Compact, Two-Sided Structural Cold Plate Configuration

Lyndon B. Johnson Space Center, Houston, Texas

In two-sided structural cold plates, typically there is a structural member, such as a honeycomb panel, that provides the structural strength for the cold plate that cool equipment. The cold plates are located on either side of the structural member and thus need to have the cooling fluid supplied to them. One method of accomplishing this is to route the inlet and outlet tubing to both sides of the structural member. Another method might be to supply the inlet to one side and the outlet to the other. With the latter method, an external feature such as a hose, tube, or manifold must be incorporated to pass the fluid from one side of the structural member to the other. Although this is a more compact design than the first option, since it eliminates the need for a dedicated supply and return line to each side of the structural member, it still poses problems, as these external features can be easily damaged and are new areas for potential fluid leakage.

This innovation will greatly advance aircraft electrical power systems with the development of an efficient, reliable, maintenance-free, and safe electrical generation system. The use of magnetic suspension minimizes concerns associated with traditional bearings, such as active lubrication, contact wear, and limited rotational speed. The ducted hardware can translate into improved efficiency and reliability. The concept lends itself to a configuration in which the units can be used individually or clustered for distributed power applications. In addition, the concept can be readily scaled into a variety of sizes for specified power delivery with similar geometric configuration. The rotor operates in compression, which results in a ≥2× improvement in fatigue life, and the extensive use of composites minimizes weight and reduces noise due to the higher dampening properties of composites.

A prototype stator and assembly and rotor have been designed and developed to study and evaluate subsystem level characteristics of the generation and levitation systems in a laboratory environment, and to verify theoretical predictions. The test setup has been used to measure successfully the flux density emanating from the rotor, the induced current in the stator winding as the rotor is driven at various speeds, the associated induced current, and the generated repulsive force. Experimental results correlate well with performance characteristics predicted using the derived theoretical equations. The goal of the final design is a self-contained suspension and electrical generation system free from mechanical couplings. The use of magnetic suspension minimizes concerns associated with traditional bearings, such as active lubrication and limited rotational speeds.

This work was done by Dennis J. Eichenberg, Dawn C. Emerson, Christopher A. Gallo, and William K. Thompson of Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18658-1.

AN Fitting Reconditioning Tool

John F. Kennedy Space Center, Florida

A tool was developed to repair or replace AN fittings on the shuttle external tank (ET). (The AN thread is a type of fitting used to connect flexible hoses and rigid metal tubing that carry fluid. It is a U.S. military-derived specification agreed upon by the Army and Navy, hence AN.) The tool is used on a drill and is guided by a pilot shaft that follows the inside bore. The cutting edge of the tool is a standard-size replaceable insert. In the typical Post Launch Maintenance/Repair process for the AN fittings, the six fittings are removed from the ET’s GUCP (ground umbilical carrier plate) for reconditioning. The fittings are inspected for damage to the sealing surface per stan-
The Active Response Gravity Offload System (ARGOS) provides the ability to simulate with one system the gravity effect of planets, moons, comets, asteroids, and microgravity, where the gravity is less than Earth’s gravity. The system works by providing a constant force offload through an overhead hoist system and horizontal motion through a rail and trolley system. The facility covers a 20- by 40-ft (≈6.1- by 12.2-m) horizontal area with 15 ft (≈4.6 m) of lifting vertical range.

The overall design and implementation of the ARGOS system is unique and is at the time of this reporting the only known system of its kind. The interface of ARGOS to the human test participant is critical and is provided by a gimbaled system that was developed to align the pitch, yaw, and roll axes, and offload force provided by ARGOS, with the center of gravity of the object or person being lifted. This gimbaled system greatly improves the realistic feel of the simulated gravity to the person in the simulation. Therefore, the system allows the person to perform tasks such as walking as if the individual was on the surface of the celestial body being simulated. The system has been used for bipedal walking robots and human testing in a variety of simulated gravitation fields.

This work was done by Paul Valle, Larry Dungan, Thomas Cunningham, Asher Lieberman, and Dina Poncia of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24815-1/24-1

This tool provides a quick solution to repair a leaky AN fitting. The tool could easily be modified with different-sized pilot shafts to different-sized fittings.

This work was done by Jason Lopez of Kennedy Space Center. Further information is contained in a TSP (see page 1). KSC-13235

Active Response Gravity Offload System

Lyndon B. Johnson Space Center, Houston, Texas

The Active Response Gravity Offload System (ARGOS) provides the ability to simulate with one system the gravity effect of planets, moons, comets, asteroids, and microgravity, where the gravity is less than Earth’s gravity. The system works by providing a constant force offload through an overhead hoist system and horizontal motion through a rail and trolley system. The facility covers a 20- by 40-ft (≈6.1- by 12.2-m) horizontal area with 15 ft (≈4.6 m) of lifting vertical range.

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