PSP Liquids

Sponsorship Information

2023-2024

PURDUE UNIVERSITY

Rev. 2023-01

Building tomorrow's workforce.

PSP Liquids is Purdue University's liquid bi-propellant rocketry team providing students the experience sought out by the aerospace industry. The team fosters professional growth through practical work in the analysis, design, manufacturing, and testing of liquid rockets. We prepare our members for the next giant leap in their careers.

PSP-L members during a launch in March 2022

STARTED IN

2017

150

CURRENT MEMBERS

1st & ONLY

COLLEGIATE TEAM TO REFLY A LIQUID ROCKET WITHIN TWO DAYS

12

MAJORS REPRESENTED

CURRENT PROJECT

CraterMaker Special

CraterMaker Special (CMS) is a third generation launch vehicle designed to compete in the FAR Dollar Per Foot challenge. Building on four years of experience, CMS is PSP-L's most ambitious rocket yet, implementing unprecedented technology for student teams. CMS employs a comprehensive avionics system, a composite airframe structure, and a crater-making engine. Sizing for CMS is driven by a complex, extensive simulation developed to maximize altitude. CMS is deep in the design phase with a critical design review in the coming months.

Key features on CMS include:

- Custom avionics computers, to control key systems and record a comprehensive profile of flight data.
- Bang-bang fluid regulator technology to maintain nominal tank pressures throughout flight.
- A custom, overwrapped, carbon fiber airframe to decrease overall vehicle mass and improve rigidity.

850lbf
Nominal Thrust

110lb
Dry Mass

13s
Burn Time

40,000ft
Pred. Altitude

CURRENT PROJECT

BLACK CAT LAUNCH SYSTEM

Black Cat Launch System (BCLS) is the launch operations system designed for rockets built by PSP-L. With a more compact design compared to the original launch trailer, BCLS can be easily transported to long-distance locations with lower risk of damaging fragile components. BCLS currently supports BZB in testing and launch operations.

Key design features of BCLS include:

- Pneumatic valves and self-separating quick disconnects that enable remote propellant loading to prioritize team and vehicle safety.
- A modular data acquisition system that provides a 1 kHz sampling rate, auto-sequencing, and complete power control of onboard systems.
- Compatibility with various liquid propellants and testing operations.
- Fully integrated nitrogen leak-checking system for rapid testing.

4ft x 4ft
Footprint

50+
Valves & Sensors


Launch 1

LAUNCH SUMMARY

BZB Mission Conclusion

In 2022, the team made PSP-L history by conducting a launch for the first time ever. After traveling from Purdue to the FAR launch site in California, the team launched BZB three times. Crews worked around the clock to prepare the vehicle for this pivotal moment in PSP history.

Following the first launch, BZB flew to an apogee of 10,000 feet, where it deployed its main and drogue parachutes. After recovery, the team analyzed BZB's components systems and, after careful deliberation, launched BZB again to 6,600 ft.

Then, three months later, PSP-L refined BZB's design to conduct another launch. After conducting a thorough test campaign at Purdue, the team travelled back to California. Working around the clock, the team successfully launched BZB for the third time.

The BZB mission ended with success for the team. The data collected from launch will provide valuable information, enabling the next giant leap for the team. PSP-L will be back, to soar higher than ever before.

VEHICLE SPECIFICATIONS

Boomie Zoomie B

Boomie Zoomie B (BZB) is PSP Liquid's second vehicle iteration, intended to improve on past vehicles and win the FAR-MARS Launch Contest. Using a simulation-driven, optimized design, BZB features significant performance increases on top of the strong vehicle architecture of our past rockets. Featuring a lightweight common bulkhead tank assembly, robust and redundant avionics design, and improved engine performance and cooling. Boomie Zoomie B has already been launched and retired as members work on a new chapter in PSP-L history.

Key design improvements of BZB included:

- 10% improved inert mass fraction compared to prior vehicles, and half the dry mass of other collegiate liquid rockets in the same impulse class.
- Custom manifolding allowing for compact fluid system packaging while reducing pressure drop.
- Improved pressurant modeling, ensuring constant tank pressures and propellant feed through flight.

900lbf
Nominal Thrust

92lb
Dry Mass

500psi
Tank Pressure

Team Culture

Growth and Development

Training and Mentorship
PSP-L prioritizes training, teaching, and mentoring members. We have technical mentor roles filled by senior members who dedicate time to answering technical and professional questions. Specific workshops and software training sessions are in place during onboarding of new team members.

Team Professionalism
The team partakes in industry practices such as:

- Utilizing task management and knowledge database software for enhanced communication
- Implementing a standardized part naming convention and labeling manufactured parts.
- Holding frequent design reviews to obtain feedback and improve upon designs and processes.

SEDS Affiliation
As part of the largest SEDS chapter in the world, students are provided with access to networking opportunities, guest speakers, and a large community of space enthusiasts that extends beyond the team itself.

Inclusion and Well-Being

Open Recruitment
PSP-L remains open to everyone. There is no application process and no prerequisites or criteria to join the team. This policy is rooted in PSP's core values—anyone should be able to join this team and develop fundamental skills to prepare them for the aerospace industry.

Diversity, Equity, and Inclusion Town Halls
PSP-L hosted a chapter wide DE&I town hall where the PSP rocket teams evaluated team practices and inclusivity. These town halls will continue to occur every semester to ensure we are continuously improving and holding teams accountable.

Prioritizing Well-Being
With the difficulties and challenges team members face academically, PSP-L has prioritized the well-being of its members. The team has invited and held workshops with Purdue's Counseling and Psychological Services (CAPS) to emphasize what resources are available for students.

"As the Liquids team, we strive to create an exciting and welcoming environment for all students to cultivate their engineerings skills outside of the classroom. I am very proud to be a part of a team that provides invaluable technical experience to all of its passionate members."

Jonah Fouts
Project Manager

How You Can Help

There are several ways through which you can help PSP Liquids achieve its mission:

- **Monetary donations** are incredibly important to the team's success. They will be used to purchase materials, tooling, and components for the manufacturing, assembly, and testing of our projects.
- **Material donations** advance the team's progress and alleviate significant costs in the team's budget. Materials include but are not limited to stock materials, valves, fittings, tooling, and machining services.
- **Mentorship and guidance** are highly valued by the team as a way to provide critical design or operational feedback and create meaningful connections between team members and industry professionals.

Whatever way you choose to give to PSP-L, you gain benefits such as promotion, recognition, and exclusive opportunities with the team.

	T MINUS 10 Less than $1,000	IGNITION $1,000 and up	LIFTOFF $5,000 and up	APOGEE $10,000 and up
Name on PSP website	•	•	•	•
Exposure on social media	•	•	•	•
Logo in workspace	•	•	•	•
Access to résumé book		•	•	•
Logo displayed on rocket		•	•	•
PSP merchandise			•	•
Logo on launch day shirts & ground support			•	•
Exclusive networking event with team			•	•
Preferred logo placement				•
Personal design presentation				•
Machined rocket model				•

Any material or service donation will be considered equal to its monetary value.
Any sponsorship involving a software license for the team's use is considered an Ignition tier donation.

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PURDUE SPACE PROGRAM
A SEDS Chapter

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