



Small, Lightweight, Collapsible Glove Box

The box is easily prepared for performing experiments in limited work space.

Ames Research Center, Moffett Field, California

A small, lightweight, collapsible glove box enables its user to perform small experiments and other tasks. Originally intended for use aboard a space shuttle or the International Space Station (ISS), this glove box could also be attractive for use on Earth in settings in which work space or storage space is severely limited and, possibly, in which it is desirable to minimize weight.

The development of this glove box was prompted by the findings that in the original space-shuttle or ISS setting, (1) it was necessary to perform small experiments in a large general-purpose work station, so

that, in effect, they occupied excessive space; and it took excessive amounts of time to set up small experiments. The design of the glove box reflects the need to minimize the space occupied by experiments and the time needed to set up experiments, plus the requirement to limit the launch weight of the box and the space needed to store the box during transport into orbit.

To prepare the glove box for use, the astronaut or other user has merely to insert hands through the two fabric glove ports in the side walls of the box and move two

hinges to a locking vertical position (see figure). The user could do this while seated with the glove box on the user's lap. When stowed, the glove box is flat and has approximately the thickness of two pieces of 8-in. (≈ 20 cm) polycarbonate.

This work was done by Jerry James of Lockheed Martin for Ames 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 the Ames Technology Partnerships Division at (650) 604-2954. Refer to ARC-15179-1.



Only Simple Motions are needed to prepare the glove box for use.

Radial Halbach Magnetic Bearings

Complex active control systems are not necessary for stable levitation.

John H. Glenn Research Center, Cleveland, Ohio

Radial Halbach magnetic bearings have been investigated as part of an effort to develop increasingly reliable non-contact bearings for future high-speed rotary machines that may be used in such applications as aircraft, industrial, and land-vehicle power systems and in some medical and scientific instrumentation systems. Radial Halbach magnetic bearings are based on the same principle as that of axial Halbach magnetic bearings, differing in geometry as the names of these two types of bearings suggest. Both radial and axial Halbach magnetic bearings are passive in the sense that unlike most other magnetic bear-

ings that have been developed in recent years, they effect stable magnetic levitation without need for complex active control.

Axial Halbach magnetic bearings were described in "Axial Halbach Magnetic Bearings" (LEW-18066-1), *NASA Tech Briefs*, Vol. 32, No. 7 (July 2008), page 85. In the remainder of this article, the description of the principle of operation from the cited prior article is recapitulated and updated to incorporate the present radial geometry.

In simplest terms, the basic principle of levitation in an axial or radial Halbach magnetic bearing is that of the re-

pulsive electromagnetic force between (1) a moving permanent magnet and (2) an electric current induced in a stationary electrical conductor by the motion of the magnetic field. An axial or radial Halbach bearing includes multiple permanent magnets arranged in a Halbach array ("Halbach array" is defined below) in a rotor and multiple conductors in the form of wire coils in a stator, all arranged so the rotary motion produces an axial or radial repulsion that is sufficient to levitate the rotor.

A basic Halbach array (see Figure 1) consists of a row of permanent magnets, each oriented so that its magnetic field is