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News From the Ordnance Center of Expertise and Design Center

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UXO technology programs and requirements intersect at the Center of Excellence

by Rear Admiral Cobb, Vice Chair, Joint Board of Directors, Unexploded Ordnance Center of Excellence, and Mr. Greg Bornhoft, Joint UXO Coordination Office

From an operational mission perspective, the nature and scope of the unexploded ordnance (UXO) problem is global and multi-dimensional. Within DOD this diverse problem is addressed by the five mission areas of active range clearance, countermine, explosive ordnance disposal, humanitarian demining, and unexploded ordnance environmental remediation. In wartime, combat engineers breach minefields and explosive ordnance disposal technicians dispose of ordnance that did not function properly. In peacetime, humanitarian deminers train indigenous work forces to reduce the current 500 weekly deaths or injuries in over 60 nations that result from the millions of landmines/UXO remaining from prior conflicts. In the last few years there have been over 125,000 UXO items/landmines removed from Ethiopia. Within the U.S., American "stakeholders" require characterization and subsequent clearance of UXO from approximately 600 formerly used defense sites and 130 base realignment and closure sites. The Army's Corps of Engineers and its contractors have removed over 100,000 UXO from these sites in the last three years. Further, DOD installation commanders seek relief from UXO that accumulates over time where their tenants conduct testing and/or training on ranges and impact areas. Roughly 90,000 sub-munitions have been removed from the Air Force ranges at Nellis Air Force Base in Nevada in the last few years. For all five mission areas, the UXO problem is as broad

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Task Force on UXO submits recommendations

by Captain Monty Matthews, Defense Explosives Safety Board

The Defense Science Board Task Force on UXO has recently submitted its final report. After a nearly two-year study, the Task Force concluded that the Department of Defense (DOD) lacks an overarching program for the remediation of unexploded ordnance (UXO). The Task Force recommends the formulation of appropriate policies and goals across DOD to guide this effort. The foundation of this policy is to ensure the long-term viability and sustainability of active and inactive ranges while responding to the requirement to remediate closed, transferring, and transferred ranges.

The Task Force also found that the scope of the UXO remediation problem remains unquantified, with an estimated 15 million acres not yet surveyed to determine appropriate actions. If only 5% of the suspect land needs full remediation, costs could exceed $15 billion dollars, based on current technology, and take decades.

While noting that DOD is primarily focused on operational warfighting requirements, the Task Force recognized that UXO remediation is not a core military function and should be outsourced to private industry to the maximum extent appropriate. The Task Force further concluded that the pacing element of UXO remediation is technology. Specifically, the remediation effort is limited by the current state of magnetometer technology. The traditional "mag and flag" method used during World War II remains essentially unchanged today. The reality is that "mag and flag" is slow, labor intensive, and expensive—as much as $45K per acre in extreme situations. This methodology is further plagued by high false alarm rates, which

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Institutional controls explored in four states

by Al Sweeney, Huntsville Center

Currently, no options exist that can eliminate all risk at ordnance sites. However, institutional control plans developed during response actions at formerly used defense sites (FUDS) can promote greater public and stakeholder safety. Institutional controls are alternative responses that use state or local powers in addition to the response authority under the Defense Environmental Restoration Program to protect citizens from explosive hazards. Intended for use by property owners or managers, institutional control plans are designed to support the maintenance and development of the properties and provide safety through vigilance and management.

On July 15, the U.S. Army Technical Center for Explosives Safety approved for the first time an institutional control plan as an alternative to removal. The site is the Nansemond Ordnance Depot, Suffolk, Virginia. Similar plans are also being developed at Motlow Range, Tullahoma, Tennessee; Illinois Ordnance Plant, Marion, Illinois; and Baywood Park Training Area, San Lusis Obispo County, California. The Huntsville OE Center of Expertise developed the institutional control plan for the former Nansemond Ordnance Depot with support from Region III of the Environmental Protection Agency, the Commonwealth of Virginia, and the City of Suffolk planning, police, and fire departments. The Commonwealth

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Saving dollars through technology

by Kim Speer, Huntsville Center Public Affairs Office

Geophysical mapping at two sites is bringing the Corps of Engineers cost savings of 75 to 85 percent.

