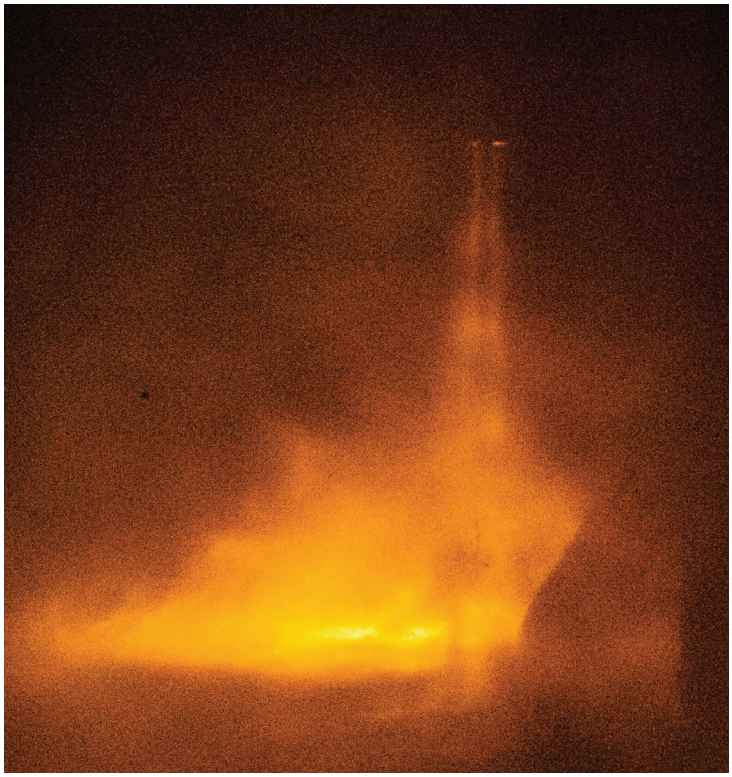
BCLS was designed from the ground up to cut the size and improve the portability of the ground support system that is required to help launch the rocket. Incorporating the methane condenser from the original Boomie Zoomie project, BCLS allows the team to travel across the country to the launch site and prepare the rocket and propellants for launch. The team is in the late stages of launch and procedure validation with the staff at Zucrow Labs.



Data highlights from PSP-Liquids Hotfire 2

The team conducted two full-stack hotfire tests to validate vehicle design and performance in the Fall of 2021 at Purdue's Zucrow Laboratories using the team's Black Cat Launch System. Results show that the engine reached the team's performance targets for the FAR-Mars Launch Contest and expects to launch in 2022.

As the BZB project draws to a close, the next generation of team members have turned their eyes towards the construction of a third liquid rocket aiming to fly to 100,000 feet. While the design is in its infancy, the team is making large strides towards a full design and beginning construction.



PSP Satellites

PSP-SATS is currently the only non-rocket team in Purdue Space Programs. Their primary objective is to launch a 3U CubeSat with a 3D food printer into orbit through the NASA CubeSat Launch Initiative (CSLI). The vision of this team is to become a CubeSat integration service provider for corporate and academic experiments, with the ability to build and launch multiple CubeSats through NASA CSLI or other launch service providers.

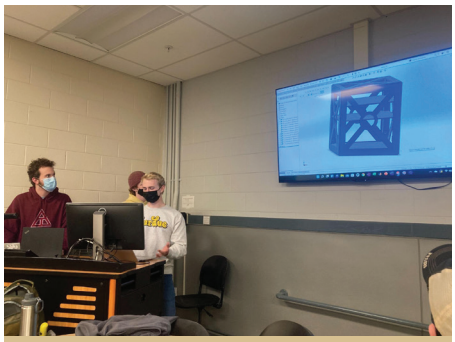
In the Summer of 2021, the PSP-Sats team submitted a 45-page report about the future of In-Space Manufacturing in the 2021 SSPI competition. Continuing their streak of placing in the SSPI competition, taking home 2nd Place

As soon as the semester started, the PSP-Sats team immediately shifted towards focusing on the goal of launching a CubeSat into space through the NASA CubeSat Launch Initiative (CSLI). This semester they saw a surge in membership now with 50 members on the team. This team decided to adopt a similar organizational leadership structure similar to many companies in the Aerospace and Aeronautics industry. This includes a Project Manager, Chief Engineer, and Sub-System Leads in Experimental Payload, Structures, Avionics, Communication, and Power.

In September, they onboarded new members, getting them knowledgeable on the team goal, the CSLI program, and CubeSat knowledge. In the following months they formed Sub-System teams and started researching CubeSat design. The tech project consisted of a fictional mission prompt about a CubeSat with an experiment, budget, and launch parameters. While this was going on, the Experimental Payload team was working on contacting professors and relevant people in the industry to find a potential experiment we could integrate on a CubeSat. PSP-Sats will be working with Purdue Professor Malshe and his research team on an experiment, 3D printing food in Low Earth Orbit. In December, the sub-teams presented all the knowledge they had gathered for the Tech Project to the rest of the team.

