

## FY23 Strategic Initiatives Research and Technology Development (SRTD)

# Verifying Venus Aerobot Instruments and Power Components Operate in a Simulated Venus Cloud Environment

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**Strategic Focus Area:** Technologies for Venus Cloud Environments / Venus In-Situ Aerosol Measurement Technologies  
**Strategic Initiative Leader:** James A Cutts

### Objectives

- Develop a sulfuric acid droplet testing facility that would simulate the chemical and corrosive environment within the Venus cloud layer.
- Develop an optical particle spectrometer to measure the sulfuric acid particle size distribution and number density within the Venus Cloud Simulator.
- Test prototype components for a Venus balloon mission solar array panel, balloon materials, and gondola materials.

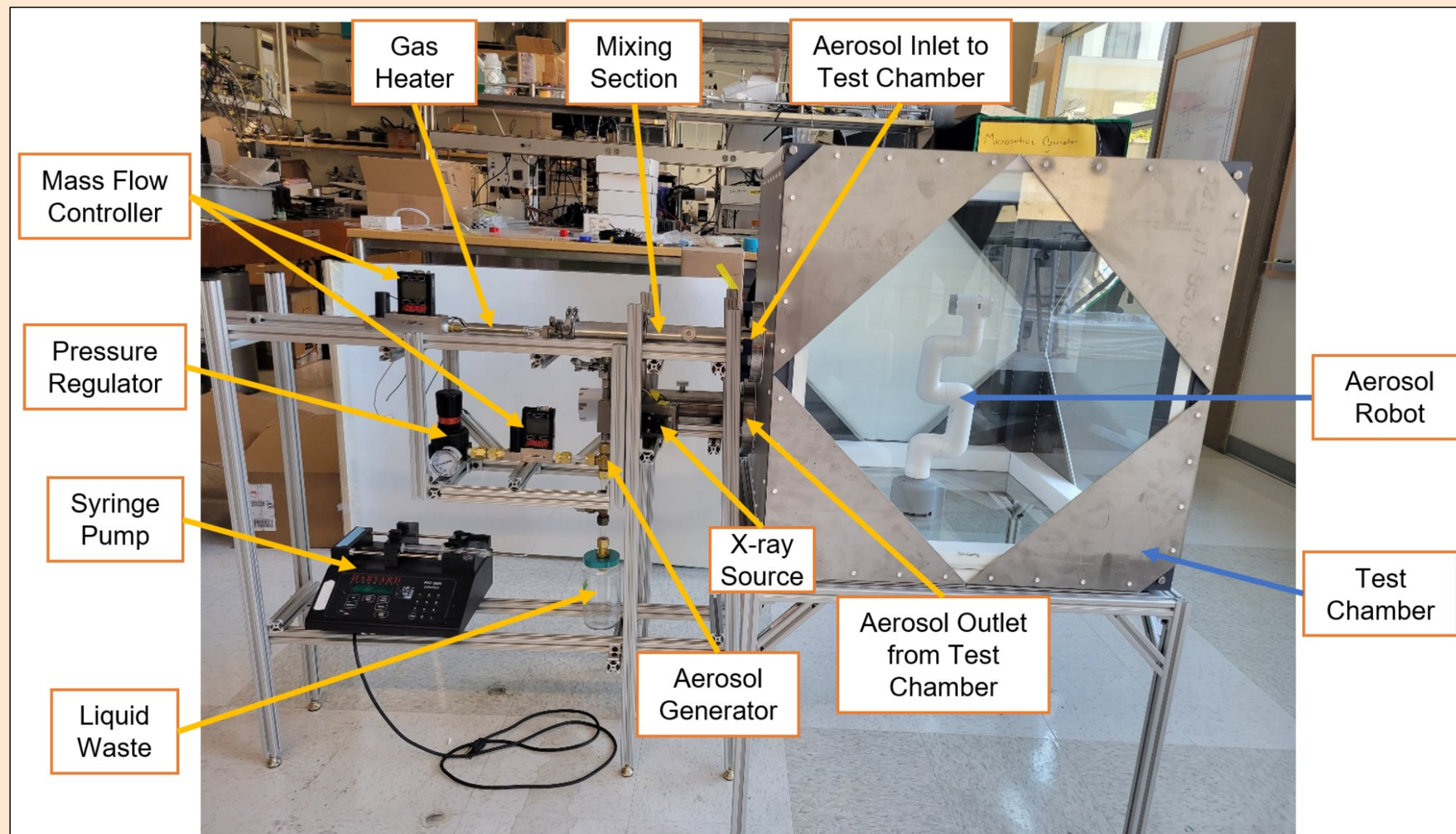
### Background

- JPL is actively developing Venus balloon technology to fly in the cloud layer as a mission concept.
- A prototype Venus balloon on a test flight →
- The Venus Cloud Simulator will demonstrate that potential materials, components, and instruments would be robust against corrosion for proposed Venus Aerobot missions.



### Approach and Results

- **Build and calibrate an Optical Particle Spectrometer (OPS)** for measuring the properties of the sulfuric acid aerosols in the test chamber.
- **Fabrication of the Venus Cloud Simulator chamber.** A cubical chamber measuring 24 inches on each side was built using glass panels, Hastelloy and Teflon components. These materials were selected for their corrosion resistance against concentrated sulfuric acid.
- **Determine the aerosol particle size distribution and number density.** The chamber was tested using ethylene glycol to demonstrate nebulization of a liquid with similar fluid properties to  $H_2SO_4$ . The particles in the chamber were measured using a commercial OPS instrument attached to a robotic arm inside the chamber as shown below.



### Significance/Benefits to JPL and NASA

- The Venus Cloud Simulator will be a unique facility asset for JPL and NASA. It will be useful in testing components, materials, and instruments in an environment that simulates the corrosive Venus cloud layer. Ensuring that robust systems are designed, developed and fabricated will be essential for mission success.
- Working with the DaVinci Probe team to collaborate on testing various parachute material samples.
- Teaming with Glenn Research Center for conducting fundamental sulfuric acid aerosol property research.

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