An application of innovative technology is saving the Army $3M at one Corps of Engineers' ordnance site. The U.S. Army Engineering and Support Center, Huntsville, Ala., is realizing such cost savings through the use of digital geophysical mapping. The geophysical mapping process takes the digital data from a geophysical sensor, combines the data with positional survey or navigational information, and develops a three-dimensional map of the characteristic that the sensor is measuring. Because of the system's capacity to log data, the user is no longer constrained to real-time decisions and investigative selections (i.e., manual identification of each anomaly during field operations). Evaluation of the logged electronic data provides a more efficient ability to discriminate between ordnance and non-ordnance anomalies detected, thereby saving time and money by eliminating unnecessary intrusive operations.

During a four-week production period at former Camp Croft, South Carolina, traditional field operations resulted in a cost of $120,000 per acre. Geophysical mapping costs were only $17,000 per acre, resulting in total savings of $103,000 per acre.

Similar savings were realized during clearance efforts at Fort Dix, N.J. Fourteen acres were cleared by conventional means at a cost of $37,300 per acre. Using the new technology, the contractor was able to clear approximately 18 acres for $9,200 per acre. □

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New Area Code

256

for

Design Center & CX

As of March 1998, North Alabama has a new area code. The new area code will run in "dual mode" until 28 September 1998. If the new code is not yet activated for your calling area, contact your local telephone company.

Norfolk project manager focuses on community perceptions

by Amy Goebelbecker, Norfolk District, Public Affairs Office

Kirk Stevens (right) of Norfolk district works with the community to build relationships and correct misconceptions. "The public hears the terms 'ordnance' and 'depot,' and they think you can drive out there and explode," he says.

Kirk A. Stevens, a formerly used defense site (FUDS) project manager, works in the Environmental Branch of the Programs and Project Management Division at Norfolk District. He is responsible for the FUDS project at the former Nansemond Ordnance Depot in Suffolk, Va.

Before he came to the Norfolk District in March 1993, Stevens worked for a general construction company, where he got a taste for engineering. Stevens, who attended Old Dominion University in Norfolk received his bachelor's degree in management information systems and business and his master's degree in civil engineering with an environmental emphasis.

Stevens' first task at the district was working on the FUDS database.

"I thought FUDS was an interesting program," said Stevens. "I like the combination of past history of the sites and the potential for environmental problems left behind."

His project at the former Nansemond Ordnance Depot has a diverse history. The depot occupied 975 acres overlooking the Nansemond and James rivers. Constructed for munitions storage and shipment, it operated from 1917 to 1960. By the end of World War I, it handled 1,300 tons of ammunition daily. During World War II, the depot supported operations at the Hampton Roads Port of Embarkation. In 1950, the depot was transferred to the Department of the Navy and became known as the Marine Corps Supply Forwarding Annex. The Department of Defense excessed the site in 1960.

The Portsmouth Campus of Tidewater Community College, Dominion Land Management, General Electric, the Hampton Roads Sanitation District, and the Virginia Department of Transportation occupy the site today.

According to Stevens, the multiple use of the site is one of the unique aspects of the Nansemond Ordnance Depot project. The city of Suffolk is planning for more commercial development on the site in the future. More homes are also planned for the area next to the former depot.

Norfolk District first became involved with the site in 1987 after crystalline TNT was found near the main entrance.

Norfolk District and Huntsville Center are finalizing the engineering evaluation/cost analysis, which will determine if there is any potential ordnance contamination at the site. If so, further actions will be recommended.

Right now, Stevens and Huntsville Center are working with property owners and state and city agencies to identify institutional controls. Similar to a property management plan, the controls will encourage certain land use and provide for landowner notification of contamination. Stevens is also starting hazardous waste investigations at the site.

Stevens said his greatest challenge with the former Nansemond Ordnance Depot is dealing with public perceptions.

"[The public] hears the terms 'ordnance' and 'depot,' and they think you can drive out there and explode," Stevens said. "Sometimes there are [news] articles written that may be skewed to one side or the other and leave certain perceptions wrong."

