

# Transition

An example of Air Force supported SBIR/STTR technology that has been transitioned into an Air Force or other DoD system or subsystem or used by Air Force test ranges and facilities or maintenance depots.

**SBIR Topic Number:**  
 NASA 06-1-S1.01

**SBIR Title:**  
 Lightweight Low Force  
 Rotary Percussive  
 Coring Tool for Planetary  
 Applications

**Contract Number:**  
 FA8650-07-C-5917  
 (Air Force Phase II)

**SBIR Company Name:**  
 Alliance Spacesystems,  
 LLC, Pasadena, CA

**Technical Project Office:**  
 AFRL Materials &  
 Manufacturing  
 Directorate, Wright-  
 Patterson AFB, OH



**Man-portable automated dynamic cone penetrometer known as the “Mosquito”**

## Automated Dynamic Cone Penetrometer

- Since Air Force operations in remote areas often require the use of unprepared landing zones for transport and cargo aircraft, a lightweight, man-packable, low-cost, and automated system is needed to facilitate the taking of soil penetration measurements
- Alliance Spacesystems developed a man-portable automated dynamic cone penetrometer, called the “Mosquito,” which uses a feedback-controlled linear actuator that provides a consistent driving impact to a specially designed penetrometer
- The Mosquito produces measurements of soil hardness and outputs California Bearing Ratio (CBR) versus depth to a light-emitting diode (LED) display and to a Cursor on Target (CoT) schema Extensible Markup Language (XML) file and a tab-delimited file
- A Mosquito prototype has been delivered to the Air Force for extended field evaluations
- The Air Force is developing a Capability Development Document (CDD), which includes this automated Dynamic Cone Penetrometer capability, in preparation for a future acquisition of this or similar devices

Commercialization Pilot  
 Program Series

RX2010-071

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## Air Force Requirement

Air Force operations in remote areas often require the use of unprepared Landing Zones (LZ) for transport and cargo aircraft. Prior to these operations, airmen perform a LZ survey to determine, among other things, the ability of the soil to support the weight of landing aircraft.

This ground hardness survey is currently conducted manually with a Dynamic Cone Penetrometer, which is a long rod with a cone-shaped tip that is driven in the ground manually, with an airman measuring and recording by hand the depth of penetration on each blow. A lightweight, man-packable, low-cost, and automated system to perform these measurements is needed to reduce the time, manpower, and error in taking these measurements.

## SBIR Technology

Alliance Spacesystems built on its experience with a lightweight, low-power, percussive coring system for space exploration to develop a man-portable automated dynamic cone penetrometer called the "Mosquito." This device uses a feedback-controlled linear actuator that provides a consistent driving impact to a specially designed penetrometer. It produces measurements of soil hardness for each impact and outputs California Bearing Ratio (CBR) versus depth.



### Using the Mosquito device to take a measurement

The operator views CBR on a light-emitting diode (LED) display in 1-inch increments up to 36 inches in depth. CBR, as well as raw data measuring displacement per blow, is also stored to a removable Secure Digital (SD) card in a Cursor on Target (CoT) Extensible Markup Language (XML) file and a tab-delimited file. Transferring the data to a computer is similar to importing photos from a digital camera and the stored data is also tagged with date/time and Global Positioning System (GPS) coordinates for easy import into Air Force mapping applications. The Mosquito is powered by readily available batteries, packaged for easy transport in a ruck sack, and provides a fast and easy method to perform soil hardness surveys.

## Transition Impact

A Mosquito prototype has been delivered to the Air Force for extended field evaluations. To date, these operators have been pleased with the performance and capability of the system, and its ability to meet their need for an automated Dynamic Cone Penetrometer to rapidly measure ground hardness. As a result of this experience, the Air Force is developing a Capability Development Document (CDD), which includes this capability, in preparation for a future acquisition of this or similar devices.

## Company Impact

"The Mosquito Program has been a unique opportunity afforded to us through the SBIR program that has allowed Alliance Spacesystems, LLC, to develop a product for the Air Force to perform a critical mission with greater speed and efficiency. This has been a tremendous opportunity for Alliance and has allowed us to expand our product offerings into a new market while simultaneously supporting our service men and women. Additionally, AFRL has been an invaluable partner throughout the development of Mosquito, and we look forward to expanding upon this project and the relationships built during this SBIR program."

Chris Thayer  
General Manager and Vice President of Operations  
Alliance Spacesystems, LLC

Note: In January 2010, Alliance Spacesystems became part of MDA Information Systems, Inc.



# SBIR/STTR

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