

Chapter 1

Introduction

Common sense tells us what can be seen can be hit and killed on the battlefield. The US Army uses smoke and obscurants to attack Threat reconnaissance, surveillance,

and target acquisition (RSTA) efforts. It also uses smoke to protect the force and to support tactical deception operations. By combining obscuration with maneuver you can

protect your force and deny the Threat the ability to acquire and engage it.

Historical Perspective

Armies have used smoke to confuse and deceive their enemies throughout history. We can find indications of smoke operations from as early as 2000 B.C. when the burning of damp straw was a common way to smoke enemy positions.

The War Department proposed the use of smoke to President Lincoln during the War Between the States. The idea was not taken seriously at the time and smoke was used sparingly. Documentation of the period reflected in the Cavalry Journal historical archives suggests that "...a little smoke, judiciously laid down, could have changed the entire course of history. Had the South used smoke, Federal forces may not have been able to stop Pickett's charge at Gettysburg even though the Federal force was greatly superior...."

The use of large-area smoke increased drastically during World War II. The British used smoke to effectively screen harbors, factories, and large cities in the United Kingdom from the Luftwaffe's relentless bombing. In 1943, US forces used smoke to protect the supply facilities and invasion fleet at Bizerte Harbor in North Africa from attacking German aircraft. The smoke blanket placed over this area by smoke generator units

resulted in over 3,000 bombs falling harmlessly in and around the area.

The use of smoke and other man-made obscurants can give a commander an edge if applied properly. Natural obscurants can also be used to friendly advantage. The actions of Combat Command A (CCA), 4th Armored Division, during the Lorraine Campaign, in September 1944, demonstrated the use of fog as a combat multiplier.

On 13 September 1944, CCA forced a crossing of the Moselle River north of the heavily defended city of Nancy. On 14 September, CCA was ordered to bypass Chateau-Salins and exploit the weakness to the south. By 1900 hours, CCA began to draw into a perimeter defense around the town of Arracourt. This allowed the Germans to strengthen their position around Chateau-Salins and assemble forces for a major counterattack against the XII Corps right flank. The Fifth Panzer Army moved north, striking at CCA's exposed position around Arracourt. The ensuing battle was one of the largest armored engagements fought on the Western Front.

On the morning of 19 September, a heavy fog concealed the German movement, giving them tactical surprise and protection from Allied

aircraft. Elements of the 133rd Panzer Brigade penetrated CCA's defenses. Two tank destroyer platoons and a medium tank company engaged the 133rd Panzer Brigade. The fog worked to the defender's (Allied forces) advantage, as the limited visibility negated the superior range of the German tank guns. As the fighting surged back and forth through the fog, CCA's tanks and tank destroyers used their mobility to outmaneuver and ambush the larger Panzers.

From 20 to 25 September, the Fifth Panzer Army directed the IIIrd Panzer Brigade and the IIth Panzer Division into a series of attacks against the Arracourt position. Each assault followed the pattern set on 19 September. The Panzers attacked under the cover of morning fog, only to be thwarted by CCA's mobile defense and driven off by armored counterattacks of company or battalion strength.

The defensive actions fought around Arracourt stalled the German offensive. The 4th Armored Division claimed 281 German tanks destroyed, 3,000 Germans killed, and another 3,000 taken prisoner in the fighting. For the German offensive, the ground fog represented a double-edged sword. It provided

them concealment but ultimately led to their demise. For US forces,

it proved to be a significant combat multiplier.

Description of Smoke and Obscurants

Obscurants are man-made or naturally occurring particles suspended in the air that block or weaken (attenuate) the transmission of a particular part or parts of the electromagnetic spectrum, such as visible light, infrared (IR), or microwaves. Fog, mist, dust, smoke, and chaff are examples of obscurants.

Smoke is an artificially created obscurant normally produced by

burning or vaporizing some product. An example is the vaporization of fog oil to produce smoke from a mechanical smoke generator. We classify US and Threat smoke and obscurants, both currently fielded and developmental, as visual, bispectral, multispectral, or special-purpose obscurants. Visual obscurants defeat the visible through near IR portion of the spectrum; bispectral obscurants

defeat the visible through far IR; multispectral obscurants defeat the visible through millimeter wave; and special purpose obscurants defeat specifically targeted portions of the electromagnetic spectrum.

Appendix G describes the characteristics of smokes and obscurants, how they work, and what obscurants are in the US inventory.

Uses of Smoke and Obscurants

We can render some electro-optical (EO) target acquisition and sighting devices ineffective; others we can degrade significantly; some we cannot affect at all. As a result of the development of IR and radar devices during World War II and subsequent technological advances, EO devices have supplemented conventional visual methods of target acquisition and aiming weapons. Precision-guided munitions and sophisticated sensors provide the ultimate in lethality on the battlefield:

What can be seen can be hit and killed.

