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**ENHANCING USAF CAPABILITIES FOR MOOTW**

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The tasks we identify in this chapter are those the USAF may be called upon to perform in future MOOTW operations. Many of them have been performed by the USAF in the past or are part of current doctrine; others are more speculative and represent our attempt to think expansively about the future global environment. We first assess the Air Force's ability to accomplish these tasks with currently deployed forces, then present and discuss several new CONOPs—for both near term and long term—to accomplish some of the more challenging MOOTW tasks.

**ASSESSING USAF CAPABILITIES FOR MOOTW**

To assess USAF capabilities for current and future MOOTW, we need to move our discussion from general mission categories (e.g., disaster relief) to the specific tasks the USAF will be expected to accomplish in future MOOTW. We begin by considering the tasks air and space power has been called upon to accomplish in past MOOTW. These include the following:

- Airlift relief supplies
- Insert, support, and extract special forces during operations in denied territory
- Evacuate noncombatants from dangerous situations
- Airlift special cargoes or passengers
- Find and rescue victims of shipwrecks, plane crashes, and natural disasters

- Advise, train, and equip friendly nations to defeat internal or external threats
- Monitor and enforce peace agreements
- Provide surveillance and transportation for drug-interdiction efforts
- Conduct raids against high-value targets in well-defended areas
- Transport and provide surveillance and fire support for large intervention forces.

Each of these operational-level tasks can, in turn, be broken into more-detailed tactical-level tasks. For example, enforcing peace agreements might entail enforcing a no-fly zone, monitoring a zone of separation, providing close support to peacekeepers on the ground, transporting peacekeepers, and/or providing intelligence to joint or combined commanders. These tasks can be broken down still further into even more-detailed tasks. For our purposes, we stay at the operational level, with occasional forays down to the tactical level.

### **Continuing Tasks: How Has the USAF Done?**

Generally, the USAF has successfully accomplished the tasks assigned to it, either because it was well equipped and well trained for the task or, when it was not, by devoting significant assets and personnel to the task. Although we were unable to identify any operations that failed to achieve their primary mission because of inadequacies in USAF MOOTW capabilities, significant problems or shortfalls may still have interfered. Certainly, the tragic shoot down of two U.S. Army helicopters over northern Iraq by USAF F-15s was evidence of just how inappropriate the standard operating procedures were for that environment. In Bosnia, surveillance shortfalls and concerns about collateral damage prevented the USAF from effectively countering Serb artillery, mortars, and snipers firing on Sarajevo. It is too early to tell how much air and space power can

contribute against these targets, but it appears that available technologies could significantly improve USAF capabilities.<sup>1</sup>

There are some particularly difficult tasks that the USAF has not yet been called upon to perform. For example, although the USAF struck Iraqi WMD facilities during Desert Storm, it has not yet been tasked to destroy a WMD facility in a peacetime raid, perhaps in part because of known limitations of existing deep-penetrating munitions, as well as for concerns that toxic agents might be released.

There are also instances in which air and space power might have made a major contribution if it had been available. For example, AC-130 gunships and even jet fighters might have made an important contribution on October 3, 1993 (“Bloody Sunday”), in Mogadishu, Somalia. On that day, U.S. Army Rangers and Delta Force commandos were ambushed and trapped by a large Somali force, resulting in the most-intense small-unit fighting since the Vietnam War. The endurance, precision, and shock effect of fixed-wing fire support might have suppressed Somali fire sufficiently so that the Rangers could be extracted by helicopters. At the least, it would have significantly increased the fire support available to U.S. soldiers and probably would have saved some lives in the process.

