ASME SP³ 2024

Space Propulsion & Power Platform

Program

CONFERENCE
August 26–29, 2024

MIT AERO-ASTRO
Cambridge,
Massachusetts USA

https://event.asme.org/SP3

The American Society of Mechanical Engineers®
ASME®

ASME
SETTING THE STANDARD

`

Welcome Message for the Inaugural Space Propulsion & Power Platform (SP³)

It is my honor and great pleasure to welcome you to the inaugural Space Propulsion & Power Platform (SP³) in Cambridge, MA, USA, on behalf of the organizing committee and the advisory board. I am thrilled to have you join us for this exciting four-day event.

The Space Propulsion & Power Platform (SP³) will provide a unique ecosystem and zone of encounter, convening stakeholders from all walks of life—from high school students to technical experts and professionals, to entrepreneurs and innovators, to academics and government employees. The mission of SP3 is to integrate knowledge exchange, technology development and innovation, career advice and planning, and professional development into one comprehensive platform. SP³ will enable new pathways for space enthusiasts and professionals of various age groups, preparing them for their next steps and long-term goals. Whether your aspirations lie in career advancement, groundbreaking research, pioneering innovation, or launching a startup, this platform will provide the resources and connections you need to thrive.

The SP³ program is thoughtfully designed to foster an ecosystem that integrates knowledge exchange, technology development and innovation, career advice and planning, and professional development. It will provide participants, from high school students to technical experts and professionals, with the most modern and latest information and insights on space propulsion and power systems, while also allowing ample opportunities for networking and collaboration. This inaugural SP³ is a truly global gathering. Our executive committee and advisory board comprise internationally esteemed scholars and engineers in the field of space propulsion and power. Participating universities hail from North America, Europe, Australia, and Asia, representing a diverse range of perspectives. Students from MIT, Rutgers University, Delft University of Technology, the University of Melbourne, and Hanyang University will showcase their space-related endeavors, research projects, and expertise.

A distinctive focus of SP³ is empowering the next generation of space leaders. Recognizing the limited exposure to the space sector at the university level, we have designed targeted programs for students at all stages. High school students will engage in educational modules covering topics from the history of moon landers to the fundamentals of turbomachinery, rocket engines, materials, and additive manufacturing, complemented by hands-on group activities. Undergraduates will gain experience-based learning, connect with potential sponsors, mentor high school students, and extend their reach into the industry. Graduate students will forge mentorship relationships with industry professionals, broaden their knowledge base, and contribute to a more inclusive space community. Industry participants will establish vital pipelines for knowledge transfer to younger generations, connect with early-career professionals and undergraduates, and serve as inspiring role models. SP³ will cultivate achievement-driven cohorts, nurtured by a diverse network of mentors.

I extend my gratitude to the advisory committee for their leadership, the executive committee and ASME staff for their support, and the industry instructors who generously volunteered their time and expertise. I also appreciate the invaluable assistance of the MIT staff in hosting participants on campus. Above all, on behalf of the executive committee, I thank our supporting organizations whose generous contributions have made this event possible.

I am confident that SP³ will be an invaluable experience for all attendees. I encourage you to fully embrace the wealth of learning, networking, and collaboration opportunities this platform offers. Thank you for your participation and for contributing to the success of this inaugural conference.

Chair of SP³ Executive Committee
Keun Ryu, Ph.D

`

Supporting Organizations

Participating Universities

`

Executive Committee

Keun Ryu, Ph.D.
Associate Professor
Department of Mechanical Engineering
Hanyang University
Platform Chair

Zachary Cordero, Ph.D.
Edgerton Career Development Assistant Professor
Aeronautics and Astronautics
MIT

Charlie Garcia
Special Programs Chief Engineer
Agile Space Industries

Dustin Davis, Ph.D.
Senior Technical Fellow
Pratt & Whitney

Thomas Chirathadam, Ph.D.
Senior Manager
Engine Dynamics
Blue Origin

Marcel Otto, Ph.D.
Research Assistant Professor
University of Central Florida

Advisory Board

Zoltan Spakovszky
T. Wilson (1953) Professor in Aeronautics
Head, Air Sector / Director, Gas Turbine Laboratory, MIT

Assimina Pelegri, Ph.D.
Chair, Department of Mechanical & Aerospace Engineering
Rutgers University

Sean Bradshaw, Ph.D.
Senior Fellow, Sustainable Propulsion
Pratt & Whitney

Richard Sandberg, Ph.D.
Chair of Computational Mechanics
Mechanical Engineering
The University of Melbourne