We use visual obscurants to defeat the enemy's battlefield viewers, such as binoculars, weapon sights, night observation sights, and laser range finders. We use bispectral obscurants to defeat the enemy's battlefield viewers and weapon guidance systems such as command line-of-sight or terminal homing systems on antitank and air defense missiles. When developed, we will use multispectral obscurants to

defeat the enemy's battlefield viewers; weapon guidance systems; radar systems; and high-energy, microwave-directed energy weapons.

Table 1, on the next page, is a tactical decision aid for selecting the type of smoke to defeat a particular EO system. Detailed information concerning the types of smokes and obscurants and their effects on EO systems are in Appendixes G and B, respectively.

How and Where To Use Smoke

Smoke aids in deceiving the enemy, conceals maneuver, and increases your potential force-on-force ratio when your target acquisition systems can see through the smoke and the Threat's cannot (see Chapter 2). For smoke to do this, you must develop a plan to use smoke synchronized with your tactical plan.

Use the military decision model from FM 101-5 as general guidance for planning and executing smoke operations. Commanders must routinely give planning guidance to the staff that answers the following questions:

- What do I want smoke and obscurants to accomplish? (Degrade target acquisition? Conceal the movement of my main attack? Aid in deception?)
- Where and for how long am I willing to sustain this smoke cloud? (Over my own position? Between my unit and the enemy? On the enemy?)
- How much restriction in my own mobility can I accept? (Visibility 50 meters or less? More?)
- How much restriction in my own target acquisition and engagement capabilities can I accept? (If I deny another's laser designators, I also

deny mine, but my thermal sights are unaffected).

- When might on-call hasty or deliberate smoke benefit me? (Where does my decision support tree indicate I may be exposed and need immediate smoke to obscure the enemy?)
- How will countersmoke help me? (If the enemy uses smoke, where and how should I retaliate with smoke to interfere with their synchronization?)

Categories of Smoke Operations

There are two general categories of smoke operations: hasty and deliberate.

Table 1. Electro-optical systems defeated by smoke.

Hasty Smoke Operations

Hasty smoke operations are smoke operations conducted with minimal prior planning. They are normally executed by the projected, on-board, and smoke generator units (company- and smaller-size elements) on hand at the time of the engagement. This does not mean that hasty smoke operations are not planned; rather, plan hasty operations as on-call smoke in your deliberate smoke plan. Use hasty smoke operations to support a combined arms force to counter an enemy action or anticipated enemy action of immediate concern to the commander. Hasty smoke operations generally cover a small area for a short duration.

Deliberate Smoke Operations

Deliberate smoke operations are conducted with detailed planning and are executed by either on-hand smoke assets or with those on hand augmented by corps and theater assets. Deliberate smoke operations normally are synchronized with specific times, events, or locations on the battlefield (for example, when we are within 1,500 meters of the objective, fire six battery volleys of 50-percent high-explosive and 50-percent smoke munitions onto the objective to obscure enemy observa-

Spectral Region	Electro-Optical System	Type of Smoke
Visible 0.40–0.75 mm	Viewers: – Daylight Sights – Naked Eye – Camera Lens – Binoculars/Standard Optics – Battlefield TV – CLOS Missiles (for example AT-3) – Night Sights	All
Near IR 0.75–4.00 mm	Viewers: – SACLOS Missiles (for example, AT-4 and AT-5) – Night Sights	All
	Sensors: – Laser Designators – Laser Range finders	All
Mid-IR 4–14 mm	Viewers: – Passive Thermal Sights	WP, PWP, RP, Type III IR Obscurant, Dust
Far-IR 14–100 mm	Sensors: – Thermal Imagers – Terminal Homing Missiles (AT-6)	WP, PWP, RP, Type III IR Obscurant, Dust
MM Wave and Lower Frequency 1.10 mm	Radar Radio Microwaves	WP and PWP (Instantaneous Interruption Only), Developmental Obscurants
X Ray and Higher Frequency	Directed EMP Nuclear Weapons	Oil Smoke (Attenuation Only), Developmental Obscurants

tion). Deliberate smoke operations normally include multiple pre-planned smoke operations. They cover large areas over long periods

to support the operations of brigades, divisions, and corps.

Smoke Planning

Each echelon of command plans for smoke employment to support both current and future operations. Integrate smoke into the overall tactical plan, synchronized with key events or decision points. Base smoke planning on the same factors

as the tactical plan: mission, enemy situation, terrain, weather, troops available, time, and distance. Mission considerations include unit capabilities, detailed planning and preparation, employment techniques, communications, intel-

ligence, and whether the unit has successfully operated in smoke previously.

The G3/S3 has primary staff responsibility for planning smoke operations in coordination with the fire support officer (FSO), G2/S2,

G4/S4, smoke unit commander, chemical staff officer, and staff weather personnel. When planning smoke operations, the primary focus must be to attack enemy EO systems and degrade enemy combat effectiveness without significantly degrading friendly command, control, or target acquisition capabilities.