To improve communication with the public, Norfolk District established a restoration advisory board (RAB) in 1997. The RAB consists of Stevens, an Environmental Protection Agency representative, a Virginia Department of Environmental Quality representative, and members of the local community. The RAB gives interested community members the opportunity to review the progress of the restoration efforts and provide input.

Another challenge he faces is that the FUDS site was closed in the 1960's, and site records are not easily available.

"With the combination of its being a FUDS and not knowing what took place at the depot, you have to rely on aerial photography and interviews with former employees," he said.

Stevens said that the secret to his success in the FUDS program is communication and teamwork.

"Environmental work can be very frustrating because you seem to be studying things [all the time]. [It's] study, study, study," he said. "It's not as simple as putting four walls up and a roof. [With environmental work,] you just look at the ground, scratch your head and say, 'I think this is the problem.' You make some engineering decisions, do the best you can and get results. The next thing you know, you've got some information, but you also have more questions. The questions never stop."□

Risk: A personal point of view

by Paul LaHoud, Chief, Civil-Structures Division, Huntsville Center

The following scenario, although hypothetical, demonstrates the challenges faced in the OE program in trying to communicate the risk from UXO at formerly used defense sites (FUDS). Huntsville Center continues to develop and refine methods of risk communication, such as the comparative risk analysis shown in the table below and other methods used to manage and prioritize the future clean-up at FUDS.

You step carefully out of the shower, avoiding the wet spot on the floor that could cause a nasty fall. You realize that you need to hurry since the public meeting at the high school gym will start in 30 minutes. You finish dressing and start down the stairs, carefully avoiding the toys and dog's ball. As you pull out of the garage, it has begun to rain heavily. You slow down as you approach the partially blind intersection at the highway and fortunately stop in time to avoid a car sliding by the yield sign. You arrive at the high school gym and pull into the parking lot. It is raining even harder, and lightning is now flashing regularly in the vicinity. Checking your watch and noticing you still have ten minutes, you sit and wait out the storm. Once the storm passes you move quickly into the gym, along with many of your neighbors and the local media.

As you find a seat, the first speaker begins to talk. The subject is the land just north of town that will soon be turned into a recreation area. The land was acquired many years ago from the Army after an old training operation was abandoned. The speaker begins to discuss the history of the site. You are familiar with some of the facts regarding the use of practice ammunition at the location during World War II and Korea, but you don't really understand the significance. The speaker from the Army Corps of Engineers summarizes the land's history. He points out all expended ammunition found on the surface was removed before releasing the land to the public, and there were deed restrictions regarding future use. He also discusses the results of a recent field investigation of the site. He says that even if some old bullets were accidentally dug up, none of the ammunition used at the former training range would be any more risky to a bystander than a book of matches or a small firecracker. He summarizes that while there may still be many pieces of old fragments and spent bullets in the ground, there is no or almost no risk to the public, and no clearance action would be undertaken.

Several of your fellow citizens begin to challenge the speaker. A local developer states that the land value close to the area will be affected. Several homeowners join in expressing concern for their children and demand that every single piece of spent ammunition be found and removed.

The speaker responds again. He points out that there is no way to assure that every item can be found. He further states that the cost of such an effort would be very expensive, and, as tax payers, we need to weigh that into our thinking. He then provides one more chart (table below) with information on the risk that is expected on this property compared to other common risks.

As he presents the information, you are struck by the apparent negligible risk existing at the site. Your mind drifts back to the events leading up to the meeting: the near slip in the bathroom, the obstacles on the stairs, the near miss at the intersection, the lightning in the parking lot. If you believe the chart, every one of those potential accidents, which you dealt with through personal awareness, was more of a risk than the residual ordnance at the park site. Even after the speaker discussed the comparative risk chart many of those in the audience still wanted an extensive clean-up effort. As one neighbor put it, "I choose to accept the risks you describe; I do not choose to accept the risk, however small, from residual ammunition."

The Corps' speaker concludes by showing other charts identifying other locations in the country with much higher danger and public risk where it would be more prudent to spend the limited amount of funds available for clean-up.

