

Institutional Controls

for

Ordnance Response

By Robert G. Wilcox

**Huntsville Engineering and Support Center
Center of Expertise for Ordnance and Explosives
Quality Review Team Leader
205-895-1508**

**Presented at UXO Forum, Nashville, TN
May 30, 1997**

The views expressed in this paper are those of the author and are in no way to be construed as views, opinions, or policy of the Huntsville Center Ordnance and Explosives Directorate

Institutional Controls

“Fences, signs and education, all seem quite ineffective when you consider that peoples lives are in the balance. After all people generally do not respect signs and fences anymore and nobody can teach them any different. Therefore, the Federal government (DOD) must remove all ordnance from the environment. Too bad we can’t afford it.” I have heard this conversation many times. But it floors my brain every time

This attitude is based on rushing to judgment with few facts and lack of confidence in people. However this concept (or some similar concept) seems to permeate the ordnance program. Few people understand institutional controls. They are generally prejudged to be a second class of alternatives that should be used when the risk is relatively low to save money. Like most situations, when things are prejudged, the results are unsatisfactory.

If you think that fences, signs and educational programs are institutional controls, you should also be certain that shovels are removal actions.



The tools are not the plan. A plan requires authority for the proposed action, a plan of action, established roles for the participants, resource requirements, and commitments from voluntary participants. the ordnance program has never produced a real institutional control plan. This paper describes Institutional Controls and contrasts them with the standard removals. Consideration of institutional controls is a necessary adjunct to removal alternatives in the planning process. Also, these alternatives have far more potential to be effective than removals at many sites.

Background

The public is exposed to Ordnance and Explosives (OE) risks at uncontrolled, abandoned sites formerly used by the military. Some of these sites have been abandoned on active military installations and are

currently scheduled for release under the Base Realignment and Closure Act. The remainder of these uncontrolled OE sites is on active military installations.

In 1986, Congress passed and the President signed the Superfund Amendments and Re-authorization Act. The new law directed the Secretary of Defense to operate a program of Environmental Restoration at active installations, properties formerly used for military purposes and abandoned vessels on the high seas. With this law, Congress provided specific authority to address OE contaminated sites with the second of three goals of the Defense Environmental Restoration Program (DERP). The law further states that the response will be carried out subject to and in a manner consistent with the Comprehensive Environmental Response and Compensation Liability Act (CERCLA). This has been interpreted as meaning that ordnance response will be carried out in a similar manner to the response for Superfund hazardous waste under the direction of the Environmental Protection Agency. The National Contingency Plan (NCP) provides the framework for response in the hazardous wastes arena. Although practicalities require some modification, the NCP has been the basic model for ordnance response.

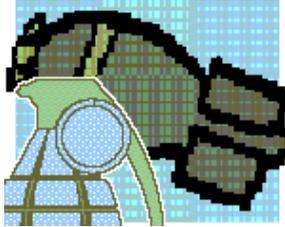
The NCP model requires that any government response be considered openly in coordination with the all stakeholders. Further, Federal decision making requires the development of alternative response strategies to assure the most effective (and least objectionable) plans are implemented. Alternative plans should be based on a variety of technologies or implementation strategies that are sufficiently different in effect to allow for technical discrimination in the assessment of plans and to allow for real choice on the part of the stakeholders.

Simple Definitions and other Facts

These definitions are intended to get to the heart of the issue. Detail is avoided to uncover basic issues.

What is Ordnance? - It is an object used by the military to kill people and break things in time of war. Some of these objects are only used in training exercises. While not as powerful, they still have the ability to kill people and break things on a smaller scale. It is all potentially dangerous stuff.

Just what is an ordnance-related accident? - It is



the unfortunate interaction between at least one member of the public and one or more of the above referenced objects.

Why does ordnance detonate? - Ordnance is an inanimate object. It is action upon it by humans that causes it to detonate. During hostile actions a human fires a projectile where impact or a time delay fuse initiates detonation in the vicinity of enemy forces. Some munitions (mines) rely on predictable actions of the enemy to activate a trip wire or some other initiating device. In any case it is the human activity that initiates the munitions. In an ordnance-related accident, once again, a human acts in some way to cause the ordnance to detonate. Tools such as hammers and wrenches are usually involved. A found ordnance item has even been thrown into a fireplace. Many times, the victim has recognized the ordnance item as a "dud."

