

The seat includes a thigh-support structure and a lower-leg support structure that can be adjusted for various heel-to-back-of-knee lengths. The occupant's heels are supported by a heel support pan and could be affixed to the pan by clips similar to those of mountain biking shoes and pedals or by straps over the tops of the feet. At the pivot between the thigh and lower-leg support structures there is a flat panel that provides for strength in adjustment and provides lateral support of the knees. The combination of lateral support of the knees and support and restraint of the feet is intended to prevent flailing or other movement of the legs while the occupant is seated.

The seat includes lateral supports at the hips that serve the dual purpose of

restraining the occupant from shifting laterally and providing structural support to the rest of the seat by acting as a gusset. To accommodate all hip sizes, the seat pan is designed to fit the largest hip breadth allowable. For a smaller occupant, spacer pads can be installed to fill the voids. Shoulder supports, which cover the shoulder joints and extend short distances down the arms, are also sized for occupants having shoulders of maximum breadth and to be fitted to smaller occupants by use of spacer pads. The seat supports bony protrusions of the torso at the shoulders and hips only, leaving the mid-torso area free of supports to enable the occupant to leave the seat by rolling through the clear space.

The seat includes a head support. However, head support on the prototype differs from the envisioned Orion head support: In Orion, the occupant would wear a space helmet and the head support would extend along the right and left sides of the helmet to prevent lateral motion of the head.

Another prominent design feature is a load-distributing seven-point harness similar to harnesses worn in off-road automobile racing. The seven-point harness includes straps over the tops of the shoulders that act, in effect, as wrap-around extensions of the lateral shoulder supports.

This work was done by Dustin Gohmert of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24485-1

Open-Access, Low-Magnetic-Field MRI System for Lung Research

Lyndon B. Johnson Space Center, Houston, Texas

An open-access magnetic resonance imaging (MRI) system is being developed for use in research on orientational/gravitational effects on lung physiology and function. The open-access geometry enables study of human subjects in diverse orientations. This system operates at a magnetic flux density, considerably smaller than the flux densities of typical other MRI systems, that can be generated by resistive electromagnet coils (instead of the more-expensive superconducting coils of the other systems).

The human subject inhales air containing ^3He or ^{129}Xe atoms, the nuclear spins of which have been polarized by use of a laser beam to obtain a mag-

netic resonance that enables high-resolution gas space imaging at the low applied magnetic field. The system includes a bi-planar, constant-current, four-coil electromagnet assembly and associated electronic circuitry to apply a static magnetic field of 6.5 mT throughout the lung volume; planar coils and associated circuitry to apply a pulsed magnetic-field-gradient for each spatial dimension; a single, detachable radio-frequency coil and associated circuitry for inducing and detecting MRI signals; a table for supporting a horizontal subject; and electromagnetic shielding surrounding the electromagnet coils.

This work was done by Ross W. Mair, Matthew S. Rosen, Leo L. Tsai, and Ronald L. Walsworth of the Harvard-Smithsonian Center for Astrophysics; Mirko I. Hrovat of Mirtech, Inc.; Samuel Patz of Brigham and Women's Hospital; and Iullian C. Ruset and F. William Hersman of the University of New Hampshire for Johnson Space Center.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to MSC-24182-1/3-1, volume and number of this NASA Tech Briefs issue, and the page number.

Microfluidic Mixing Technology for a Universal Health Sensor

John H. Glenn Research Center, Cleveland, Ohio

A highly efficient means of microfluidic mixing has been created for use with the rHEALTH sensor — an elliptical mixer and passive curvilinear mixing patterns. The rHEALTH sensor provides rapid, handheld, complete blood count, cell differential counts, electrolyte measurements, and other lab tests based on a reusable, flow-based microfluidic platform.

These geometries allow for cleaning in a reusable manner, and also allow for

complete mixing of fluid streams. The microfluidic mixing is performed by flowing two streams of fluid into an elliptical or curvilinear design that allows the combination of the flows into one channel. The mixing is accomplished by either chaotic advection around microfluidic loops.

All components of the microfluidic chip are flow-through, meaning that cleaning solution can be introduced into the chip to flush out cells, plasma

proteins, and dye. Tests were performed on multiple chip geometries to show that cleaning is efficient in any flow-through design. The conclusion from these experiments is that the chip can indeed be flushed out with microliter volumes of solution and biological samples are cleaned readily from the chip with minimal effort.

The technology can be applied in real-time health monitoring at patient's bedside or in a doctor's office, and real-