After the meeting ends and you are driving home you are troubled by the issues you have heard. You have many questions.

- Is the risk as small as suggested?
- Do you feel the same about the risk as other risks you encounter in day to day activities?
- Should you demand that limited funds be spent on clearance of areas with little risk when much more serious risks threaten other families and communities?

As a concerned member of your community, a family member, and a taxpayer, can you say what the right answers are?□

Comparative Risk Of Accident Occurrence

Accident Source	*No. of Accidents per 20 years (population base 455K)*
In the home	256,444
Motor vehicle	141,092
Fires or burns	6,129
Students on school buses	358
Hunting	42
All aviation	34
Commercial aviation	6 (0.61×10^{-6})
Lightning	2.5 (0.28×10^{-6})
UXO site (example)	0.4 (0.04×10^{-6})

Millions of acres across the United States may contain unexploded bombs and shells from military testing and training activities, and many of the people who live near former, as well as active, impact ranges are concerned. Base closures have placed many more civilians at risk of contact with unexploded ordnance, and the continuing expansion of metropolitan areas puts more people on land previously considered safely remote. Local governments, Indian tribes, and community activists are insisting that the Department of Defense (DOD) proactively investigate and remove unexploded ordnance UXO for which it is responsible.

In response to growing demands for action, the U.S. Army Corps of Engineers and other DOD elements are developing quantitative risk models to aid in determining where, when, and how to respond on UXO-contaminated land. The public—at least those members of the public who display an interest—view those efforts with a great deal of suspicion. The Range Rule Risk Model, as originally proposed, is likely to perpetuate such suspicion. It appears extremely complex, and it contains numerous factors that look like they can only ratchet risk calculations down.

OE CX perspective on risk

by Jim Manthey, OE CX

The determination, communication, and reduction of risk from UXO have been a priority of the Ordnance and Explosives Center of Expertise since its inception. Risk Management strategies include initial risk prioritization of projects, response selection, risk reduction analysis, uncertainty analysis, and response closeout criteria development. Risk tools to execute those tasks must address many functions and foci. Those tools range from relative qualitative risk models to deterministic quantitative risk assessment. The OE CX is striving to improve the models and their use as well as the communication of their use to the stakeholders. Only through continuous dialogue and technical improvement can we meet program goals.

Public stakeholders come to the table with a skeptical view of the concept of risk assessment. The experts have been wrong just often enough for many people to reject any quantitative analysis of risk for any purpose. Members of the public are especially suspicious of an approach that attempts to compare a calculated expression of risk against a standard level of acceptable risk to determine whether to seek and clear buried UXO. Accepting risk based upon confusing formulas is difficult. Thus, members of the public are apt to insist upon 100% clearance and 0% risk of exposure. Yet, there is no technology that can provide even close to such guarantees for wide-area clearance, particularly where erosion or migration is likely to occur. (And from what I can tell, in the long run, that's virtually anywhere.)

Nevertheless, despite their extremely stringent objectives, most community activists react constructively when given information and a chance to participate in decision making. They are, after all, taxpayers too. While some are critical of U.S. military policy, many other base neighbors are veterans and retired military civilian personnel.

In small areas where people are already living or where the presence of UXO threatens economic development plans, the public may insist that DOD go for broke. But in most areas, they can be expected, in their own way, to weigh *risk reduction* against *cost*. That is, if doing a little more will make the land much safer, they'll insist upon the higher level of response. If doing a whole lot more will marginally improve safety, they may think twice.

In making that comparison, few people will be convinced by complex formulas containing numerous untested variables. Instead, they will judge whether the military and its regulators seem to have their interests at heart. Telling people that they are more likely to die in a car crash, even if true, will not win their confidence. However, most people are likely to be receptive to limited clearance in one section if they see an all-out effort in another one.

Risk: Public acceptance means building trust

by Lenny Siegel, Director, Center for Public Environmental Oversight

In fact, the military's experience with relative risk evaluation for toxic cleanup illustrates how the public can be receptive to certain calculations and uses of risk. In this case, a transparent model, in which it is possible for lay people to participate in categorizing site risk, brings people into the process. And the results, together with other factors used to sequence projects, are not used to simply say "no response." Rather, sites are rated relative to each other. Every decision to lower the risk rating of a site, in effect, raises the rating—and indirectly the priority—of other sites.