Staff officers must constantly plan to integrate smoke into the tactical plans for both current and future operations. Planning ranges from deliberate plans to provide smoke support for future operations in a 48- to 72-hour window to hasty planning for current operations.

Staffs must develop estimates that define enemy capabilities and our own courses of action, analyze smoke targets, and prioritize smoke resources. They must finally recommend courses of action for the commander's approval. When the commander approves the staff estimates, the staff prepares orders that combine smoke with combat power. Appendix A shows a smoke estimate format and a smoke annex to plans and orders.

Situation and Target Development

Targeting begins with the commander's guidance and continues through the development of a prioritized list specifying what targets to attack and when to attack these targets (DECIDE) and acquiring high-payoff targets (DETECT) and what will defeat these targets (DELIVER). This process concludes with the commander's decision on which course of action he will select to engage the various targets: maneuver, fire support, and smoke unit support, or a combination thereof. There are two basic processes in the targeting process: situation development and target development.

Situation development and target development are the processes that provide commanders the intelligence and targeting data they

need to plan and fight the close and deep operation. Both processes, conducted simultaneously, incorporate intelligence preparation of the battlefield (IPB) and the intelligence cycle functions. Situation development enables commanders to see and understand the battlefield in sufficient time and detail to employ their forces and weapons effectively. In situation development, the G2/S2 uses IPB to produce a description of enemy force disposition on the battlefield in terms of location, size, type, direction, rate of movement, and activity. For smoke planners, situation development provides information about weather, terrain, enemy disposition, and composition in the area of interest. FM 34-1 provides a more detailed description of situation development procedures.

IPB provides a basis for accomplishing situation and target development. IPB orients the mission planning, collecting, processing, and disseminating efforts of situation and target development. The IPB process includes—

- Threat evaluation. This is a detailed study of enemy forces and their composition, organization, tactical doctrine, weapons, equipment, and supporting battlefield functional systems. For smoke planning, we focus on enemy EO and smoke capabilities as listed in Chapter 2 and Appendix B.

- Evaluation of areas of interest and operation. This is a study of enemy order of battle (OB) for a specific area of the battlefield. For smoke planning, we focus on numbers and probable locations of EO systems.

- Terrain analysis. This is an analysis of the military aspects of the terrain in a specific area. For smoke planning, we focus on the terrain effects on smoke.

- Weather analysis. This is an analysis of the impact of weather on both terrain and friendly and enemy capabilities. For smoke planning, we focus on the weather effects on smoke.

- Threat integration. This is the development of situation, event, and decision support templates. For smoke planning we input the priority intelligence requirement (PIR) and extract actual findings from the decision support template.

Smoke Estimate Preparation

When the G2/S2 performs the IPB, the chemical officer, in coordination with the G3/S3, FSO, and smoke unit commander, will prepare the smoke estimate. This estimate will go to the G2/S2 and targeting officer for inclusion into the target value analysis (TVA) for fire support planning and to the G3/S3 and chemical staff for smoke target planning.

The chemical staff officer prepares a smoke estimate to recommend courses of action for attacking enemy targets with smoke and obscurants. Besides supporting the commander's estimate, the smoke estimate assists the chemical staff, FSO, and G3/S3 in determining the detailed plan for smoke employment. FM 101-5 contains detailed guidance on the military decision-making process and estimates.

Smoke Support Plan Development

Simultaneous with preparing the smoke estimate, the staff chemical officer develops a draft smoke support plan. The procedures for preparing a smoke support plan are—

- Coordinate with the commander and staff prior to smoke support planning. Obtain the restated mission.

- Obtain required fire and smoke planning information such as task organization, smoke delivery systems, objectives, axis of advance or sector, and commander's intent.

- Recommend smoke support coordinating measures such as key time, place, and event and no smoke

areas and target allocations (smoke unit targets, artillery targets, and mortar targets) based on available information such as restrictive fire line (RFL), coordinated fire line (CFL), no fire line (NFL), munition availability, and priority of fire.

- Update status displays.
 - Plot locations of maneuver elements and objectives.
 - Plot locations of agreed targets.
 - Develop a smoke support plan.
 - Get target lists from the FSO.
 - Modify target lists as necessary.
- Use the smoke target analysis procedures in Appendix A as guidance.
- Develop a list of smoke delivery assets.
 - Decide the type of support required (for example, smoke versus EO system effectiveness).
 - Decide the time support is required.
 - Decide the best delivery system to engage.
 - Decide the best delivery unit to engage (for example, smoke generator unit, direct support (DS), 155-battery).
 - Prepare and consolidate target lists.
 - Assign smoke target numbers. Appendix A outlines the procedure for numbering smoke targets.
 - Coordinate the smoke support plan with the FSO.
 - Inform or brief requirements for fire support engagement with smoke.
 - Obtain target numbers for targets requiring fire support asset engagement.