### **Preparing for Future MOOTW**

Our review of past operations leads us to the conclusion that the USAF’s MOOTW challenge is less about correcting shortfalls associated with past failures than it is about improving and expanding USAF capabilities to accomplish future, more-demanding tasks. Indeed, the greatest challenge may be thinking more expansively and creatively about how to apply air and space power in future MOOTW. Such thinking is particularly important in view of the new sensor, weapon, and aircraft technologies that, if embraced by the USAF,

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<sup>1</sup>Concepts to defeat snipers and artillery from airborne platforms are presented in Alan Vick, David Orletsky, John Bordeaux, and David Shlapak, *Enhancing Air Power’s Contribution Against Light Infantry Targets*, Santa Monica, Calif.: RAND, MR-697-AF, 1996.

could substantially increase its capability to accomplish MOOTW tasks, including such tactical-level tasks as the following:

- Maintain covert, persistent, high-resolution surveillance of a point target (e.g., hostage location)
- Detect, identify, and attack personnel in urban or heavily wooded areas
- Detect, identify, and attack artillery, mortars, and snipers
- Protect convoys
- Control mobs
- Secure an urban landing zone.

In some situations, it will not be possible to accomplish these tasks wholly or at all from the air. In other situations, advances in sensors, unmanned aircraft, and nonlethal weapons have the potential to significantly increase the contribution that air and space power can make in many MOOTW situations. For example, the combination of foliage-penetrating radars, hyperspectral image processors, thermal imagers, long-range electro-optical devices, and air-implanted ground sensors can give airborne platforms an enduring, often high-resolution, portrait of activities in urban or wooded areas.<sup>2</sup> When mounted on unmanned aerial vehicles, these sensors can often go where manned platforms would not be risked or could not go. One such application would use a small battery-powered UAV equipped with an uncooled thermal imager and flown at building level or below to provide high-resolution, covert, night monitoring of activities during urban peace operations. Other sensors, such as foliage-penetrating or synthetic aperture radars (SARs), could be carried by long-endurance, medium- or high-altitude UAVs to monitor wooded areas or roads. Finally, a number of nonlethal weapons, such as incapacitating agents or net barriers, could be used from airborne platforms.

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<sup>2</sup>For a more detailed discussion of these technologies and their application in MOOTW settings, see Vick et al., *Enhancing Air Power's Contribution*, 1996.

## **NEW CONOPs FOR A NEW WORLD**

To illustrate how these technologies could be applied in future MOOTW, we present and discuss four new concepts of operation—two near term and two far term—to accomplish the following tasks:

- Detect and destroy drug-growing and drug-processing locations
- Monitor peace agreement and enforce with air and space power only
- Conduct opposed evacuation of U.S. nationals from an urban setting
- Detect, identify, and neutralize a WMD-manufacturing facility.

For the first two tasks, we present CONOPs that could be implemented within the next five years using technologies either already deployed or well along in R&D. For the last two tasks, we present CONOPs for the year 2015 to illustrate how more-exotic technologies might be used to accomplish these missions.

The CONOPs presented here seek to achieve one or both of the following goals:

- The CONOP performs the MOOTW task better than one using currently available systems.
- The CONOP performs the MOOTW task while reducing the optempo of MRC-critical assets.

### **Near-Term CONOP 1: Detect Drug-Growing and Drug-Processing Locations**

If the United States becomes more active in combating the flow of illegal drugs over its borders, the USAF will likely play a major role. Since beginning drug interdiction in 1983, the USAF has focused most of its effort on the surveillance of international airspace and waterways. Once a suspect vehicle is identified as a possible drug-runner, the Air Force generally passes the information to a different organization for engagement. In many cases, this organization is a U.S. law enforcement agency that engages the suspected drug-runners in U.S. territory—either upon landing at an airstrip or, for

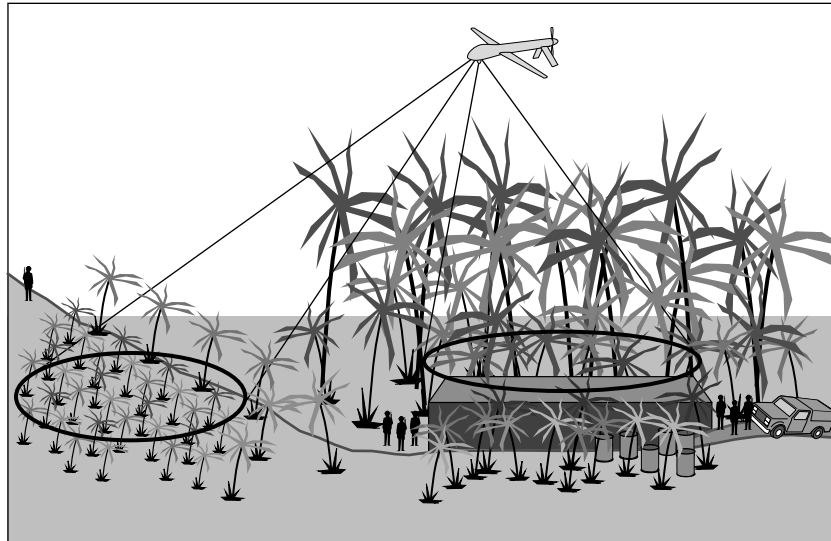
boats, in U.S. territorial waters. Other times, the information is passed to the air force of an allied nation, whose fighter aircraft then identify and engage the suspected drugrunning aircraft.