As the Defense Science Board suggested, a simple relative risk model can be used to allocate resources for UXO response work. The public and regulators can take part in the evaluations. But the model should not attempt to compare explosive risk with toxic (or radioactive) risk. That's the proverbial comparison of apples and oranges. Rather, there should be separate funding streams for the two types of activity, with close coordination, of course, at sites where both problems exist. It's up to Congress, not risk assessors, to determine the relative allocations of the two related programs.

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Excellence *continued from page 1*

and diverse as the combined military arsenals of the entire world produced since the invention of gunpowder.

JUXOCO established

UXO is a global problem requiring solutions in a broad range of areas: operational, technology, and resources. The newly formed Joint Unexploded Ordnance Coordination Office (JUXOCO), located at Fort Belvoir, Va., began fulfilling its DOD charter on 1 October 1997 as the day-to-day operating arm of the UXO Center of Excellence (UXOCOE). DOD's overarching strategy is to (1) match DOD's requirements for UXO clearance with current and potential technological capabilities, (2) coordinate technology development, (3) standardize technology testing metrics, (4) centrally post all information collected, and (5) establish dialogue with other federal agencies and the international community. The goal of the UXOCOE is simple—to better focus DOD's efforts to develop technology that will detect and clear UXO in support of military operations. The JUXOCO is the intersection point for outlining each of the Services' existing mission area operating centers' technology programs to focus them on a unified effort. The first technology goal is the development of sensor systems that act together through shared sensor data to detect the key "fingerprints" of the UXO that may not be detectable by individual sensors. The second is development of technology solutions that can quickly and cost effectively neutralize point and large area hazards. Achieving those goals will be tough and requires a coordinated, cooperative, and collective effort. There is no simple, single "silver bullet" technology that can detect, classify and neutralize ordnance from the earth's surface to 30 feet depths in all terrain, climates, and environments. DOD needs a coordinated "toolkit" approach to accomplish all these functions.

Funding programmed

DOD demonstrated its commitment to improving the effectiveness and economy of UXO detection and clearance technology throughout the five DOD mission areas by forming the UXOCOE last year and programming $132M in FY98 and $189M in FY99. Efforts to establish this Center of Excellence began over two years ago when the General Accounting Office published a report that identified two main deficiencies: absence of a single focal point for all UXO related research, development, testing and evaluation (RDT&E), and failure to leverage the ongoing RDT&E of other federal agencies, industry, and academia and in the international arena.

Requirements defined

DOD's first UXO Clearance Report to Congress was generated through a requirements-driven process that reviewed all on-going RDT&E efforts in all five UXO mission areas and demonstrated the need to coordinate all UXO-related technology requirements and efforts. Users from all five mission areas came together to determine the collective requirements. Most representatives of each mission area had never met each other, but discovered quickly that many shared a number of common problems when they harmonized their initial 170 overlapping requirements into 60. Those 60 documented requirements provide the framework for applying RDT&E resources. Mission areas can now clearly show the importance of each requirement identified for that specific mission area and justify the application of funds. The JUXOCO can now identify high-priority requirements of multiple mission areas so that programs can be complementary, capabilities can be broadened and resources can be optimized.

Technology goals developed

Mission requirements definition led to technology goals and to metrics for assessing the capability of various concepts and the performance of various technologies. Essentially, common methods were established for determining how good technology needs to be and how good is good enough? Those goals varied by mission area, and requirement type. Key metrics, such as probability of target detection, target signals/noise discrimination, target classification, rate of coverage, cost and risk to operator were codified. Achieving consensus across mission areas was hindered by Service concerns, laboratory rivalries, and multiple Pentagon proponencies.

