

will have its trajectory bent just enough to exit the back slit.

The SDEA units are compact, rectangular, and operate with low voltages. The units can be built up into small arrays. These arrays could be used either to widen the field of view or to sharpen an

existing one. This approach can also be used to obtain angular distributions in two planes simultaneously, thus cutting down the ion source power requirements in half. This geometry has enabled a new mass-spectrometer concept that can provide miniaturized mass spectrometers for

use in industrial plants, air-pollution monitoring, and noxious-gas detection.

This work was done by Federico A. Herrero of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15610-1

Polymeric Bladder for Storing Liquid Oxygen

Lyndon B. Johnson Space Center, Houston, Texas

A proposed system for storing oxygen in liquid form and dispensing it in gaseous form is based on (1) initial subcooling of the liquid oxygen; (2) containing the liquid oxygen in a flexible vessel; (3) applying a gas spring to the flexible vessel to keep the oxygen compressed above the saturation pressure and, thus, in the liquid state; and (4) using heat leakage into the system for vaporizing the oxygen to be dispensed. In a typical prior system based on these principles, the flexible vessel

is a metal bellows housed in a rigid tank, and the gas spring consists of pressurized helium in the tank volume surrounding the bellows. Unfortunately, the welds in the bellows corrugations are subject to fatigue, and, because bellows have large ullage, a correspondingly large fraction of the oxygen content cannot be expelled.

In the proposed system, the flexible vessel would be a bladder made of a liquid-crystal polymer (LCP). (LCPs are strong and compatible with liquid oxy-

gen.) In comparison with a metal bellows, a polymeric bladder would have less ullage and would weigh less. In experiments involving fatigue cycling at liquid-nitrogen temperatures, two LCPs were found to be suitable for this application.

This work was done by David H. Walker, Andrew C. Harvey, and William Leary of Foster-Miller, Inc. for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-22943-1

Pyrotechnic Simulator/Stray-Voltage Detector

John F. Kennedy Space Center, Florida

The concept for a dual test item has been developed for use in simulating live initiators/detonators during ground testing to verify the proper operation of the safing and firing circuitry for ground and flight systems ordnance as well as continuous monitoring for any stray voltages. Previous ordnance simulators have consisted of fuses, flash bulbs, inert

devices with bridge wires, and actual live ordnance items mounted in test chambers. Stray voltage detectors have included devices connected to the firing circuits for continuous monitoring and a final no-voltage test just prior to ordnance connection. The purpose of this combined ordnance simulation and stray-voltage detection is to provide an

improved and comprehensive method to ensure the ordnance circuitry is verified safe and operational.

This work was done by Terry Greenfield of ASRC Aerospace Corp. for Kennedy Space Center. For further information, contact the Kennedy Innovative Partnerships Program Office at (321) 861-7158. KSC-13282

Inventions Utilizing Microfluidics and Colloidal Particles

Lyndon B. Johnson Space Center, Houston, Texas

Several related inventions pertain to families of devices that utilize microfluidics and/or colloidal particles to obtain useful physical effects. The families of devices can be summarized as follows:

- Microfluidic pumps and/or valves wherein colloidal-size particles driven by electrical, magnetic, or optical fields serve as the principal moving parts that propel and/or direct the affected flows.
- Devices that are similar to the aforementioned pumps and/or valves ex-

cept that they are used to manipulate light instead of fluids. The colloidal particles in these devices are substantially constrained to move in a plane and are driven to spatially order them into arrays that function, variously, as waveguides, filters, or switches for optical signals.

- Devices wherein the ultra-laminar nature of microfluidic flows is exploited to effect separation, sorting, or filtering of colloidal particles or biological cells in suspension.

• Devices wherein a combination of confinement and applied electrical and/or optical fields forces the colloidal particles to become arranged into three-dimensional crystal lattices. Control of the colloidal crystalline structures could be exploited to control diffraction of light.

- Microfluidic devices, incorporating fluid waveguides, wherein switching of flows among different paths would be accompanied by switching of optical signals.