NNA08200778-RRG

Aerospace Testing and Facilities Operations and Maintenance

Facility Information

February 5, 2008

A. Thermophysics Facilities Branch

1. See attached ArcJet Complex 'pdf' document.
2. See http://thermo-physics.arc.nasa.gov

B. Unitary Plan Wind Tunnel (http://www.windtunnels.arc.nasa.gov/)

General

1. Construction began in 1951, completion in 1956 on 11 acre site at Ames.
2. Facility is a continuous flow tunnel with 3 test sections.
3. 11X11 transonic test section, mach speed 0.7-1.5.
   9X7 low supersonic test section, mach speed 1.4-2.6.
   8X7 high supersonic test section, mach speed 2.4-3.5.
4. Test pressures can be varied from partial vacuum to >2 atmosphere.

Flow Diversion Valves

1. 20 foot valve, weigh in at 251 tons each.
2. 24 foot valve, weigh in at 391 tons.
3. Each of these valves can complete a ½ turn rotation in 3.5 minutes.

3 Stage Axial Flow Compressor-Transonic

1. Rotors and blades weigh in at 160 tons, rotating at 685 RPM.
2. Stator casing made from 3 inch steel plate.
3. Compressor moves 6.25M cubic ft or 400 tons of air per minute.

11 Stage Axial Flow Compressor-Supersonic

1. 11 rotors with 1122 blades weigh in at 24 tons each. Rotor, blades, and shaft weigh in at 445 tons.
2. Rotor rotates on 2 journal bearings that are 36 inches in diameter and 55 inches long.
3. Compressor moves 3.2M cubic ft or 90 tons of air per minute, the air at this point is at 450 deg F.

Drive System

1. Four 3 phase, 6,900 volt induction motors connected in tandem delivers 180,000 hp continuous with a 1 hour overload rating of 216,000 hp.
2. Motor control is the slip regulator type for 100% speed variation.
3. Total shaft length, motor, and compressor is 266 ft, with a rotating mass of 1,300 tons.

Auxiliary System

1. Make up air is furnished by a compressor delivering 50,000 cubic ft per minute.
2. The air is dried and stored in 4 spherical tanks, each 38 ft in diameter at 140 PSI. These tanks can be filled in 18 minutes.
3. The cooling towers maintain the air at 120 deg F, and they circulate 54,000 gallons of water per minute.

Tunnel Structure

1. All welded steel pressure vessel.
2. Plate thickness is 1-3.5 inches up to 4 inches.
3. There is 5,000 tons of steel plate in the structure.
4. There are 2,500 tons of steel plate and rolled steel section in the nozzles.

Foundation

1. The tunnel rest on 1,700 concrete piles, driven to a depth of 48 ft. Each pile carries a load of 45 tons.
2. Concrete foundation contains a total of 10,400 cubic yards or 21,000 tons of concrete.