Standard and protocols established

To provide a "level playing field" for technologies, the JUXOCO's Center of Excellence for Testing is establishing standard targets, test protocols and data formats to allow for uniform, controlled collection of objective, compatible, and reproducible experimental data. The center will scientifically examine physical properties of UXO, model the phenomena of the environment, try hypotheses, and design sound technological solutions. Such a data repository of sensor signals enables subsequent comparison of test results and provides baseline information for improving UXO-aided target recognition and other evolving detection technology. Initially, information will be collected on handheld mine detectors on 12 representative mine targets through a pilot experiment at Fort A. P. Hill, Va.

Information collection and sharing

One of the primary missions of the Center of Excellence is the sharing of information to get better definition of the problems in each mission area as well as good ideas. The Navy's Smart Ship program showed that sharing this information on the internet generated numerous good ideas on how to solve problems. The JUXOCO uses the website as a gateway to collect and present information about the UXOCOE, UXO sensor data collection, minutes of the technology workshops, other UXO-related documents and links, and potential contracts in UXO clearance, both operationally and R&D. It posts the UXOCOE data format and provides high-quality data sets that DOD is using in sensor fusion and aided target recognition efforts. The UXOCOE web site lists all the UXO requirements and applicable technolo-

gies and provides a common source for users and researchers, such as labs and R&D Centers, for better understanding of each other's problems. JUXOCO invites researchers or manufacturers with solutions to one of those needs to submit a one-page description to the JUXOCO so the rest of the UXO community will know of their work. The JUXOCO wants more than just concepts and proposals. It would like to leverage existing work. Visit the UXOCOE WebPages at www.denix.osd.mil\UXOCOE to participate in this process.

Participant coordination

There have already been many participants in this process ranging from our Allies in the international community to other Federal agencies, the Services, academia, and industry. Our allies include the British Demining Center, a European Commission R&D Center, and a Ukrainian R&D Center, among others. The JUXOCO is coordinating US participation in these efforts. Other Federal agencies include the Department of Energy, with which DOD just concluded an agreement to leverage the assets of the 14 National Laboratories. Within industry, the JUXOCO has invited the National Association of Ordnance and Explosive Waste Contractors to join in technology workshops that are charting future investments. Within academia, our primary channels are the Multi-University Research Initiative to conduct basic research, sponsored by the Director of Defense Research and Engineering.

First-year achievements

In its first year of operation the JUXOCO has made significant accomplishments. Some initial success stories include a library of UXO "fingerprints," a rollup of the capabilities and limitations of the full spectrum of detection technologies, a suggested "guide" to investment proposals on promising technologies, the signature benchmark site for improving aided target recognition of UXO, and a pilot test site for the Center of Excellence for Testing—the "level playing field." Successes to date are the direct result of the intense interest by Secretary of Defense Cohen and his Under Secretary of Defense for Acquisition and Technology, Dr. Gansler, and active participation in the UXOCOE by the Office of the Secretary of Defense, and the Services. Such participation enabled the JUXOCO to coordinate multiple agency actions, leverage their findings and investments, and develop the recommendations to enhance capabilities in all of the mission areas. The JUXOCO will incorporate their findings and recommendations in the Annual UXO Clearance Report to Congress, submitted through the Under Secretary of Defense for Acquisition and Technology. The report will be submitted with the Presidents Budget for Fiscal Year 2000, detailing progress in this coordinated approach.

The UXOCOE will reach its goals when detection and clearance technology has been developed that meets the requirements of all the mission areas. Being at the focal point where the technology programs and mission requirements intersect will enable the UXOCOE and DOD to move closer to a resolution of this global problem.

Rear Admiral Cobb is Commander, Naval Ordnance Center, Indian Head, Md.; Commander, Naval Surface Warfare Center; and Vice Chairman, Joint Board of Directors, Unexploded Ordnance Center of Excellence. Mr. Greg Bornhoft is a retired Army combat engineer and a BRTRC employee providing contractor support to the Joint Unexploded Ordnance Coordination Office.□

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drive much of the cost. Of $125M spent per year on UXO remediation, about $70-80M is spent on this labor-intensive cleanup methodology. In order to capitalize on promising technologies and reduce cleanup costs, the Task Force recommends an aggressive program to develop tools and technologies appropriate for detecting, characterizing, and neutralizing both surface and subsurface UXO.