Student creating team agenda

They're all systems go for next semester to develop a proposal for the CSLI program. The total cost of research, development, and build of the CubeSat is estimated to cost $50K+ and launch costs around $300K, which NASA would cover. This CubeSat project will take 2-4 years to build and launch if accepted by the CSLI program. The key aspects of the proposal are conducting merit and feasibility reviews and having letters of financial support.


Preliminary CubeSat CAD model

PSP Spaceport

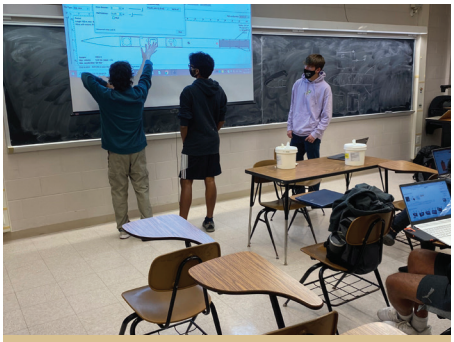
PSP Spaceport America (SA), previously known as PSP Solids, is dedicated to the manufacturing and launch of a student-built rocket. The team aims to compete at the Spaceport America Cup annually in New Mexico. With the rebranding of the team, the main objective has shifted toward teaching new members about rocketry basics. Project Icarus has taken full swing with this goal in mind and will be flying to an altitude of 10,000 feet at the June 2022 competition in the "Commercial Off-The-Shelf" (COTS) motor category.

With the restructuring of other teams, PSP Spaceport America had a brand new start beginning in Fall 2021. The team of 22 is composed of freshmen, sophomores, and one junior. This new era began with learning the basics of rocketry and familiarizing the team with the rules of the competition. With a strong foundation, the team was able to move into design.

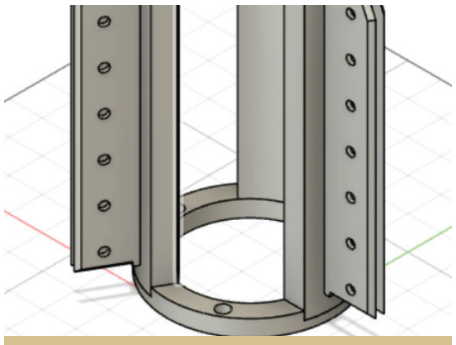
Within the past few months, the team has transformed ideas into a functional model. Beginning with the structures team, a full analysis of the stability, fin flutter, and efficiency of the structural design has been conducted. To reduce fin flutter, the team focused their efforts around a complex aluminum fin can. This fin can is the highlight of the overall design and simplifies the process of replacing the fins on the rocket. There have been several reiterative designs of the overall model and the team is excited to further improve upon the current iteration.

The payload team has made great effort in conceptualizing a dual-camera system that calculates the altitude of the rocket using visual recognition during flight. This system intends to utilize parallax visualization techniques to accurately depict the height. The electronics will be directly connected to the avionics to ensure proper data transmission. As the idea develops further, the team hopes to begin manufacturing and testing of the payload.

As learning has been a large focus this year, the team is anxious to begin working in the labs. The team has held a preliminary design review with other PSP teams and executive leads to gain insight on possible improvements and is further excited to have the first test launch of Icarus at the end of January 2022. Independent of launch success, the team will move forward with more detailed design and host a critical design review to further their experience. This young team is innovative and motivated to do well at the competition.



Rocket simulation discussion



Aluminum fin can CAD model

Students learning about fin design

PSP Student Launch

The Student Launch Team represents Purdue University at the annual NASA Student Launch Competition in Huntsville, Alabama. Our team is responsible for designing, building, testing, and flying a rocket and payload system to accomplish the task NASA has set for us. Building off of our top-10 finishes the past two years, the SL team has our sights aimed at the very top for this year's competition.

In the 2020-2021 competition, the team continued improving from previous years, placing 4th of 46 teams and also winning the top award for Social Media and Outreach. To place so well in a time of uncertainty and stress is a tremendous achievement that is not overlooked by anyone on the team. Every member of SL worked their hardest to successfully launch our 2020-2021 full-scale rocket three times this year and to cement our place as one of the best collegiate teams in the Student Launch Competition.

During this time they broke convention on how the fins and motor are attached to a rocket, creating an entirely metal support structure. That configuration persists into the 2021-2022 competition and is being paired with a fusion of 3D printed and carbon-fiber laid fins, also a novel design for the SL team. Also, our nose cone this year keeps its elliptical shape and 3D printed form, but is now being integrated with the payload system instead of housing our camera bay.

2020-21 competition leads

2020-21 team picture

Second launch of All Gas, All Brakes rocket

This competition, PSP-SL is targeting another top-5 finish with our full-scale rocket, “Green Gas, All Brakes” named for its motor’s signature green flame and the return of an aerobraking system. This team is confident in their ability to reach that top-5 goal due to everything they have learned from previous competitions and the success of their sub-scale flight demonstration in December. This flight showed that entirely 3D printed fins are capable of handling the stresses of flight, and continued to prove that a 3D printed nose cone is a great choice for balancing the manufacturability and effectiveness of 3D printed parts.

