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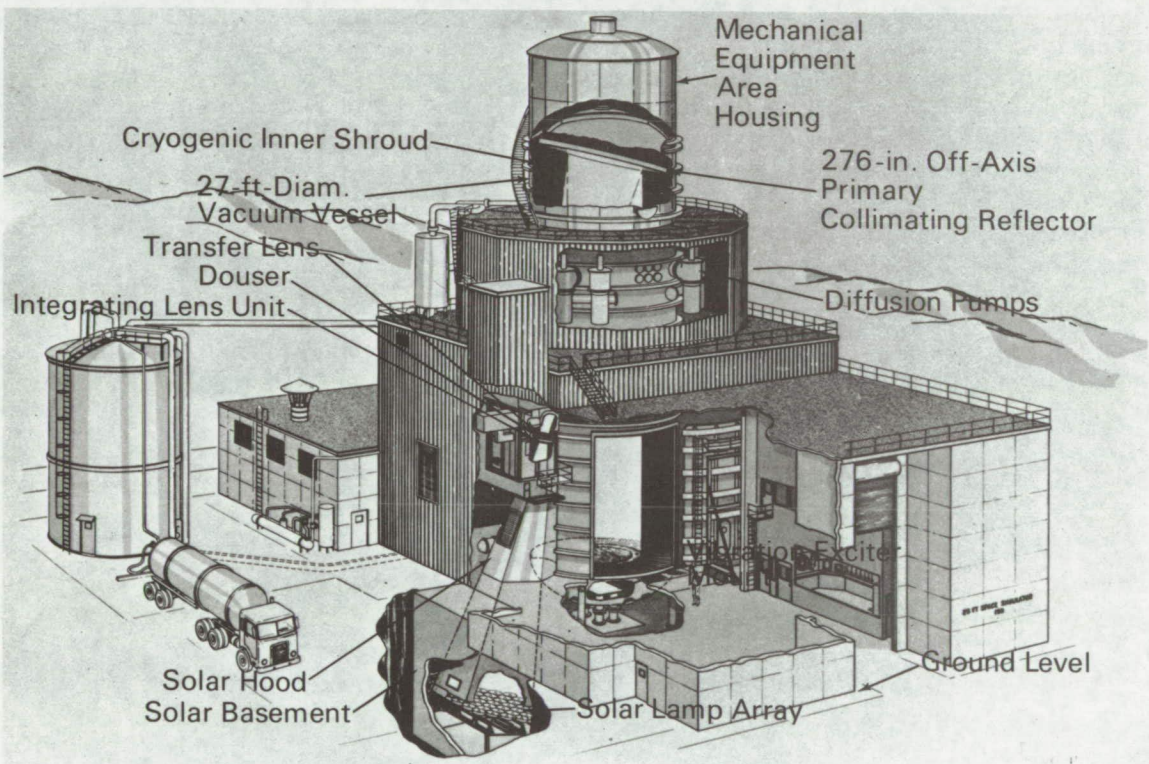
NASA TECH BRIEF

NASA Pasadena Office

7.6m (25-ft) Extreme Environments Simulator

A 7.6 m (25 ft) extreme environments simulator is designed for testing equipment under extreme cold, high partial vacuums $\geq 1.33 \times 10^{-4}$ N/m^2 ($\geq 10^{-6}$ torr), and intense solar radiation. Typical applications include heat balance and temperature distribution studies, investigations of subsystem interactions, tests of attitude control equipment and sensors, and acceptance tests of complete systems.



The simulation chamber is a stainless steel cylinder measuring 8.2 m (27 ft) in inside diameter, 25.9 m (85 ft) in height, and 1367 m^3 (48,686 ft^3) in volume. A 14.5 Mg (16 ton), 4.6 by 7.6 m (15 by 25 ft) side-opening door, with a personnel access door, provides access for the test equipment. The walls and floor are lined with thermally opaque, cryogenic, aluminum shrouds controllable between 78° and 506°K (−320° and +250°F).

The off-axis solar simulation system consists of an array of 37 20-kW compact xenon arc lamps. The simulated solar beam is reflected down into the test

(continued overleaf)

chamber by a 7 m (23 ft) collimating mirror which is temperature-controlled by gaseous nitrogen over the range 200° to 364°K (−100° to +200°F).

The test volume, 6.2 m (20 ft) in diameter by 7.6 m (25 ft) in height, is irradiated by a 4.6 m (15 ft) diameter beam of simulated solar energy at intensities of up to 2570 W/m^2 (236 W/ft^2) for test durations of 400 hours; maximum energy with the 4.6 m beam is 3376 W/m^2 (314 W/ft^2). The spectrum is that of a compact xenon arc lamp modified by the simulator optics. Uniformity is within 4%, as measured by a 4 cm^2 detector, and maximum beam divergence is 0.017 rad (1 deg) from vertical. A water-cooled dowser simulates solar eclipse of the beam. A vibration exciter, capable of 133.5 kN (30,000 lbf), is available for installation on an isolated seismic mount in the floor.

For supporting tests items, six hard-load points, each rated at 44.5 kN (10,000 lb) of vertical loading, are installed at each of three levels. The points are oriented for three- or four-cable symmetric support, 1.57 or 2.09 rad (90 or 120 deg) spacing. A circumferential ring support can be installed at any of the three levels for cable orientation.

The simulator is housed within a pressurized, air-conditioned building with separate areas for mechanical equipment, test specimen preparation, test monitoring equipment, and operational control. Operation is controlled and monitored from a strategically located graphic control console.

Note:

The following documentation may be obtained from:

National Technical Information Service
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.95)

Reference:
NASA-CR-106222 (N68-39361), The 25-ft Space Simulator at the Jet Propulsion Laboratory

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
Mail Code 1
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103

Source: J. W. Harrell and M. J. Argoud of
Caltech/JPL
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