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14. ABSTRACT One of the Army's leading research and development centers, TARDEC, recently participated in an experimental study with the Omni Directional Inspection System (ODIS) robot in Long Beach, California. Members of the TARDEC Robotics Mobility Lab (TRML) team conducted the test in cooperation with the California State University Long Beach (CSULB) Center for International Trade and Transportation (CITT), the California Highway Patrol (CHP) and the US Coast Guard (USCG).					
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Multi-agency Field Study with TARDEC Robotics Mobility Lab's ODIS Robot

One of the Army's leading research and development centers, TARDEC, recently participated in an experimental study with the Omni Directional Inspection System (ODIS) robot in Long Beach, California. Members of the TARDEC Robotics Mobility Lab (TRML) team conducted the test in cooperation with the California State University Long Beach (CSULB) Center for International Trade and Transportation (CITT), the California Highway Patrol (CHP) and the US Coast Guard (USCG).

The Ports of Los Angeles and Long Beach (POLA/POLB) are responsible for moving over 30% of the United States trade goods. Queues of 54-foot container trucks routinely exceeding over 100 trucks extend for over a mile from the port entrances. These vehicles represent a considerable portion of the traffic in the local area. This location is a prime target for a terrorist attack. An example of a ten lane U.S. customs inspection point where a portion of the ODIS study was conducted is shown below.



Trucks at U.S. Customs port awaiting inspection.

The CHP is responsible for inspecting these vehicles for roadworthiness, a dangerous and dirty job. The method currently in place to inspect the undercarriages of container trucks is with the use of a "mirror on a stick". In many cases the lack of resolution and clarity from the mirror requires the guard to further examine suspicious areas by physically getting under the truck. In this line of work the guards and inspection personnel put their lives in harms way when examining a suspicious vehicle.

Danger exists not only if the vehicle is armed with an explosive or hazard, but also if the driver forgets to engage the parking brake possibly causing the truck to run into the inspector. Currently such inspection checkpoints are the only way of securing and clearing the truck before they enter public roads or the shipping docks.

At this test, the ODIS system demonstrated the capacity to rapidly and continuously screen convoys of trucks and exposed assets through the use of robotics. On board Nuclear Biological Chemical (NBC) and Hazardous Materials (HAZMAT) sensors provided the guards with stand off capability allowing them to remain a safe distance away from the vehicle while its being inspected.



CHP inspecting an item ODIS has found.

Along with NBC and HAZMAT sensor data the ODIS also remotely communicates visual and thermal sensor data to the operator using radio signals. The operator can use a hand held Operator Control Unit (OCU) or a wearable vest-like OCU to tele-operate the robot. For a prototype robot 1-½ years old the ODIS-T preformed better than exemplary. An illustration of a CHP officer and a CSULB student using such OCU's are depicted below.



CHP officer and CSULB student operate the ODIS from a vest and a handheld OCU.

Use of advanced robotic platforms such as ODIS would be a force multiplier and measurably improve base and force protection at both inbound and outbound DOD and commercial facilities. This robot continues to show great potential in providing this type of capability. CHP officer, Les Chambers, stated, “I couldn’t do what ODIS can with this particular rig”. Inspection times with the robot versus the manual inspection are comparable but are much more thorough with the robot. During this experiment, we inspected 164 trucks with our ODIS robots. Primarily CSU students operated the robots, but we did have several CHP and USCG operators as well. These scenarios at the seaports are representative of TRANSCOM operations at the Port of Basra during current operations in Iraq.