One possible escalation of the drug war would be to significantly expand surveillance and engagement efforts within growing, producing, and exporting countries. Locating and identifying drug-growing and drug-processing locations is a task well suited to the USAF and its assets—a task that could become one of the more frequent uses of air and space power in a MOOTW context. Once these facilities were detected, they could be destroyed by U.S. air power, by host-nation military forces, or by a combined operation. Given past practices, the most common approach would probably be for the host nation's police and military forces to raid the facility following cueing from U.S. assets.

This near-term CONOP, depicted in Figure 5.1, would use a medium-altitude, long-endurance UAV carrying a foliage-penetrating (FolPen) radar and a hyperspectral image (HSI) processor to detect drug-growing and drug-processing locations. Radars operating in the high-frequency (HF) and very high-frequency (VHF) portion of the radio spectrum can penetrate foliage with relatively little attenuation. The FolPen radar could detect buildings and vehicles that are completely obscured by foliage. Under many circumstances, objects that lack the necessary contrast to be detected using only the visual portion of the spectrum can be detected using HSI processing, which samples across hundreds of bands from the ultraviolet to the infrared to produce a detailed description of the incident radiation on the detector element. An HSI processor would look through gaps in the foliage and, depending on the geometry, it may be able to detect and identify coca fields or other drug-producing infrastructure. In this way, unnatural objects, including visually camouflaged items that would otherwise appear to be completely masked by foliage in the visible portion of the spectrum, can often be detected.

The systems can be used to cue each other to further investigate suspicious areas; when used in combination, they can often positively identify such locations.

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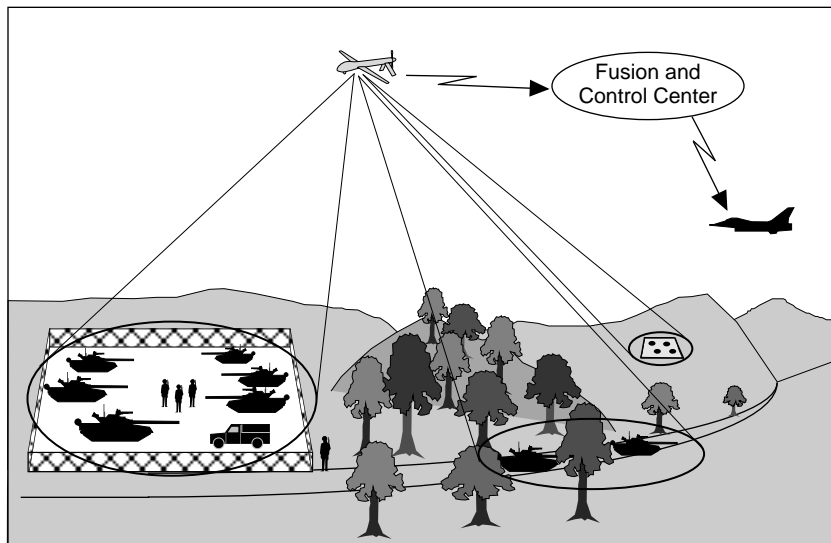