Looking back at the past few years of the Purdue Space Program: Student Launch’s history, it’s easy to see how they’ve improved. Two years ago highlighted their ability to bounce back from a near-complete loss of their rocket in a month, which eventually lead to a 9th place finish; last year they persevered through an entirely virtual competition to place 4th (and clinching back-to-back Social Media and Outreach awards). The challenge given to the team by NASA each year has never gotten easier, and the challenge of even being competitive with other universities has never been greater, but the PSP-SL team continues to work hard as a united group to overcome anything thrown their way. They are very excited to continue demonstrating the capability of producing high-quality rocket and payload systems that push the boundaries of what is possible for a college team to achieve.

PSP-SL leads right after finishing building their 2021-2022 subscale launch vehicle

DEMOGRAPHICS

OVERVIEW

474 Members
Cumulative 2021

194 Active in Spring 2021

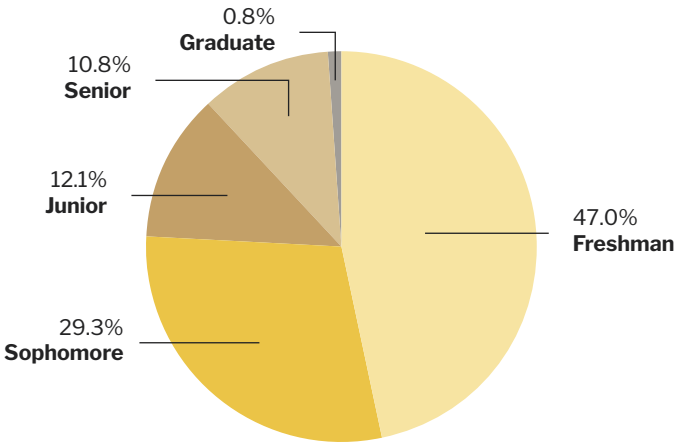
380 Active in Fall 2021

TEAM PARTICIPATION

2.4% **None**

Active Controls	High Altitude	Hybrids	Liquids	SATS	SPRT	SL
9.4%	25.4%	9.2%	33.1%	8.9%	5.6%	6.0%

CLASSIFICATION



MAJORS

First-Year Engineering	43.4%
Aeronautical and Astronautical Engineering	35.8%
Mechanical Engineering	6.0%
Computer/Electrical Engineering	3.9%
Computer Science	2.1%
Exploratory Studies	1.3%
Math	0.8%
Professional Flight	0.5%
Physics	0.5%
Other	5.7%

Breakdown includes students pursuing multiple majors.
"Other" includes students pursuing Aeronautical Engineering Technology, Agricultural Economics, Anthropology and Genetics, Chemistry, Civil Engineering, Computer Engineering Technology, Data Science, Film and Video Production, Finance, Materials Engineering, Mechanical Engineering Technology, Multidisciplinary Engineering, UX Design

CAREERS

100+ Received Internship or Co-Op Offers

41 Employers Represented

AGI
Agile Space Industries
American Airlines
Aptiv
Arconic
Blue Origin
Boeing
Cirrus
Collins Aerospace
Cummins
Daimler
Eaton
Formlabs
GE Aviation
General Atomics
Honeywell Areospace
John Deere
Launcher
Lockheed Martin
Marotta Controls
Microsoft
The Museum of Flight
NASA
Northrop Grumman
Raytheon Technologies
Relativity Space
RocketLab
Rolls Royce
RZ Automation
Schnabel Engineering
Sierra Nevada Corporation
SpaceX
Swagelok
Textron Aviation
Trane Technologies
UPS
U.S. Dept. of Defense
Virgin Orbit
Zucrow Labs

SUPPORTERS

Aerojet Rocketdyne
PSP Solids,
PSP Student Launch

Aerojet Rocketdyne Foundation
PSP Liquids

AGI
PSP

Ansys
PSP Hybrids, PSP Liquids,
PSP Solids, PSP HA

Arconic
PSP Liquids

Atlassian
PSP Hybrids,
PSP Student Launch

Blue Origin
PSP Liquids

Boeing
PSP Liquids,
PSP Hybrids

Celestron
PSP

Indiana Oxygen
PSP Liquids

InSpace LLC
PSP Liquids

Kennametal
PSP Liquids

MathWorks
PSP Lquids

Norman Filter Company
PSP Liquids

Northrop Grumman
PSP Student Launch,
PSP Liquids

PESC
PSP Liquids

Purdue University
School of Aeronautics and Astronautics
PSP Liquids, PSP Solids,
PSP Student Launch

Purdue University
School of Electrical and Computer Engineering
PSP Student Launch

Purdue University
School of Mechanical Engineering
PSP Student Launch

Purdue Propulsion
PSP Liquids, PSP Solids,
PSP Student Launch

Raytheon Technologies
PSP Liquids

SimScale
PSP Hybrids

SolidWorks
PSP Hybrids, PSP Liquids

Wildman Rocketry
PSP Student Launch

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