



Joint Ground Robotics Enterprise

Request for Information: Robotics Prize Competition???

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Prize Competition



“There are many DoD programs with difficult technological challenges that could be addressed through the use of a prize competition model. Additionally, the fringe benefits of such a competition are incredible for DoD, small businesses, industry, young people and the Nation. I again challenge DoD labs and program offices to identify challenges and conduct new prize competitions.”

John J. Young
USD(AT&L)

Congress has given us the authority, let's use it!

**Public Law 110-36 Section 2374a. Prizes for
Advanced Technology Achievements**



Robotic Prize Competition



- Advance the state of the art from manual and/or remote controlled tele-operation to:
 - Threshold – Semi-Autonomous
 - Objective - Fully Autonomous
- Missions under consideration to be automated:
 - Route Clearance
 - Roadside Vegetation Clearance
 - Range Clearance
 - Humanitarian De-mining Operations



How We Do Things Today



Dangerous missions that are manpower intensive...
is there a better, safer way?



Route Clearance



- Detect IEDs along Routes
- Mark detected IEDs for future interrogation
- Neutralize IEDs to render route safe for passage

Green denotes steps that potentially can be accomplished with automation

“You only have to think about this for a moment to realize it can be an unusually dangerous job. They conduct their missions with expected care and caution, which means progress is quite literally ‘at a snail's pace’”.



Range Clearance



1. Determine Land use – depth of remediation dependant upon future use
2. Determine the boundaries of areas to be remediated (4 100'x100' grids per acre)
3. Surface clear area within boundaries to remove any UXO/metal trash/debris
4. Determine locations & depth of UXO creating map plot of UXO in each grid
5. Remove and/or neutralize the UXO
6. Document the process
7. Conduct Quality Assurance Inspections

Green denotes steps that potentially can be accomplished with automation



De-mining



Clearance operations make use of three main methods:

- Manual clearance relies on trained deminers using metal detectors and long thin prodders to **locate the mines**, which are then destroyed by controlled explosion;
- Mine detection dogs, which **detect the presence of explosives** in the ground by smell. Dogs are used in combination with manual deminers;
- **Mechanical clearance using machinery, including flails, rollers, vegetation cutters and excavators, often attached to armored bulldozers, to destroy the mines in the ground.** These machines can only be used when the terrain is suitable, and are expensive to operate. In most situations they are also not 100% reliable, and the work needs to be checked by other techniques.

In many situations manual clearance remains the preferred method, for reasons both of cost and reliability...is it time for this to be turned around?



With the Help of the Commercial Sector, Can We Take It To The Next Step?



“An automated tractor — is already capable of turning, shifting gears and seeing through darkness and dust. It can follow a crop line with sub-inch precision in moonlight, and can save thousands of hours and countless dollars. Everybody in our market has an eye on this as the end game,”

[John Deere Agricultural Management Solutions.](#)





What Are We Looking To Achieve?



Prize Competition: Best demonstrated ability to conduct military tasks at reduced risk, cost, and/or time, or with increased operational effectiveness.

e.g.

- **Clear routes with greater effectiveness and reduced danger to military personnel**
- **Clear roadside vegetation in less time than manual methods with reduced exposure to insurgent threat**
- **Clear range at less cost and time over current methods with increased safety**
- **Conduct humanitarian demining at less cost and time over current methods with reduced risk of mine detonation**



So What? 3 Reasons...



#1 DoD increasing military presence in Afghanistan...

We will be sending our service men and women into:

- 2,602 Suspected Hazard Areas (SHAs) in all but 2 of the 32 provinces
- Confirmed use by Taliban in 2007 and 2008 of Anti-Personnel and Anti-Vehicle mines
- In 2007, demining resulted in 26,970 APM, 674 AVMs destroyed, and 1.7M explosive remnants of war (ERW) removed
- From the Jan 2006 baseline of 4,223 SHA, 2 years of demining only resulted in a 38% reduction and that does not take into account the reinstated use of mines by the Taliban*

DANGER
EXPLOSIVES
OPERATION
IN PROGRESS



* Data Source = 2008 Landmine Monitor Report



So What? 3 Reasons...