**Figure 5.1—Detect Drug-Growing and Drug-Processing Locations: FolPen Radar and HSI**

### **Near-Term CONOP 2: Monitor and Enforce Peace Agreements**

This CONOP, depicted in Figure 5.2, was designed to mitigate some of the problems that result from the high optempo caused by USAF participation in peace operations. It does so by substituting unmanned surveillance platforms (e.g., UAVs) for manned (e.g., the Joint Surveillance Target Attack Radar System [JSTARS]). It envisions a peace agreement in which the warring parties are obligated to place their heavy weapons in cantonment areas (as the Dayton Agreement obliged the Bosnian parties). A high-altitude UAV (e.g., Global Hawk) monitors these cantonment areas, highways, and open areas, using a radar with an SAR mode and a moving-target indicator

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**Figure 5.2—Monitor and Enforce Peace Agreement**

(MTI) mode. A high-altitude platform was chosen to maximize the area covered and to provide long on-station times.<sup>3</sup>

To spot vehicles missing from a cantonment area, onboard computer processing of SAR images can compare images from the last mission with the current images to identify changes. If a change is detected, the radar's MTI mode can be used to search the area around the cantonment area for moving vehicles. The MTI mode can search large areas quickly. Tactical air (TACAIR) could be called upon to positively identify suspect vehicles that are moving away from the cantonment area. TACAIR can also be used to destroy the violators.

<sup>3</sup>The design parameters for the Global Hawk UAV are 3,000-nautical-mile range and 24 hours on-station.



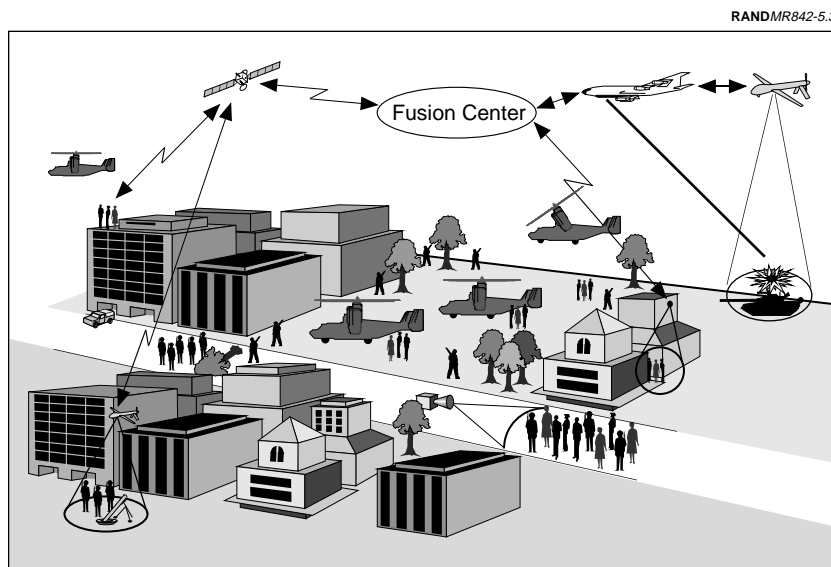
### **Far-Term CONOP 1: Conduct Opposed Evacuation of U.S. Nationals from Urban Setting**

As of this writing, the USAF has performed at least 31 noncombatant evacuation operations since U.S. personnel were evacuated from Hanoi in July 1954. In most of these operations, adversaries did not make serious attempts to disrupt the evacuation. This may not always be the case. The USAF should be prepared for situations in which the adversary's national military forces or a sizable sub-national group attack the U.S. civilians and military forces during the evacuation.

Let's consider a situation in which the United States must conduct an opposed evacuation of a large number of noncombatants from an urban area. Such a contingency could require the USAF to accomplish all six of the tactical-level tasks listed earlier in this chapter.

In our concept of operation for the year 2015 (see Figure 5.3), we envision using high-endurance UAVs equipped with electro-optical sensors and SARs to provide continuous surveillance of critical areas such as landing zones, the U.S. Embassy, main roads, airfields, and locations of hostile forces. Large medium- and high-altitude UAVs would be supplemented by small, low-altitude platforms and air-dropped ground sensors that could provide very high-resolution surveillance of selected targets. Vertical takeoff and landing (VTOL) aircraft, such as CV-22 Ospreys, would be used to insert security forces to protect the landing zones. The security forces would deploy ground sensors and nonlethal weapons (e.g., acoustic devices) for perimeter security. The security forces would also be able to call on airborne platforms for support. These airborne platforms might deliver sticky foam and other barriers, incapacitating agents, small precision-guided munitions, or directed-energy weapons. Satellite telephones would be used by Embassy staff to arrange pickups for isolated evacuees and to organize the movement of others to landing zones.

