

High-temperature sensors have been used in silicon carbide electronic oscillator circuits. The frequency of the oscillator changes as a function of the changes in the sensed parameter, such as pressure. This change is analogous to changes in the pitch of a person's voice.

The output of this oscillator and many others may be superimposed onto a single medium. This medium may be the power lines supplying current to the sensors, a third wire dedicated to data transmission, the airwaves through radio transmission, an optical medium, etc. However, with nothing to distin-

guish the identities of each source — that is, the source separation — this system is useless.

Using digital electronic functions, unique codes or patterns are created and used to modulate the output of the sensor. By using a dividend of the oscillator frequency to generate the code, a constant a priori number of oscillator cycles will define each bit. At the receiver, a detected frequency will be correlated with stored code patterns to find a match. If detected and verified as coming from a known sender, a frequency will be disassociated from noise and

from other transmitting sensors in that it has a unique modulation pattern or "voice." The length of the detected code, or instantaneously, the frequency detected, is the measure, and intelligent data transfer has been accomplished.

This work was done by Michael Krasowski 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-18910-1.

Using Combustion Synthesis to Reinforce Berms and Other Regolith Structures

New structures will require a minimum of maintenance and upkeep.

Lyndon B. Johnson Space Center, Houston, Texas

The Moonraker Excavator and other tools under development for use on the Moon, Mars, and asteroids will be employed to construct a number of civil engineering projects and to mine the soil. Mounds of loose soil will be subject to the local transport mechanisms plus artificial mechanisms such as blast effects from landers and erosion from surface vehicles. Some of these structures will require some permanence, with a minimum of maintenance and upkeep.

Combustion Synthesis (CS) is a family of processes and techniques whereby chemistry is used to transform materials, often creating flame in a hard vacuum. CS can be used to stabilize civil engineering works such as berms, habitat shielding, ramps, pads, roadways, and the like. The method is to unroll thin sheets of CS fabric between layers of regolith and then fire the fabric, creating a

continuous sheet of crusty material to be interposed among layers of loose regolith. The combination of low-energy processes, ISRU (in situ resource utilization) excavator, and CS fabrics, seems compelling as a general method for establishing structures of some permanence and utility, especially in the role of robotic missions as precursors to manned exploration and settlement.

In robotic precursory missions, excavator/mobility ensembles mine the Lunar surface, erect constructions of soil, and dispense sheets of CS fabrics that are covered with layers of soil, fired, and then again covered with layers of soil, iterating until the desired dimensions and forms are achieved. At the base of each berm, for example, is a shallow trench lined with CS fabric, fired and filled, mounded, and then covered and fired, iteratively to provide a footing against lateral shear. A larger

trench is host to a habitat module, back-filled, covered with fabric, covered with soil, and fired.

Covering the applied CS fabric with layers of soil before firing allows the resulting matrix to incorporate soil both above and below the fabric ply into the fused layer, developing a very irregular surface which, like sandpaper, can provide an anchor for loose soil. CS fabrics employ a coarse fiberglass weave that persists as reinforcement for the fired material. The fiberglass softens at a temperature that exceeds the combustion temperature by factors of two to three, and withstands the installation process.

This type of structure should be more resistant to rocket blast effects from Lunar landers.

This work was done by Gary Rodriguez of sysRAND Corporation for Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24411-1

Visible-Infrared Hyperspectral Image Projector

Goddard Space Flight Center, Greenbelt, Maryland

The VisIR HIP generates spatially-spectrally complex scenes. The generated scenes simulate real-world targets viewed by various remote sensing instruments. The VisIR HIP consists of two subsystems: a spectral engine and a spa-

tial engine. The spectral engine generates spectrally complex uniform illumination that spans the wavelength range between 380 nm and 1,600 nm. The spatial engine generates two-dimensional gray-scale scenes. When combined, the

two engines are capable of producing two-dimensional scenes with a unique spectrum at each pixel. The VisIR HIP can be used to calibrate any spectrally sensitive remote-sensing instrument. Tests were conducted on the Wide-field