- Modify the plan as agreed.
- Ensure the plan is logistically supportable and sustainable.
- Brief smoke support plan to obtain concurrence from the commander (or G3/S3 as required by local policy).
- Brief requirements for fire support engagement with smoke.
- Modify the plan as agreed.
- Decide the support.
- Decide the time.
- Decide which smoke delivery unit (s) will engage.
- Finalize the target list.
- Coordinate the fire support plan changes with the commander or G3/S3 and the FSO.
- Inform or brief them concerning changes made in coordination.
- Modify the plan as agreed.
- Coordinate the smoke support plan with adjacent units.
- Inform or brief them concerning the plan.
- Modify the plan if required.
- Confirm coordination with the commander or G3/S3 and with the FSO.
- Brief the smoke unit leader(s) on the smoke annex to the OPORD.

Smoke Support Plan Execution

The extreme impact of smoke on tactical operations mandates close coordination, control, and planning for contingencies. Command supervision and staff supervision are essential to ensure the use of smoke

enhances rather than degrades mission success.

Commanders must control smoke in their area of operations. Use decision points based on IPB and human feedback to control when you start and stop smoke. Smoke unit leaders monitor the communications nets for the supported unit as well as internal nets. This ensures the commander has an immediate response to start or stop smoke at a particular point or time.

Plan to minimize friendly force degradation from our own use of smoke. Rehearse those contingencies. An antitank position with clear fields of fire may be valueless in dense smoke unless the gunner or section leader has rehearsed movement to previously prepared alternate positions (limited visibility positions).

The preceding paragraphs established the "Why" and "How" of smoke support. The remainder of Chapter 1 answers the "When and Where" and "What" and explains with what delivery systems and delivery units we make smoke. The remaining chapters outline Threat (Chapter 2) and provide doctrine, tactics, and techniques for smoke employment in the offense (Chapter 3), defense (Chapter 4), and other operations (Chapter 5). The manual concludes with smoke support sustainment planning considerations (Chapter 6).

Operational Concept for Smoke and Obscurants

Smoke and obscurants themselves are not lethal. However, when synchronized throughout the depth of the battlefield they enhance the maneuver commander's ability to maneuver. They concentrate combat power against enemy vulnerabilities at the critical time and place. They also reduce his own vulnerability to enemy intelligence and target acquisition. Smoke and obscurants provide the commander with

another means to meet the imperatives of the AirLand battle by-

- Degrading the enemy's ability to see.
- Disrupting the enemy's ability to communicate.
- Concealing friendly forces.
- Deceiving the enemy.
- Providing a means to identify and signal.
- Degrading or defeating directed-energy weapons.

- Enhancing friendly weapon system effectiveness.

The Comprehensive Smoke Study analyzed what happened when US forces used smoke and the adversary used smoke, and the net effect on combat effectiveness when both sides used smoke and obscurants. The lessons learned indicate -

- Smoke favors the attacker. Our force exchange ratio improves 25 to 80 percent.

- Projected smoke is important to success, but resource intensive. Firing units require 400 percent above normal basic loads.
- Large-area smoke is beneficial. There is up to a 30-percent increase in our force exchange ratio. Combined with artillery-delivered WP smoke gives a 75-percent increase in our force exchange ratio.
- You should avoid smoke on friendly antitank guided missile lines of sight.

Operational Level of War

Operational objectives within a theater of war include the marshaling and sustaining of forces and materiel to conduct successful campaigns. Commanders and staffs at this level of war will plan and conduct smoke operations to—

- Deceive the enemy as to friendly force location, status, and movement.
- Defeat enemy air and satellite reconnaissance efforts.
- Reduce the effectiveness of enemy fire and air attacks.
- Defeat enemy precision-guided weapons.
- Increase force survivability.

Tactical Level of War

Obscurants can support the movement and positioning of forces on the battlefield and the provision of fire support. They can also conceal the logistical support of forces before, during, and after engagements with the enemy. The objec-

tive of smoke employment is to increase the effectiveness of US operations while reducing the vulnerability of US forces.

Obscurant use supports battlefield deception and enhances friendly combat operations by—

- Increasing friendly force survivability by—
 - Concealing friendly mass and maneuver.
 - Degrading Threat weapon system effectiveness.
 - Attenuating energy weapons.
 - Increasing friendly-to-enemy force ratio.
 - Increasing Threat force vulnerability by—
 - Decreasing Threat rate of advance.
 - Disrupting Threat command and control.
 - Deceiving Threat intelligence collection.

In the offense, the commanders can achieve surprise and protect their force by combining obscurants with maneuver and firepower.

Obscurants allow us to reduce our vulnerability through concealment as we mass forces to attack. Obscurants will conceal friendly movements and screen breaching of obstacles and river crossings. They will also negate the stand-off capabilities of enemy long-range antiarmor weapons and interfere with enemy guidance and acquisition systems. Smoke supports tactical objectives by deceiving the enemy as to the exact location, timing, and size of the main attack. It also isolates units for piecemeal destruction.