How common are ordnance-related accidents? - Less than ten accidents resulting in 14 deaths over the last fifty years on formerly used defense sites. The incidence is somewhat higher on active installations.

Accident Analysis

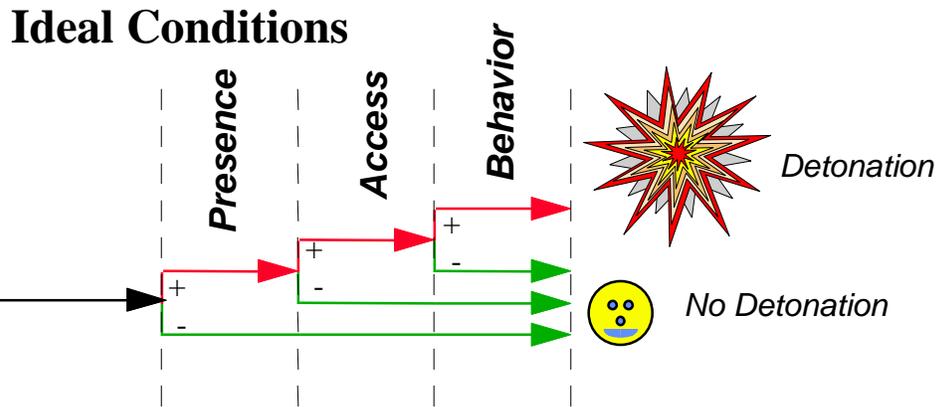
Accident analysis is a response to disasters related to technology. The National Transportation Safety Board spends millions of dollars each year analyzing the cause of fatal airline crashes. If a technical flaw is suspected in a particular model of airplane, the

whole fleet may be grounded by the Federal Aviation Administration pending results of the investigation. The theory simply stated is that to avoid accidents (reduce risk), we must understand the causes of accidents.

Root Cause Analysis is used to find the factors that, if avoided, would prevent an accident (reduce risk). An example in the airplane industry might be something like wing icing during certain weather conditions. Inability to use the controls may easily lead to a fatal crash. The response to such an incident may be technical, i.e., to design a better deicing system for that model of airplane. It could be administrative, i.e., this type of airplane only flies during clear weather; or it could be behavioral,



i.e., the existing deicing system requires certain preventive maintenance or special maneuvers in flight to be effective under extreme conditions. This last option may require more experienced pilots or training for all pilots. The response will likely be phased - immediate action to cancel all flights involving this airplane pending results of the assessment. The immediate action will be followed up by a long-term fix based on the assessment. It is pertinent to note that in all cases there is a federal agency (the Federal Aviation Administration) that has the power to enforce the selected response. The root cause analysis for ordnance related accidents are displayed in an accident event tree (figure one). This analysis provides three causative factors that if totally avoided would totally prevent an ordnance-related accident.



Simply stated, it means that if no ordnance is located on the site, there is no possibility of an ordnance-related accident. Even if there is ordnance on the site, but people do not have access to the site, there is no possibility of an ordnance-related accident. Even if there is ordnance on the site and people do have access to the site, but their behavior is appropriate, there is virtually no possibility of an ordnance-related accident. An accident requires all three events or circumstances to be present. No accident can happen if any one causative factor is missing. Each factor provides the basis for a separate implementation strategy. It is therefore logical to formulate plans that target each factor separately.

Removals

A strategy that engages the presence of ordnance is a removal action. Removals are the traditional response. They are analogous to the technical response in the airline analogy above. In general a plan of action involves developing and coordinating plans for worker and public safety during the operation, site mobilization, operations and site close out which may include continuing maintenance requirements. Operations typically emulate a high tech Easter egg hunt.

Search procedures are generally enhanced with geophysical detection equipment and maybe partially mechanized. The site maybe mapped in detail with results recorded and archived in a Geographical Information System (GIS). The GIS will be useful in community planning to avoid future OE exposures.

Unlike the aircraft example above, the Federal government's authority in ordnance responses can be very limited. At a former defense site, it is dependent on cooperation of the land owner for site



access and other (state or local) government agencies for any administrative control of the site. Technology cannot find all ordnance at a reasonable cost. Removals frequently cost more than the real estate would be if no ordnance were present. Site dynamics (natural, and human) tend to undo the response by erosion and/or inappropriate development.

However, the worst aspect of the standard removal response is that it tends to minimize the human element of a potential ordnance related accident.