#2 – Assistance with De-mining helps build partnerships



“Just about every threat to our security in the years ahead will require working with or through other nations. Success in the war on terror will depend less on the fighting we do ourselves and more on how well we support our allies and partners...

The Comprehensive Response to Unexploded Ordnance (CRUXO) Act 2009 (draft) ...enlarge current international demining efforts, training programs, and material assistance to civilian and NGO demining efforts...for the purpose of building ties between nations



Pervasive Problem





Something to Think About



In poor communities it is common for civilians to salvage military debris for saleable scrap metal



Scrap metal collection at a Central Demolition Site, Afghanistan © Zak Johnson



So What? 3 Reasons...



#3 US has extensive, expensive Range Clearance problem at home

- In the FY02 Defense Environmental Restoration Program (DERP) Annual Report to Congress the DoD estimated that:
 - total costs to address risks from UXO, discarded military munitions, and munitions constituents (MC) at operational ranges will be between \$16–\$165 billion
 - estimated costs to address these items at Military Munitions Response Program (MMRP) sites (i.e., other than operational ranges) will be between \$8–\$35 billion.
 - 2,307 sites known or suspected to contain UXO or discarded military munitions, which is an increase of 553 sites reported in its FY01 interim inventory
- The 2003 UXO Defense Science Board Task Force on UXO also recognized the extent of the problem, which involves over 10 million acres of land.

The Comprehensive Response to Unexploded Ordnance (CRUXO) Act 2009 (draft) ... To improve the effectiveness of Department of Defense programs for the remediation of unexploded ordnance at former defense sites, for the coordination of munitions abatement efforts, and for other purposes



Prize Competition Parameters



- Possible focus for competition:
 - **UGVs that can detect/mark/map location of objects/explosives both surface/subsurface**
 - UGVs that can clear vegetation from area
 - UGVs that can surface clear objects/metallic trash/debris
 - **UGVs that can subsurface clear objects/metallic trash/debris**
- “Tee up” Transition Path (shape competition to enable transition of technology) - after a winner is declared then the real work begins
- Legally Binding Agreement between DoD and Competitor – enables information exchange, government furnished equipment, access to DoD ranges, etc.
- Is there a STEM opportunity – e.g. invite students to view competition, talk with competitors...



Prize Competition Parameters



- Qualification and competition events under control of range owners and DoD personnel...not competitors
- Prize awarded based on best performance based on metrics, not against each other

SAFETY SAFETY SAFETY!!!



Possible Transition Paths



- Assuming successful competition results in viable technology or fieldable solution... possible transition paths:
 - Short Term JCTD to establish operational concepts, requirements, TTPs, integration of technology into “fieldable” system, user assessment
 - Simultaneously with JCTD effort, establish programming to seek official programs of record with MS C initiation
 - Straight to Rapid Acquisition



How Does Competition Transition to Procurement?



- No competitor comes close - thus no award and no follow-on contract
- Competitor proves ability to automate military tasks but not at sufficient maturity level to immediately field - thus follow-on acquisition contract would require appropriate level of development (which should be relatively short in duration and limited in scope as the competition solved the functional/performance issues – JCTD or tradition acquisition development) leading to a procurement contract (Competition serves as the basis of selection for follow-on contract)
- Competitor demonstrates successful "fieldable" solution – thus initiate Rapid Acquisition against an Operational Need Statement (Competition serves as the basis of selection for the follow-on contract)

Key: Competition Serves as “Basis of Selection”



Legally Binding Agreement



Joint Ground Robotics Enterprise

Use existing Other Transaction Agreement:

- cost share – gov provides consideration in lieu of funding



ROBOTICS TECHNOLOGY CONSORTIUM

Cooperative R&D Agreement

DoD and RTC ... Partnering to Leverage Capabilities and Investment



Let Us Know What You Think...



Ready for a little healthy competition?