In the defense, obscurants support disruption of enemy activities and enhancement of friendly operations throughout the battlefield. Smoke will isolate attacking echelons and conceal friendly unit locations. It will screen friendly maneuvers, support deception, and interfere with enemy movement and communications. Obscurants help to preserve forces essential to the mission. Smoke supports tactical objectives by selectively denying air and ground routes and by forcing the enemy into tightened tactical formations, which are easier targets.

In a nuclear environment, temporary massing of friendly forces may create a particularly lucrative target. Dense smoke provides both concealment and some measure of protection against thermal radiation.

Commander and Staff Considerations

Commanders must be prepared to use smoke to their advantage regardless of whether it is employed by friendly or Threat forces. Commanders and staffs at all levels—

- Consider the use of smoke to enhance friendly scheme of maneuver.
- Avoid developing a predictable pattern of smoke use.
- Anticipate and plan to counter enemy smoke and countersmoke measures (see Chapter 2).
- Train for limited visibility operations to minimize friendly force degradation.

Operational Continuum

Smoke and obscurants disrupt the enemy's ability to locate, acquire, and defeat our forces across the operational continuum. Use smoke in peacetime, conflict, and war.

Peacetime

Use smoke in peacetime in support of security assistance operations, show of force, and

peacekeeping operations. Smoke systems may be particularly useful in segregating or isolating violent elements. This creates a sense of isolation among the people. In counternarcotics operations, use smoke to restrict use of airfields and to conceal the movement of law enforcement personnel.

Conflict

Use smoke in conflict to support all types of military operations. Smoke is useful in insurgency/counterinsurgency and peacetime contingency operations in support of tactical objectives. Smoke systems may be particularly useful in concealing initial insertion of forces.

This would provide surprise and security for our forces.

War

Use smoke in war to support all operational and tactical operations. Smoke is useful from the onset of

hostilities to protect the force, alter force ratios, conceal maneuvering forces, and give leaders an added dimension of flexibility.

Spectrum of Conflict

The Army recognizes that under low-intensity conflict (LIC) conditions indirect, rather than direct, applications of military power are the most appropriate and cost-effective ways to achieve national goals. If US involvement requires military action, force protection and identification of Threat RSTA means are critical. In LIC, use projected, generated, and self-defense smoke to –

- Support counterinsurgency operations. Smoke use can protect the force in all phases of counterinsurgency operations. In addition, when identified we use smoke to attack Threat RSTA means. Smoke creates a psychological feeling of isolation. This may reduce the insurgent's will to resist.

- Support terrorism counteraction. Smoke use can restrict use of airfields or facilities and conceal the movements of counterterrorist forces. Use smoke to conceal objectives prior to assault or occupation

by law enforcement or counterterrorist forces.

- Support peacekeeping operations. Smoke use can protect our forces by screening our forces from Threat observation. It can also restrict the effectiveness of combatant target acquisition or weapon guidance systems. Marking smokes are effective for signaling and early warning. In addition, we can use smoke and obscurants to segregate or isolate forces in conflict.

- Support peacetime contingency operations. Smoke use can protect our forces, particularly in a show of force or demonstration. In strikes, raids, and unconventional warfare, use smoke to attack known Threat RSTA means. For example, in a raid on a suspected Threat communications center, friendly forces would—

- Use projected smoke (for example, mortars, rifle grenades, or aviation-delivered smoke rockets) to obscure guard posts and observa-

tion points. This is particularly important when special operating forces are being inserted.

- Use emplaced smoke such as smoke hand grenades to conceal entry into the facility once their presence is known.
- Use projected or emplaced smoke to conceal their exfiltration route and allow them to break contact.

In high-intensity and mid-intensity conflicts, US forces face large, rapidly maneuvering formations on battlefields characterized by sophisticated weapons, high-consumption rates, and extended time and distance. Smoke supports all types of military operations in mid- and high-intensity conflict.

Using smoke and obscurants across the spectrum of conflict will positively influence the outcome of any operation. Chapters 3 through 5 outline tactics for smoke employment to meet the challenges of the spectrum of conflict.

Smoke and obscurants disrupt enemy combat operations throughout the depth of the battlefield. One of the key concepts in AirLand battle is the entire battlefield consists of one single battle fought by one commander with one plan. Obscurant operations must support all levels of command in fighting a unified battle of deep, close, and rear operations.

Deep Operations

Deep operations disrupt the enemy's movement in-depth, destroy high-value targets behind the enemy's lines, and interrupt enemy

The Battlefield

command and control at key decision points. Deep attacks are conducted to create "windows of opportunity" by disrupting or destroying follow-on echelons. Smoke systems that support the deep battle include aviation, artillery, smoke generator, and armored vehicle smoke systems.

Army aviation assets deliver smoke rockets from attack helicopters to obscure enemy observation, degrade target acquisition, and mark targets for close air support aircraft. Medium-lift helicopters supporting airmobile operations can move chemical units with smoke generators behind enemy lines. In

addition, we can air transport the chemical company of an airborne division to support airborne operations in the deep battle.

