Fact Sheet

PERFORMANCE OF DROP-IN GROUND PENETRATION RADAR SENSOR (DIGS) MINE DETECTOR IN SNOW

BACKGROUND

The current U.S. Army inventory for detecting buried land mines consists of the AN/PSS-12 metal detector. A Drop-In Ground Penetration Radar Sensor (DIGS) integrated with the AN/PSS-12 has been proposed as a practical and cost-effective transition to the next generation mine detector. The DIGS is an extremely sensitive device that is capable of detecting small changes in the electrical properties of the ground. DIGS is designed to detect low-metal-content and nonmetallic mines that do not have enough metal to be detected by the AN/PSS-12 metal detector. The extreme sensitivity required to detect low-metal-content and nonmetallic mines often comes at the expense of high false-alarm rates that depend greatly on the local environmental conditions. The effect of the environment on the operation of a DIGS system needs to be investigated to better document the capabilities and the limitations of the DIGS system.

SOLUTION

A DIGS system has been obtained from the Countermine Training Support Center, U.S. Army Engineering Center. The system is being evaluated at a test site located at the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, New Hampshire. The test site is instrumented with soil moisture probes and thermistor array to document the state of the ground. The effect of snow cover, freeze–thaw cycle, and other winter environmental conditions on the operation of a DIGS system is being investigated.

DIGS search head and electronics unit. The search head clips into the AN/PSS-12 metal detector.

RESULTS

The most striking result observed to date is the effect of snow cover on the DIGS operation. Extremely high false-alarm rates rendered the DIGS system inoperative. Radar-absorbing material (RAM) was used to determine the source of the high false-alarm rates observed in snow. A snow-free test section with low false-alarm rate was first identified. A portion of this test section was then covered with sheets of radar-absorbing material (RAM). After subsequent snowfalls, low false-alarm rates were observed over the snow-covered test section where the RAM was located. However, high false-alarm rates were again observed over the test section without the RAM. These results suggest that the interaction of reflected signals from the snow surface and the ground is primarily responsible for the high false-alarm rates observed over a snow-covered terrain.

RECOMMENDATION

Algorithms are needed to gate out the unwanted reflections from the snow-cover surface in order to reduce the false-alarm rates observed over a snow-covered terrain. Until then, the DIGS system should not be operated over a snow-covered mine field.

POINT OF CONTACT

Gary Koh
603-646-4282
Fax: 603-646-4397
E-mail: gkoh@crrel.usace.army.mil

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US Army Corps of Engineers®
Cold Regions Research & Engineering Laboratory

CRREL, 72 Lyme Road, Hanover, NH 03755-1290