Ordnance removal at times seems like surgery with a blunt instrument. Our experience indicates that about ten ordnance-related accidents have occurred in the United States since World War Two. The majority of lethal ordnance related accidents occurred when a human did something appallingly stupid with an object that they recognized as a piece of ordnance. Less common is the type of accident resulting from the inadvertent impact on ordnance with digging implements or axes when the presence of ordnance was unknown to the victim. High reliance on removal strategies is like redesigning aircraft parts to resolve airline crashes without considering pilot or air traffic controller behavior to prevent airline crashes.

When a federal response action is complete there is a natural tendency for stakeholders to assume that the site is clean. This happens no matter how clearly it is stated that no removal action is complete. Removal produces a condition where there is less ordnance. If human behavior were the same before and after the removal we could claim the risk is substantially reduced. However, if as a result of the removal, human access is stimulated and/or behavior is less cautious, we have an unknown situation where the risk might be greater.

The absolute risk in any event is unknown. It will certainly increase over time because of natural forces. Human behavior will determine the safety of people using the site much more than the absolute number of munitions.

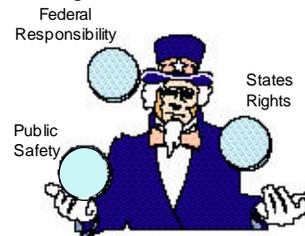
Institutional Strategies

Institutional controls are alternative response plans that use governmental or other authorities in addition to the response authority under DERP. These approaches require a close voluntary relationship among the various levels of government, stakeholders and landowners. Figure 1, The Event Tree, indicates that the remaining strategies are each potentially as effective as any removal action. The drawback of course is that the power to enforce any

site access or behavior modification strategy does not rest with the Department of Defense. Those powers and authorities reside in State or local ordinances that are in effect for land use control or public safety. Derivatives of property rights are also potentially effective since permission to use property may be granted with restrictions.

Voluntary Controls

Posse comitatus is a legal principle that limits the power of the Federal government in any situation where local enforcement is available. However, much of the regulatory framework exists for the express purpose of public safety/health and advance the "greater good".



This provides opportunity for local control if the local authorities are convinced that risks are sufficient to warrant their participation. In most cases, public officials are willing to help protect their constituency. If a logical connection can be made to an existing program mission, or responsibility currently assigned to their agency, they feel somewhat compelled to participate in the ordnance response. The pressure however, comes from their dedication to their existing responsibilities and not any requirement of Federal law. By way of example, signs that warn of ordnance and prohibit entrance could be enforced by land owners with cooperation of the sheriff or local police through trespass laws. Authority for this type of enforcement currently exists. Authority to support this program with Federal money and expertise exists under DERP assuming it is duly formulated, coordinated, assessed, supported by stakeholders and recommended by the response agency to the decision makers.



Family of Controls

The variety of actions that could reduce ordnance related risk is tremendous. Other governmental subdivisions may have jurisdiction and authority. They may have existing missions and certain capabilities that can be applied to the ordnance problem in their community. The two institutional strategies (access control and behavior modification) tend to blend and be less distinct as practical application is considered. Also, it can be seen that these controls may be used in combination for greater effectiveness.

Access Control

In general, access control limits the use of the contaminated property. This can be accomplished by installing various restrictions or dedicating the property to compatible use. The target strategy is to remove the human element from the chain of events leading to an accident. In this respect it is analogous to the administrative approach considered in the aircraft example above.

Restrictions - Typically we think of posting signs to put people on notice that entry is prohibited activity. Defiance of these restrictions is subject to disciplinary legal action under existing trespass laws. Fences provide a barrier to inadvertent entry. Therefore, it may be easier to enforce existing trespass strictures. Fences should not be included in final plans without consideration of landowner desires, existing uses, and enforcement burdens placed on local governments. However, this strategy may be effective assuming support of the land owner, cooperation of local officials and the community, and funding and technical support of the Federal government. The signs and fences must be maintained. Such plans severely limit use of the property but are as effective as the cooperation attained. Enforcement is a local matter based on state or local authority.

Appropriate Use - Many uses are compatible with ordnance contamination. If those uses are

encouraged, benefit may be derived from use of the real estate for the land owner and the community. In our aircraft analogy, the planes can fly in clear weather. A typical situation might be a wildlife preserve. The limitation on human activity may be sufficient to protect the public. A parking lot is another use that would be suitable even if ordnance contamination existed under the surface. Less obvious but possibly suitable would be a golf course. Assuming appropriate precautions were taken during construction and maintenance, no exposure to ordnance risk is experienced because people admitted to the golf course participate in the sport of golf. They play; they practice; they instruct; they spectate. Such participants are unlikely to dig under the trees and unsupervised children are generally not allowed.