Current artillery-delivered obscurants will seldom have a direct impact on deep strike capability. In the far term, millimeter wave obscurants delivered by rockets onto radar sites will be effective to suppress enemy air defense and counterbattery abilities. Similarly, special purpose obscurants that block certain regions of the electromagnetic radiation will be more effective in disrupting hardened command and control centers than high-explosive munitions.

Deep attacks with armored columns may require the use of smoke self-protection systems. Combat vehicle defensive obscurant systems include vehicular launched grenades and vehicle engine exhaust systems. The prime constraints will be logistical support (fuel and armament).

Close Operations

In the defense a covering or screening force occupies a sector far enough forward of the forward edge of the battle area (FEBA) to prevent surprise, to force the enemy to deploy their forces, and to gain sufficient time to respond to the Threat. Extensive use of concealing and deception smoke helps to develop the situation by forcing the enemy to deploy. It also denies information about disposition and composition of friendly forces, degrading enemy target acquisition.

Defending forces fill valleys and terrain defiles with visual obscurants to force enemy helicopters above the obscurant cloud, while ground fire is adjusted, using thermal viewers. Use visual and infrared defeating smokes to support countersurveillance and counter-reconnaissance.

Smoke provides concealment for maneuver and counterattack and reduces the effectiveness of enemy target acquisition. It also deceives the enemy about the true intentions of our forces and creates conditions necessary to surprise them. Smoke enables the covering force to delay the Threat advance more effectively.

When advanced positions can no longer be retained, the security force must quickly and efficiently conduct a passage of lines. It must hand the battle off to the main battle area (MBA) units. Smoke pots, smoke generator units, and projected smoke conceal friendly forces and routes during battle handoff.

Obscurants support the decisive battle in the MBA by concealing

battle preparations, denying enemy intelligence information, and concealing maneuver and counterattack. Units conceal areas for real and decoy battle positions during initial preparation and camouflage. Before the battle, mobile units provide smoke in multiple areas until the battlefield is fully prepared.

Use smoke and obscurants aggressively to assist the unit in regaining the initiative. Obscurants isolate enemy echelons, conceal movement of counterattacking forces, and deceive the enemy about friendly intentions. Smoke from smoke units, smoke pots, and enemy smoke lines conceal movement of friendly forces. Artillery- and mortar-delivered smoke blinds enemy armored and antitank elements while friendly forces attack targets from the flanks using thermal viewers. Obscurants separate enemy echelons to preclude supporting and overmatching fire and to facilitate their piecemeal defeat.

Obscurants in the defense of the MBA require careful preparation to preclude an ill-conceived deception; disruption of friendly activities; or poorly-timed, low-visibility retrograde operations. Obscuration will slow friendly activities. Commanders and planners should plan additional time for movement under smoke and obscurants.

Rear Operations

Because support units normally remain fixed over a period of hours or more, smoke units will normally maintain a large-area haze over brigade and division support activities throughout the early part of the battle. Based on command priorities and resources, brigade and division support areas may be concealed by obscurants from the beginning to the end of the battle. Obscurants used in rear operations include deception and screening of vital targets. Such targets include communications centers, ammunition supply points, motor pools,

tank parks, assembly and staging areas, and critical portions of main supply routes.

At the operational level, the protection of key transportation and logistics activities is critical to sustaining the force. Echelons above corps must plan for obscurants in the defense to conceal static operations. Ports and terminals; fixed rail facilities such as bridges, tunnels, and rail yards; logistics-over-the-shore sites; dams; locks; trailer transfer points; and critical points along main supply routes must be covered. Obscurants may also provide limited protection for nonstatic operations such as water transport, railroad operations, inland waterways movement, and convoys. Commanders and staffs must carefully plan operations to ensure that the use of friendly obscurants at one logistics facility does not impede activities at another.

Smoke can assist in defeating or delaying enemy airborne and airmobile operations. Place smoke over potential drop zones and landing zones in rear areas to conceal them and force the enemy aircraft to remain exposed to our air defense assets longer. This is particularly useful when you have significant intelligence indicators that airborne or airmobile operations are imminent, as smoke may deny the enemy the ability to insert those forces at all.

In the event of enemy breakthrough, rear sites and some rear area forces will not be able to maneuver away from an attacking Threat force. They will have to defend in place. Placing smoke on rear operations will conceal them from observation. However, this will degrade their operations. Smoke may be placed on the Threat forces, in coordination with electronic warfare and deception assets, to isolate the Threat units and prevent resupply, relief, or reinforcement prior to their destruction.

Battlefield Applications of Smoke

Smoke has four battlefield applications that support combat operations: obscuring, screening, protecting, and marking.

Obscuring Smoke

Obscuring smoke is smoke delivered directly on or immediately in front of enemy positions to blind or degrade their vision both within and beyond their location. Use obscuring smoke to attack and defeat enemy target acquisition and guidance systems at their source. Projected means, such as artillery, mortars, rockets, and rifle grenades, generally deliver obscuring smoke.

