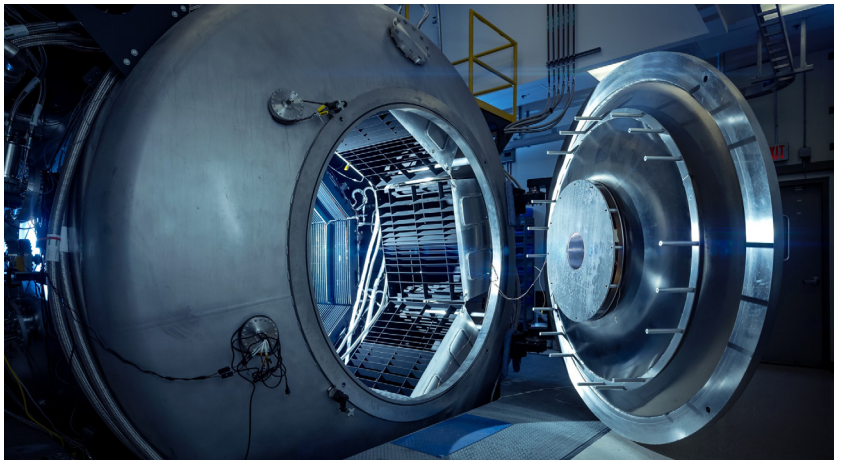
AEROSPACE

PROPULSION SCIENCES DEPARTMENT

EP3: AEROSPACE'S NEW FACILITY FOR NEXT-GENERATION EP TESTING

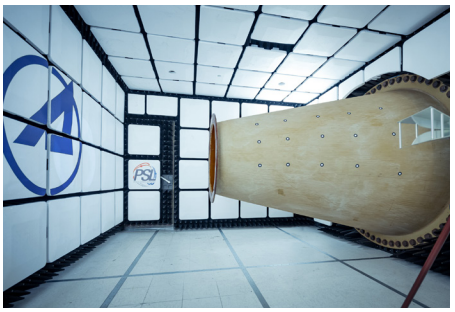


Aerospace's new EP3 facility was designed and built to test the next generation of high-power electric propulsion technology.

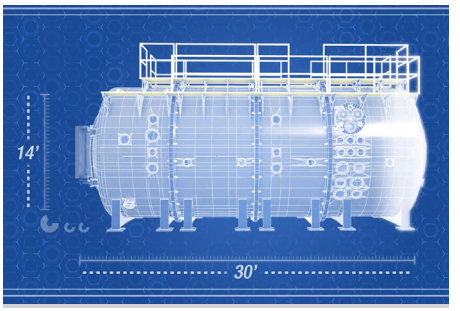
As available onboard power increases, spacecraft can afford to utilize larger and more powerful electric propulsion (EP) systems, which has driven the development of higher-power thrusters. Aerospace recently completed construction of a new test facility —nicknamed EP3— that is designed to accommodate the next generation of high-power EP technology. The new facility is designed to maximize size and pumping speed, which positions Aerospace to address the testing needs of the EP community for decades to come.

With today's rise in commercially available EP systems developed by small companies and new space entrants, EP3 positions Aerospace to provide test services to a wide range of customers. The unique attached semi-anechoic facility enables the acquisition of critical electromagnetic interference and compatibility (EMI/EMC) data that is essential for thruster integration.

EP3's enormous pumping speed means that thruster tests can be performed in a more flight-like environment than ever before, providing ground data that will most accurately predict on-orbit performance. Staffed by world-leading experts in thruster technology, plasma diagnostics, and thruster/satellite integration, Aerospace can provide end-to-end solutions to the toughest propulsion challenges.

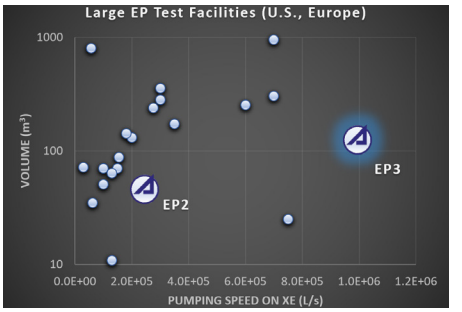


EP3 features a unique EMI/EMC test facility that lets Aerospace acquire thruster emission data that is critical for spacecraft integration concerns. An 8 ft long Radio Frequency-transparent fiberglass vacuum chamber is attached to EP3 through a large gate valve and is surrounded by a semi-anechoic room that provides isolation from background noise.



Key figures:

- Dimensions: 14 ft diameter, 30 ft long vacuum chamber
- Volume: 140,000 L
- Estimated facility weight: 250 tons
- Vacuum: Custom cryopump system capable of 1,000,000 L/sec pumping speed on Xe, base pressure <1e-8 Torr N_2
- Attached semi-anechoic facility for EMI/EMC measurement



This graph shows chamber volume and pumping speed for large EP test facilities in the U.S. and Europe. EP3's large volume, coupled with exceptional pumping speed, make it a national asset for electric propulsion testing.

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PROPULSION TESTING

Aerospace is at the cutting edge of propulsion research, operating a wide array of test capabilities ranging from the advanced study of electric propulsion thrusters to high-hazards chemical propulsion. Aerospace provides end-to-end testing – from measuring thrust, exhaust velocity, and specific impulse to more advanced work like plume characterization. Our laboratories also offer non-invasive testing using laser and optical diagnostics. We specialize in bespoke test campaigns to answer the toughest questions facing the propulsion community today.

Facilities and Capabilities

Facility	Description
EP3	Electric Propulsion testing > 5 kW, including EMI/EMC measurement. Other high-volume/high-pumping vacuum testing.
EP2	Electric propulsion testing up to 5 kW and other high-volume/high-pumping vacuum testing.
ESD1	Custom ESD tests on articles up to 1 m^2 (electron beam or LEO plasma); high-precision sputter yield and contamination measurements; combined thermal, plasma, and 1 sun environmental exposure tests with extensive telemetry (e.g. for solar arrays).
SP-1 (Snakepit)	High flow testing and micropropulsion testing down to 10 uN.
Multipactor	RF breakdown testing up to 1 kW and 9 GHz, including multipactor, corona, and secondary electron yield measurement.
Cherry Pie	Multi-use smaller chamber with thermal control, thrust stand, and fast turnaround time.
Blueberry Pie	Small chamber for micropropulsion testing for metal propellant thrusters with diagnostics.
Mudpie	Multi-use small/medium chamber for alternate, chemical, and potentially hazardous propellants with fast turnaround time.
Plasma FX	Electron-beam ESD, charging and resistivity of material samples; hi-pot DC breakdown testing; misc. plasma measurements.
Propulsion Research Facility	High-hazards testing capable of handling high-pressures, high flow, explosives, and ignition/combustion.
Particle Shock Tube	Particle impact testing including high-speed video and other diagnostics.
Ordnance Testing	Highly customizable energetic materials testing including environmental exposures, propellant mixing, and diagnostics for characterization.
Catalyst Flow Tube	Testing of monopropellant catalyst performance capable of measuring exhaust composition.
Hydrazine Laboratory	Wet chemistry laboratory focused on propellant handling and analysis.
Waterflow Test Laboratory	Subscale hydrodynamic facility for characterizing cavitation instabilities.

To learn more, please contact **Propulsion.Science@aero.org**.

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