This may be effective assuming support of the land owner, cooperation of local officials and the community, and funding and technical support of the Federal government. Enforcement is a local matter based on property owner policy.

Behavior Modification

This strategy relies on personal responsibility of the site users. The aircraft analogy serves us here as well. Typically pilot error is a prime suspect for the cause of most airline accidents. It usually turns out to be at least a contributory factor. Therefore, much emphasis is placed on appropriate behavior for pilots and crew. However, mechanics make and aircraft controllers make errors also and mechanical objects fail at times catastrophically. It is important to note that the concept of behavior modification extends to agencies that have jurisdiction over the site. Some behaviors that must be modified belong to local governments. When building permits are knowingly issued for residential development of ordnance contaminated property, there exists a serious Problem the federal government has little opportunity to correct.

Notice - Notice can be a strong influence. When notice of ordnance contamination is given, it can affect the expectations of potential buyers and developers. Appropriate uses can be sought and the land may still be used for economic gain. In this regard, ordnance is an engineering defect that must be considered in the design of improvements or maintenance activities.

Notice is usually tied to and used in conjunction with a three-point plan: 1. Be alert for ordnance. Always remember that the property is ordnance contaminated. No response action by the Department of the Army will change this fact, 2. If ordnance is located, contact the appropriate local official, 3. If more than one is located, be sure that the appropriate local official contacts the Corps of Engineers. We may need to reevaluate the site if a quantity of ordnance is discovered.

Training - Training relies totally on the individuals involved with the site. Ordnance awareness, respect for the risk involved and perseverance are key ingredients. Knowing that plans exist and that help is available should problems arise is also a critical element.

Land Use Controls - Planning boards and zoning commissions have the authority based on state or local law to restrict uses of property in the public interest. Eliminating ordnance contaminated property from unrestricted residential development may be prudent and beneficial. Especially if combined with other strategies such as administrative requirements.

Administrative Requirements - These controls generally protect property owners and the public through approvals or permits required to develop property in certain ways. Approvals generally assure that appropriate notice is given, reasonable plans consider the presence of ordnance, and training and awareness is appropriate for the intended use. Permits combine all the benefits of approvals and get a legally binding commitment for certain behavior. The assumption that permits can be revoked for cause provides enforcement under local authority.

Lending Controls - In general, property owners have responsibility to protect the public from dangers associated with their property. In the case of an ordnance related accident, the property owner will at

least have to defend himself in court should a wrongful death or other suit result. If the court finds negligence on the part of the land owner he may be subject to substantial penalty. Such a penalty may affect his ability to pay his mortgage. While this has never actively been considered in a response action, lending institutions and bank regulatory agencies should take note. It may be prudent to consider this factor when lending money on ordnance contaminated property.

This family of controls that we call institutional controls is varied and dependent on the site and communities that they exist in. It is not appropriate to consider this as a comprehensive list. Opportunities will be there if we look. If we don't look we will miss opportunities for everyone. These potential plans are not "cookie cutter" products. Uniformity is not as desirable as local acceptability. The use of this approach should require a more open and up front involvement with local governments, regulators and stakeholders. This may be a real key to substantial and meaningful stakeholder participation in developing ordnance responses.

Institutional Analysis

Institutional analysis is data collection for institutional control plans. We must search for opportunities that exist and to do that several basic elements must be understood.

Authority - What are the limits of authority exercised within the jurisdiction? What is its origin? How much control can be exercised? What about enforcement?

Jurisdiction - Other Federal agencies, states, counties, municipal or other agencies may have duly constituted authority over the project site. Tribal governments and various commissions should be considered also.

Mission - Public safety and land use control are the two critical missions. If ordnance response may tap into either mission, there is reasonable potential for effective control.

Capability - The institutions that are investigated will have some capability. It is very possible that these capabilities will be unique and a reflection of the community affected by the site. This local flavor may be the key to community participation. Many of

our sites have been lacking in community involvement. Perhaps the federal government is not trusted with local issues in some places.