For example, smoke delivered on an enemy antitank guided missile (ATGM) position may prevent the system from acquiring or subsequently tracking targets, thereby reducing its effectiveness. Employment of obscuration smoke on an attacking armored force may cause it to vary its speed, inadvertently change its axis of advance, deploy prematurely, and rely on nonvisual means of command and control.

Screening Smoke

Screening smoke is smoke delivered in areas between friendly and enemy forces or in friendly operational areas to degrade enemy ground or aerial observation or both. It also defeats or degrades enemy EO systems. In general, use screening smoke to attack enemy target acquisition and guidance systems by placing smoke between the friendly unit and the sensors. Generated means, such as smoke generators, smoke pots, and smoke hand grenades, deliver screening smoke.

For example, employ screening smoke to conceal ground maneuver, breaching and recovery operations,

key assembly areas, and supply routes. There are three visibility categories for screening smoke that the supported unit commander uses to establish the visibility requirement for a smoke mission. These are —

- **Smoke haze.** A smoke haze is a light concentration of smoke placed over friendly areas to restrict accurate enemy observation and fire. It is not dense enough to disrupt friendly operations within the screen. A smoke haze is defined as a concentration of smoke that would allow an individual to identify a small tactical vehicle between 50 and 150 meters away, but no farther than 150 meters.

- **Smoke blanket.** A smoke blanket is a dense, horizontal development of smoke used over friendly areas to conceal them from enemy ground and aerial observation. A smoke blanket may hamper operations of friendly troops by restricting movement and activity within the screen. It provides maximum concealment. It is a concentration of smoke that would allow the identification of a small tactical vehicle from 0 to 50 meters but no farther.

- **Smoke curtain.** A smoke curtain is a dense, vertical development of smoke. It is placed between friendly and enemy positions to prevent or degrade enemy ground observation of friendly positions. Since the smoke curtain is not placed directly on friendly troops, it will not hamper friendly operations. Commanders should use smoke curtains when friendly forces have air superiority or air parity. It does not prevent aerial observation; however, it may force aircraft to fly higher in order to see behind the curtain, thus increasing vulnerability to air defense weapons. In general, smoke curtains will defeat sensors in the

visual through mid-infrared portions of the spectrum depending on the concentration of the smoke.

Protecting Smoke

Protecting smoke is smoke used to defeat enemy guidance systems or to attenuate energy weapons on the battlefield. Smoke and obscurants have the ability to reflect, refract, or absorb energy. When enemy gunners have already fired ATGMs or have used laser designators, use protecting smoke to immediately screen vehicle movements and defeat enemy guidance links. In an active nuclear environment or when threat of nuclear weapon use is high, use protecting smoke to attenuate the thermal energy from nuclear detonations.

When the enemy possesses directed-energy weapons, use smoke or obscurants to degrade the effects of those weapons. Directed-energy weapons include lasers; high-power microwaves; particle beams; and non-nuclear, directed electromagnetic pulse. A detailed description of the effects of smoke and obscurants on directed-energy weapons is in Appendix B.

Marking Smoke

Marking smoke includes smoke used to mark targets, identify friendly positions, and provide for prearranged battlefield communications. The smoke means used for identification or signaling smoke are normally projected means and smoke hand grenades. For example, use helicopter-delivered smoke rockets to mark a target for destruction by close air support aircraft, artillery, or mortars. Use smoke hand grenades to signal aircraft.

Smoke Delivery Means

The primary factors that affect delivery of smoke onto a target are the smoke weapon system (delivery means and smoke agents) and terrain and weather conditions (steering winds and temperature gradients). Appendixes C and G detail smoke delivery means and smoke agents, respectively.

Smoke Delivery Systems

In general, there are three means for producing smoke: projected, self-defense, and generated smoke devices and systems.

Projected Smoke

Projected smoke is smoke produced by artillery or mortar munitions, naval gunfire, helicopter-delivered rockets, and bombs and generator smoke from fixed-wing aircraft. The advantage of using projected smoke munitions is you can place smoke directly on a deep, close, or rear target.

The disadvantage of projected smoke is that most projected smoke devices and munitions are lethal; they cannot be used on or near friendly forces. Most unit basic loads for munitions are insufficient for sustaining smoke on a target. The exception to this is generator smoke from fixed- and rotary-wing aircraft, which is considered a projected smoke system because of its ability to obscure deep targets.

Projected smoke can support both short- and long-duration missions based on the availability of ammunition. Combine use of projected smoke munitions with other smoke employment means throughout the battlefield.

The ideal battlefield applications for projected smoke systems are producing obscuring smoke, initiating screening smoke, and marking targets. For example, use projected smoke systems to place smoke on enemy intelligence gathering assets, ATGM positions, and artillery for-

ward observers. Also, use them for initiating screening smoke forward of an attacking force that smoke generators will sustain.