If ground convoys were necessary to move evacuees to airfields, ports, or landing zones, their movement could be monitored by UAVs equipped with electro-optical sensors, counterbattery radars,



**Figure 5.3—Conduct Opposed Evacuation of U.S. Nationals from Urban Setting**

and sniper-detection systems. Airborne fire support could be provided by AC-130 gunships, fighter aircraft, or advanced aircraft carrying directed-energy weapons. The gunships and fighter aircraft could use a mix of lethal and nonlethal weapons, as the situation called for.

### **Far-Term CONOP 2: Detect, Identify, and Neutralize WMD Facilities**

The spread of weapons of mass destruction may be the single greatest threat to U.S. interests in the post-Cold War world, particularly if these weapons become available to terrorists. To prevent these weapons from being deployed or used, the USAF may be tasked to detect, identify, and neutralize WMD-production facilities. This is a

task for which air and space power is well suited and will likely play a primary role.

This CONOP for the year 2015 describes a three-step approach to the identification and destruction of an underground biological-weapons research and production facility. First, the suspected facility must be positively identified as a weapons plant. Second, the facility must be destroyed without releasing toxic materials into the atmosphere. Third, battle-damage assessment (BDA) must be performed to confirm that the facility has indeed been destroyed and to determine whether any toxic materials were released during the attack.

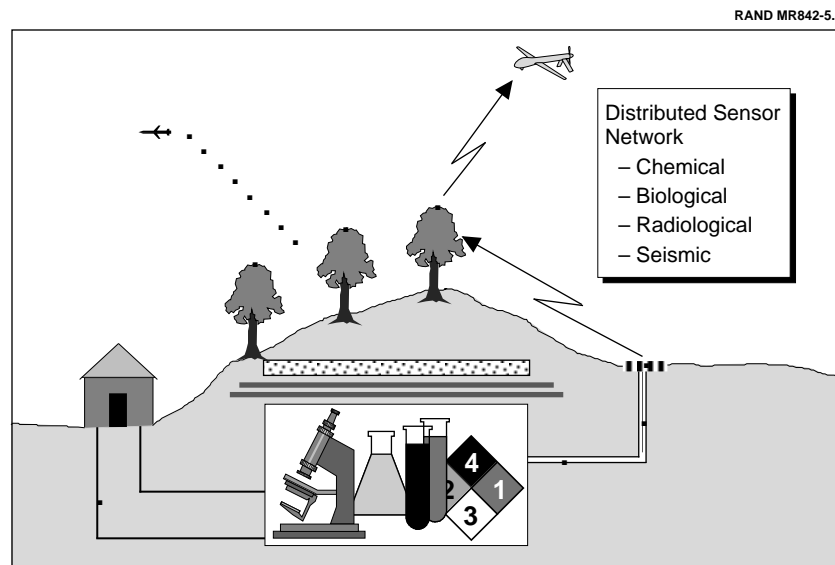
The first step in this CONOP is to confirm that the suspected facility is producing biological weapons. In some cases, the United States might want the host nation to know that it is watching them; in others, this surveillance would need to be covert. In this CONOP, we assume that covert reconnaissance is called for and envision a stealthy UAV dropping insectoids over the suspect facility. *Insectoids* are small (fly size or smaller) autonomous land-based robots that can execute simple instruction sets.<sup>4</sup> Each insectoid would carry one or more sensors that can be used to confirm that the suspected facility is actually producing biological weapons. Sensor types could be video (visual and infrared), chemical, seismic, and others. The insectoids would be programmed to seek out ventilation tunnels and other routes of access to the facility. Some insectoids could be programmed to wait by the door and, at night, jump on a worker's pants' leg for access. We envision that each load of insectoids will be accompanied by one or more "mother insectoids," functioning as the communications center. It will be larger than the other insectoids, to accommodate the power required to communicate with an airborne relay station. Each insectoid will have a low-power communications device; a relay method may be used to transmit gathered information