Peter Stuttaford, Ph.D.
CEO
Thomassen Energy

`

SP³ 2024 Schedule-at-a-Glance*

**Subject to change*

Eastern Time	Monday, August 26, 2024	Location/Room
8:30 AM – 10:00 AM	Check-in	Bldg 17, Neumann Hangar
8:30 AM – 10:00 AM	**Breakfast**	Bldg 33, Seamans Lounge
10:00 AM – 11:00 AM	Kick-off, Schedule Review, Team Assignments, Instructor Introduction	Bldg 37, Classroom-212
11:00 AM – 12:00 PM	Problem Statement Introduction and Overview of Industry *Zachary Cordero, MIT*	Bldg 37, Classroom-212
12:00 PM – 1:00 PM	**Lunch**	Bldg 33, Seamans Lounge
1:00 PM – 5:00 PM	**Rotations - Part I - High School Students**	
1:00 PM – 2:15 PM	History of Moon Landers + Staging Math *Charlie Garcia, Agile Space Industries*	Bldg 37, Classroom-212
2:20 PM – 3:35 PM	Tour + Break (snacks and beverages provided)	Bldg 33, Seamans Lounge
3:40 PM – 4:55 PM	Orbital Mechanics *Richard Linares, MIT*	Bldg 33, Classroom-116
5:00 PM	High School Student Dismissal	
1:00 PM – 5:00 PM	**Rotations - Part I - Undergraduate Students**	
1:00 PM–2:15 PM	Orbital Mechanics *Richard Linares, MIT*	Bldg 33, Classroom-116
2:20 PM – 3:35 PM	History of Moon Landers + Staging Math *Charlie Garcia, Agile Space Industries*	Bldg 37, Classroom-212
3:40 PM – 4:55 PM	Tour + Break (snacks and beverages provided)	Bldg 33, Seamans Lounge
1:00 PM–5:00 PM	**Rotations - Part I - Graduate Students**	
1:00 PM–2:10 PM	Tour	Bldg 33, Seamans Lounge
2:10 PM–2:30 PM	Break (snacks and beverages provided)	Bldg 33, Seamans Lounge
2:30 PM – 3:40 PM	Orbital Mechanics *Richard Linares, MIT*	Bldg 33, Classroom-116
3:45 PM – 4:55 PM	History of Moon Landers + Staging Math *Charlies Garcia, Agile Space Industries*	Bldg 37, Classroom-212
Eastern Time	**Tuesday, August 27, 2024**	
8:00 AM– 9:00 AM	Check-in	Bldg 17, Neumann Hangar
8:00 AM – 9:00 AM	**Breakfast**	Bldg 33, Seamans Lounge
9:00 AM – 12:00 PM	**Rotations - Part II - High School, Undergraduate and Graduate Students**	
9:00 PM – 10:20 AM	Introduction to Turbomachinery *Zoltan Spakovszky, MIT*	Bldg 37, Classroom-212
10:20 AM –10:35 AM	Break	Bldg 33, Seamans Lounge
10:35 AM –11:55 PM	Introduction to Rocket Engines *Fabio Bendana, The Aerospace Corporation / Yanice Benitez, The Aerospace Corporation*	Bldg 37, Classroom-212
12:00 PM – 1:00 PM	**Lunch**	Bldg 33, Seamans Lounge
1:00 PM – 5:00 PM	**Rotations - Part III - High School Students**	