The report suggests a two-phase technology effort in which phase I would focus on the near-term improvement of existing technologies, including signal processing and data fusion, with a goal of reducing false alarms by a factor of 10. A phase II effort would run concurrently to focus on those technologies in the early stages of development that show promise, such as thermal neutron activation, synthetic dog's nose, and hyperspectral imaging.

In response to Task Force recommendations, DOD has initiated certain actions. Already implemented is the first recommendation: designating Ms. Sherri Goodman, the Deputy Under Secretary of Defense (Environmental Security), as the DOD lead for environmental restoration (read: the remediation of formerly used defense sites) and active range clearance.

Other Task Force recommendations include:

- Development of a risk-based priority system, similar to the relative risk site evaluation framework for hazardous waste sites.
- Formation of a DOD-wide active range policy that addresses safety issues, advocates effective range maintenance, and promotes the dissemination of information to stakeholders.
- Accelerated UXO remediation efforts on tribal lands.
- Establishment of an aggressive research and development program.
- Establishment of a research and development funding account.

The full report, along with tables of the Task Force's alternative technology assessment, can be found at http://www.acq.osd.mil/ens/esb on the worldwide web.□

Controls *continued from page 2*

and local agencies may use existing programs to implement an institutional control program, such as permit programs and deed notices.

Permit programs are a means for the local governments to establish conditions for land use and development. The permitting agency establishes specific conditions, which may be met before a certain use or action is allowed on the property. Notice and compliance will be a condition of the permit program (if this is supported by the city and other interests). Such an ordinance could be adopted as part of the local zoning code, building code, or site plans. Local permits would be required before construction or other intrusive activities in the area. If ordnance were found, the appropriate agency would be notified before a permit is issued.

Deed notice is a method of informing the prospective land purchaser through the use of a notice attached to the deed. Transfer of the property would require a notice before purchase. The owners of the property would be informed of the requirements listed in the notice.

For this approach to be effective, various factors must come into play. First, institutional control planning requires a close, voluntary relationship between the U.S. Army Corps of Engineers and the various levels of federal, state, local governments, and communities. Second, a plan that protects the community is developed with the participation of cooperative stakeholders. That plan supports the "mission" of the community and the safety and welfare of workers who may need to dig in potentially contaminated areas in order to maintain or repair facilities. The plan also provides a contingency procedure if an ordnance item is found. Finally, an effective institutional control plan must include a component that addresses future use of the site and provide a plan for use if ordnance is found during land development.

For success, institutional control plans must be developed with the community, local government, state agencies, and the local Corps of Engineers district. Local support is the key to establishing an enforceable plan.□

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(There's an important exception: at sites with both apples and oranges, sometimes risk managers must decide which risk is greatest. One might have to clear UXO before drilling groundwater monitoring wells or remove an acutely toxic substance before sending out teams to detect buried ordnance.)

Finally, though there is no comprehensive database of UXO accidents, most people in the field report that most casualties result not from accidental contact, but from people spotting, moving toward, and in one way or another imparting energy onto the explosive device. Often someone takes the shell or round home, and it's someone else who triggers the explosion. While one is tempted to let stupid people suffer the consequences, more often than not the victim is a child or at least someone other than the one who thought the UXO would make a good souvenir. Therefore, it seems important when calculating risk to assume that anyone spotting UXO, even from a distance, will approach and further uncover it to see what it is. It's also prudent to assume that eventually someone uninformed or careless will set off a souvenir. While this means that the quantitative measure of risk is greater than that predicted by random encounter, it also means that education is an important element of risk management. Risk could be cut dramatically by educating potential receptors. For example, recently some beachcombers near the Salinas River mouth in California found an old explosive device on the beach. Instead of adding it to their collection of shells, they contacted authorities.

DOD officials and the public who often express concern seem to share the same goal: the reduction of explosive risk from range UXO. But often they approach each other with mistrust. If decision-makers treat the public with respect, as people who have valuable input and knowledge, they are more likely to achieve the results that they want: protection of public health and safety in a sensible, cost-effective way.

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