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<sup>4</sup>These sensors are currently being developed by Sandia National Laboratories and are expected to be available within the next five years. See Pat Cooper, "Tiny Troops May Combat Chemical Agents," *Air Force Times*, December 9, 1996, p. 42; and Keith W. Brendley and Randall Steeb, *Military Applications of Microelectromechanical Systems*, Santa Monica, Calif.: RAND, MR-175-OSD/AF/A, 1993.

to the mother insectoid. In addition to positively confirming that the facility is producing biological material, the insectoids could provide information on the type of toxins being produced, the underground structure of the facility, and other information necessary to plan an attack (see Figure 5.4).

A primary objective during the attack would be to minimize the amount of material that may be vented to the atmosphere. Either of two options is envisioned: (1) detonate high explosives underneath the facility in an effort to entomb the dangerous material or (2) detonate thermal weapons inside the facility to produce very high temperatures and destroy the material before it can be vented. The choice of engagement method requires a careful analysis of the likely characteristics of the underground facility, the types of agents involved, and the nature of the surrounding area (collateral-damage concerns). The engagement CONOP discussed here was chosen to illustrate a variety of plausible technologies.



**Figure 5.4—Step 1: Detect and Identify WMD Facilities**

This CONOP uses a B-2 to deliver one or more guided boosted penetrator weapons equipped with thermal warheads,<sup>5</sup> as shown in Figure 5.5. This weapon would need either a smart or imaging fuze to ensure that it detonated at the optimal depth. One fuze under development by the Air Force uses an accelerometer to determine whether it is passing through concrete, soil, or an empty space (such as an underground room). The fuze could be programmed to detonate in the first room it reaches or on a particular floor of a multi-story facility. The latter option would obviously require that superb intelligence about the facility be gained from the insectoids or other sources. A second fuze option would be a ground-penetrating radar that, just prior to impact, would image the facility to determine the optimal location to detonate. This imaging fuze is in the earliest stages of development and may prove impractical. The figure also shows several other guided weapons being employed on the ventila-

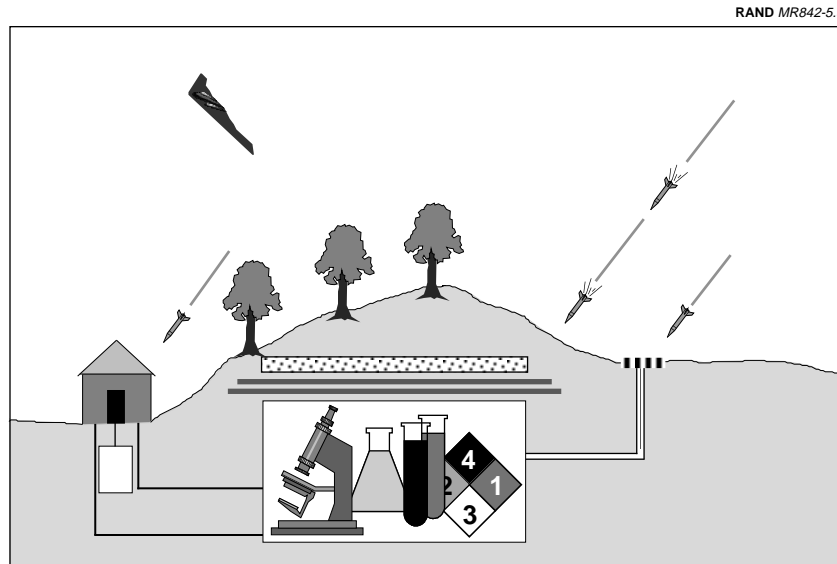


Figure 5.5—Step 2: Neutralize WMD Facilities

<sup>5</sup>The boosted penetrator is an Air Force program that is being developed by the Wright Laboratories.

tion shafts and entry ways. These weapons are intended to maximize damage to the facility and to make repair or extraction of any remaining material more difficult.