Desire - This is a drop dead issue. There is no Federal authority to force participation on the local level. If the local officials are not convinced that participation is in the best interest of the their community, the Corps will be hard pressed to push any project at a contaminated site. This is where resources may need to be committed. If the local officials understand that the Federal Government may be able to pay for extra services needed from the local governments to resolve ordnance related issues, desire to cooperate may be there. Failure to achieve this desire in the local agencies will force any institutional control plan to certain infeasibility. Basic cooperation is necessary

How will Institutional Analysis be accomplished?

Basic data can be collected with a series of interviews. Data concerning Jurisdiction, authority, mission capability and desire to participate will be collected on a series of forms. These forms will then be summarized to consider elementary plans of action. Sensitivity and creativity will be required to formulate the final plans. Much of this data may be collected by a contractor but the real plan formulation will be a team building exercise between the Corps District and the local officials. If trust can be built, a plan will follow. Contractors may facilitate, record and report. The real work will result in intergovernmental commitments to protect citizens. Cooperative assignments of responsibility, commitment of appropriate authority and resources will support a plan to modify behavior and manage access to ordnance contaminated sites for the protection of stakeholders.

Current Status

About 10 projects have active institutional analysis incorporated into project planning. Several others are catching up after the studies were initially completed without any real consideration of institutional alternatives to removal. Acceptance of this concept seems to be very good at this time. Caution is however, recommended in predicting trends in this area. While consideration in the planning stage of a project should be universal, we

expect acceptance of institutional controls to be a very site specific consideration. Two projects nearing the end of their planning phase appear to be good candidates at this time. Institutional controls are the major element of the plan (no removal of ordnance is planned).

Other Benefits

The benefits of institutional analysis are numerous. The table on the following page provides a brief synopsis of other benefits. the list will grow as we gain experience.

Accident Prevention

Please refer to the event tree above (figure 1). The concept of prevention does not include 100%. This applies to all three strategies. Typically, we consider removals to be about 75% effective. For each 3 ordnance items that are found, one remains on the site. We can not justify a claim of 100% removal. Therefore all sites remain contaminated. The same problem exists when any other single strategy is selected. We do not have any numerical method to predict effectiveness of institutional controls at this time.

People sometimes forget about rules, disobey signs and occasionally commit trespass, therefore logic indicates that we should not expect 100% effectiveness. Also most people obey rules, respect signs, and don't commit trespass, so it is logical to expect more than 50% effectiveness for the institutional strategies. The absolute effectiveness of institutional controls will be a function of the diligence and cooperation of the stakeholders and the public.



If all three strategies were 75% effective, the use of all three would result in a project that was 98.5% effective. If the institutional controls were 50% effective the use of all three strategies would be 94% effective. The use of institutional controls without removal would duplicate the effectiveness of removal. This should indicate the importance of

multiple strategies and the inevitability of remaining risk on ordnance contaminated sites. Many sites will dictate removal actions because of gross contamination and or lack of control. This paper does not advocate using Institutional controls to the

exclusion of removal. It does advocate complete formulation and consideration of all applicable strategies and real choice for the decision makers and the stakeholders.

Other Benefits Resulting From Institutional Controls

Consideration	Benefit
Public Involvement	Direct contact with agencies early in process.
Stakeholder Participation	Stakeholders will be prime mover for institutional controls. Active participation in planning and execution opportunity for local self determination.
Choice	Real choice among alternatives based on different strategies.
Long Term Protection	Institutional controls will last far longer than removal in most situations
Effectiveness	Institutional controls specifically address human element several layers of protection are possible.
de-Federalization	The Federal government is doing less of what local government and individuals can do for themselves.
Resource utilization	Provides for use, economic return, environmental protection
Costs	less Federal tax dollars, less overall cost

Summary

Future success of the Ordnance Program may well depend on better solutions based on authority not available to the Federal government. Only through the use of authority of the states and the local governments can we hope to resolve the real ordnance problems in the communities. It will happen only through coordination and cooperation among the various levels of government. The federal government has no authority where the best potential for meaningful improvement exists

Institutional analysis provides the opportunity to fuse authority, responsibility, resources, cooperation and expertise into a plan that protects our citizens from potential harm. In so doing we are providing decision makers with a complete plan based on real alternatives. We have satisfied the principles of functional decision making by including alternatives based on all relative strategies. The stakeholders are given a real opportunity to participate in a substantial and meaningful way. Communities have a real voice. The institutional knowledge contributed by local officials will tend to form the project with a local flavor. Local acceptance will be enhanced. We are more likely to provide a greater degree of safety, maximize our resource use and environmental protection at a lower overall cost True synergy as in figure 2.



Figure 2