1:00 PM – 2:15 PM	Introduction to Materials *Zachary Cordero, MIT / Andres Garcia Jimenez, MIT*	Bldg 37, Classroom-212
2:20 PM – 3:35 PM	Introduction to Additive Manufacturing *Lynnora Grant, MIT / Roger Hou, MIT*	Bldg 33, Classroom-116
1:00 PM – 5:00 PM	**Rotations - Part III - Undergraduate and Graduate Students**	
1:00 PM – 2:15 PM	Introduction to Additive Manufacturing *Lynnora Grant, MIT / Roger Hou, MIT*	Bldg 33, Classroom-116
2:20 PM – 3:35 PM	Introduction to Materials *Zachary Cordero, MIT / Andres Garcia Jimenez, MIT*	Bldg 37, Classroom-212
3:35 PM – 3:50 PM	Break (snacks and beverages provided)	Bldg 33, Seamans Lounge
3:50 PM – 4:55 PM	Industry Presentation (Blue Origin / Agile Space Industries) *Thomas Chirathadam, Blue Origin / Charlie Garcia, Agile Space Industries*	Bldg 37, Classroom-212
5:00 PM	High School Student Dismissal	
Eastern Time	**Wednesday, August 28, 2024**	
8:00 AM– 9:00 AM	Check-In	Bldg 17, Neumann Hangar
8:00 AM – 9:00 AM	**Breakfast**	Bldg 33, Seamans Lounge
9:00 AM – 12:00 PM	Work Session on Water Rockets (high schoolers)	Bldg 17, Neumann Hangar
9:00 AM – 12:00 PM	Work Session on turbomachinery rigs (Undergraduate and Graduate Students)	Bldg 33, Gelb Lab
12:00 PM – 1:00 PM	**Lunch**	Bldg 33, Seamans Lounge
1:00 PM – 2:00 PM	Graduate Student Presentations	Bldg 33, Classroom-116
2:05 PM – 4:55 PM	Wind Tunnel + stability testing (High School Students)	Bldg 17, Neumann Hangar
2:05 PM – 4:55 PM	Work Session on turbomachinery rigs (Undergraduate and Graduate Students)	Bldg 33, Gelb Lab
5:00 PM	High School Student Dismissal	
Eastern Time	**Thursday, August 29, 2024**	
8:00 AM– 9:00 AM	Check-In	Bldg 17, Neumann Hangar
8:00 AM – 9:00 AM	**Breakfast**	Bldg 33, Seamans Lounge
9:00 AM – 12:00 PM	Final Touches	Bldg 17, Neumann Hangar
12:00 PM – 1:00 PM	**Working Lunch**	Bldg 33 Seamans Lounge
1:00 PM – 3:00 PM	Launch	Briggs field
3:00 PM - 3:30 PM	Break (snacks and beverages provided)	Bldg 33, Seamans Lounge
3:30 PM – 4:30 PM	Lightning Talks (Graduate Students)	Bldg 37, Classroom-212
4:30 PM – 5:00 PM	Closing Ceremonies	Bldg 37, Classroom-212
5:00 PM	***Event Concludes***	

Schedule-at-a-Glance Key

High School Student Programming	Undergraduate Student Programming
Graduate Student Programming	Undergraduate + Graduate Student Programming
Meals	

INDUSTRY PRESENTATIONS

Tuesday, August 27
3:50 PM – 4:55 PM

Blue Origin: Building a Road to Space

Blue Origin envisions a future where millions of people live and work in space for the benefit of earth. Learn about our mission to reduce the cost of access to space, using in-space resources to protect earth, and inspiring the next generation to take this vision forward.

Thomas Chirathadam, Ph.D.
Senior Manager
Engine Dynamics
Blue Origin

Agile Space Industries – A New Generation of Spacecraft Propulsion

Learn how small, quick moving teams can leverage new manufacturing processes and hardware rich development cycles to develop new rocket engines quickly.

Charlie Garcia
Special Programs Chief Engineer
Agile Space Industries

`

WiFi

MIT Guest Network: https://nic.mit.edu:444/dhreg/bootstrap/

- Connect to MIT GUEST
- On next page choose TEXTING option
- Follow instructions on the page to send a code

Or connect via eduroam if your institution participates.

Maps

MIT Interactive Campus Map: https://whereis.mit.edu/

SP³ will be held in:

- MIT Rocket Team Lab, 76 Vassar Street**, Building 17** (https://whereis.mit.edu/?go=17)
- Guggenheim Laboratory, 125 Massachusetts Ave, **Building 33** (https://whereis.mit.edu/?go=33)
- McNair Building, 70 Vassar Street, **Building 37** (https://whereis.mit.edu/?go=37)

Guggenheim Laboratory
Building 33

View from: west side

Street Address:
125 Massachusetts Avenue

Wright Brothers Wind Tunnel
Building 17

View from: south

Street Address:
76 Vassar Street

Public parking at MIT

The following public parking facilities are in the MIT area and may be used by vendors, visitors, and others who have business with MIT but who do not have an MIT parking permit.

Hayward Garage
(Entrances at 33 Amherst Street & 55 Wadsworth Street)
Hours: Open 24 hours
Questions? Call 617-500-6553

One Memorial Drive Garage
(Entrance is on Memorial Drive)
Questions? Call 617-423-0170

4 Cambridge Center
(Entrance on Ames St. or Broadway)
Questions? Call 617-621-7618

5 Cambridge Center, East Garage
(Ames St./Broadway)
Hours: Open 24 Hours
Questions? Call 617-621-7618

7 Cambridge Center, West Garage
(Ames St /Galileo Way)
Hours: Open 24 Hours
Questions? Call 617-621-7618

55 Franklin St. Garage, University Park
30 minutes or less: $4
Hours: Open 24 Hours
Questions? Call 617-621-8023

245 Riverview Garage
(Entrance is on First Street)
Questions? Call 617-494-1619

The American Society of Mechanical Engineers®
ASME®

ASME
SETTING THE STANDARD