

CHALLENGE



A leading defense and aerospace company required a custom environmental test system for rapid-cycle testing of flight electronics and control systems. The customer's test articles weighed up to 1,000 lbs and generated live loads of up to 750 watts during operation, creating significant thermal management challenges within the test environment.

The application required precise control of both temperature and humidity while maintaining aggressive transition rates to accelerate qualification testing. In addition to current test requirements, the customer wanted a platform capable of accommodating larger flight components and higher heat loads in future test programs without requiring significant system modifications.

Because aerospace and defense electronics must perform reliably in demanding environments, the customer required repeatable temperature and humidity conditions while supporting high-power operating equipment. The solution also needed to maximize facility space utilization and provide flexibility for evolving test profiles and future performance requirements.



SOLUTION



CSZ engineered a welded walk-in temperature and humidity chamber specifically configured for large-scale aerospace electronics testing.

The 900 cu. ft. chamber utilizes three (3) remote water-cooled 30HP cascade refrigeration systems capable of achieving temperature transition rates up to 5°C per minute. To support future test programs, the system was equipped with an LN₂ boost coil integrated into the plenum, providing the capability for accelerated temperature transitions when required.

To optimize the customer's facility footprint, the three refrigeration power packs were installed on a mezzanine directly above the test space, maximizing valuable production floor space. The system also incorporates both steam-generating and atomizing humidity technologies, providing precise humidity control across a broad range of testing conditions.

An advanced moisture-control system was integrated to minimize condensation, support low-humidity testing, and maintain stable environmental conditions during demanding test profiles. Together, these features provide a scalable testing platform capable of supporting current qualification programs while maintaining the flexibility to accommodate larger systems and increased thermal loads in future applications.

SYSTEM HIGHLIGHTS

- **Temperature Range:** -70°C to +180°C
- **Humidity Range:** 10% to 95%
- **900 Cu. Ft. Welded Walk-In Chamber:**
Designed for testing large flight electronics and control systems
- **High-Capacity Refrigeration System:** Three (3) remote water-cooled 30HP cascade refrigeration systems
- **Rapid Thermal Performance:** Temperature transition rates up to 5°C/min
- **Future-Ready Design:** LN₂ boost capability for accelerated temperature transitions and future high-demand testing
- **Advanced Humidity Control:** Combined steam-generating and atomizing humidity systems
- **Low-Humidity Capability:** Enhanced moisture-control technology supports low-humidity testing while minimizing condensation
- **Space-Saving Configuration:** Remote refrigeration power packs mounted on an overhead mezzanine to maximize facility floor space
- **High-Load Testing Capability:** Designed to support test articles up to 1,000 lbs with live loads up to 750W