Once the facility has been attacked, another set of insectoids is dropped, as shown in Figure 5.6. These insectoids would function in much the same way as in the pre-attack phase, but would likely have a different set of sensors to perform BDA. These insectoids would likely provide images of the damage and test for traces of any biological agents that may have been vented.

### EVALUATING THE CONCEPTS OF OPERATION

All of the CONOPs presented in this chapter could either enhance USAF capabilities to accomplish MOOTW tasks or reduce the operating tempo of USAF forces currently assigned to MOOTW missions. As Table 5.1 indicates, two of the CONOPs enhance USAF capabilities, one reduces optempo, and one achieves both objectives.

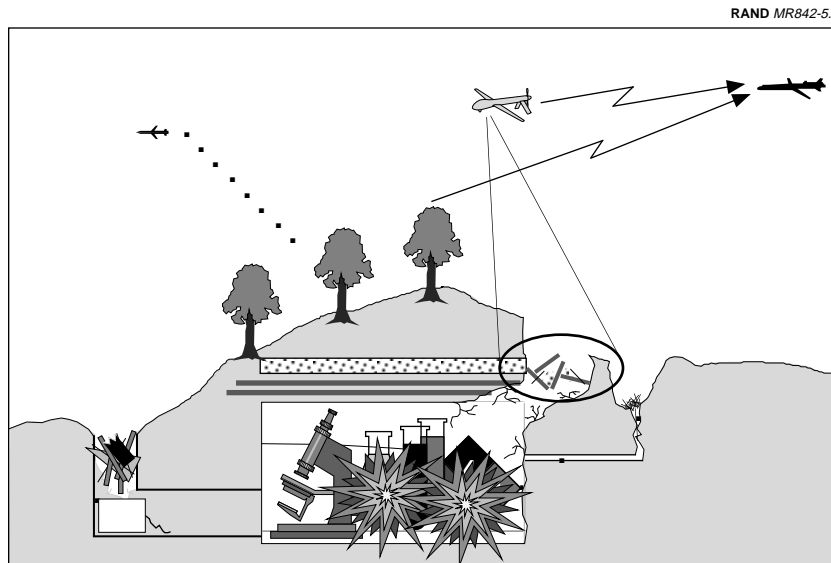


Figure 5.6—Step 3: Conduct BDA Following Attack on WMD Facility

**Table 5.1**  
**Potential of CONOP to Enhance Capabilities**  
**or Reduce Optempo**

CONOP	Enhances USAF Capabilities	Reduces USAF Optempo
Drug interdiction	X	X
Peace monitoring		X
Opposed NEO	X	
Attack WMD	X	

The peace-monitoring concept was the only concept that would not enhance USAF capabilities, but it would achieve its primary objective of reducing optempo. Replacing JSTARS with a UAV would reduce capability, but UAVs with SARs can meet most peace-operations requirements for surveillance. Conversely, if the USAF develops air-implanted ground sensors, they could be used to supplement UAV monitoring of peace operations: Internetted ground-sensor arrays, when combined with airborne SARs, offer a vast improvement over even JSTARS' surveillance potential and could substantially improve USAF capabilities to monitor ground traffic. However, a ground-data fusion center equivalent to the JSTARS battle-management staff would probably have to be created to exploit the UAV and ground sensor data, driving up the cost of this option.

Most of the technologies discussed in this chapter are already being developed, but few are being funded for MOOTW purposes. Some of the technologies will need much more maturing before they can be deployed; others (e.g., SARs on UAVs) are being used operationally in Advanced Concept Technology Demonstration (ACTD) programs. Some of these technologies (e.g., directed-energy weapons) will most likely be developed for MRCs. MOOTW applications will be given low priority, and, unfortunately, most technologies for those applications will fail to reach operational status—some because they prove impractical or too expensive, but many others because they lack strong sponsorship from a user.

It is our hope that the CONOPs presented here will capture the imagination of planners and operators throughout the Air Force and will provide the impetus for new programs to enhance USAF

MOOTW capabilities. We recognize that these are difficult times in which to start new programs but believe that the USAF will find that a relatively small investment in some MOOTW-specific technologies will pay large dividends by adding critical MOOTW tasks to the list of USAF competencies and by minimizing the number of general-purpose forces involved in MOOTW.