Self-Defense Smoke

Self-defense smoke is smoke produced by smoke grenade launchers and the vehicle engine exhaust smoke system (VEESS), which we mount on most armored vehicles. An advantage of this system is rapid smoke production and responsiveness to the small unit leader. Disadvantages include danger to dismounted troops with the grenade launchers, interrupting your own target acquisition while taking evasive maneuvers, and additional fuel consumption for VEES.

The ideal battlefield application for self-defense smoke devices is to conceal armored vehicle movements and to reduce vulnerability to attack by enemy antiarmor weapons. The devices function as follows:

- Armored vehicle smoke grenade launchers. Mounted on M88, M113, M60, M1, M2, and M3 families of armored vehicles, smoke grenade launchers provide rapid obscurant production to assist the vehicle in self-defense. The launchers deliver the obscurant in front and/or to the flanks of a vehicle by smoke grenades electrically fired from the vehicle.
- Vehicle engine exhaust smoke system. The VEES injects diesel fuel into the engine exhaust system. The fuel then vaporizes and is released into the air, where it condenses and produces smoke. Vehicles that currently have the VEES include the AVLB, LEV, M88A11, M60, M1, M2, and M3 families of combat vehicles.

Generated Smoke

Generated smoke is smoke produced by smoke pots, smoke grenades, and smoke generators. Steering winds deliver generated smoke to a target. Combine generated smoke with projected

smoke to provide depth of coverage throughout the battlefield.

Generated smoke can cover small and large areas for up to an indefinite period of time based on the availability of logistical support, particularly fuel.

- Smoke pots and smoke grenades. You can pre-position these. They do not require an operator. You can ignite them manually or electrically. Use these smoke devices in hasty smoke operations because of their relatively short burn time and ease of access. The ideal battlefield applications for smoke pots are initiating screening smoke, marking smoke, and providing smoke unit self-protection. Smoke hand grenades are best for small-area screening smoke (squad-size maneuver) and marking smoke.

- Smoke generators. Smoke generator units produce large volumes of smoke to support hasty or deliberate smoke operations. Smoke generator units require a stand-off distance from the target based on wind speed and direction. Smoke generators are ideal for large-area smoke missions of long duration. They require detailed planning for logistical support. The ideal battlefield applications for smoke generators include screening, protecting, and sustaining obscuring smoke.

There are two concepts for employing smoke generators: mobile and stationary.

Mobile smoke is smoke produced while the system is on the move. Mobile smoke units normally are positioned well forward on the battlefield. They have the advantage of maneuver, but are exposed to more enemy weapon systems. They have a self-concealment ability that enhances their survival, and they can make smoke from a freed position or while moving. Mobile smoke systems rely heavily on passive operations security (OPSEC) measures to enhance their survivability.

Mobile smoke is supplied by units equipped with M1059 mechanized smoke carriers or motorized M157 smoke generators.

The M1059 is an M113 armored personnel carrier (APC) equipped with the M157 smoke generator set. This system can support armored and mechanized forces well forward. It is less vulnerable to small arms and indirect fire than wheeled systems due to its armored plating. Its tracked chassis provides it with the ability to move with its supported unit both on and off the road.

The motorized M157 smoke generator is an M1037 HMMWV equipped with an M157 smoke generator set. This system can provide mobile smoke to light infantry and specialized units. This system is vulnerable to small arms and indirect fire.

Stationary smoke is smoke produced from a fixed location, normally by units equipped with M3A4 mechanical pulse jet smoke generators mounted on M998 HMMWVs or M151 1/4-ton vehicles with trailers. Units move their vehicles and smoke generators into positions on a smoke line and then produce smoke. These units are limited by their mobility and require more time to set up and depart an area. They are well-suited for large-area smoke missions conducted in rear areas.

Weather and Terrain Effects

Steering winds actually carry the smoke and determine its direction, speed, and downwind travel distance. Temperature gradients are normally based on the time of day. Temperature gradients affect the

height, density, duration, and travel distance of smoke. There are three types of temperature gradients: lapse, neutral, and inversion.

Since steering winds carry smoke, smoke usually follows the contours of the earth's surface. On flat, unbroken terrain and over water (open terrain), smoke streamers take longer to spread out and mix with other streamers. Obstructions, such as trees and buildings, tend to break up smoke streamers. The streamers may then re-form, cover a larger area, and create a more uniform cloud than over open terrain. Large hill masses and very rugged terrain cause strong cross currents of wind and tend to create holes and uneven dispersal of the smoke cloud.

Appendix F details the effects of weather and terrain on obscurants. It also gives a summary of the best and worst employment conditions.

Smoke Units

Smoke generator units are assigned to chemical battalions under chemical brigades at corps, to chemical battalions at TAACOMs, and to divisions. Detailed information concerning the modified or living tables of organization and equipment (MTOEs/LTOEs) and capabilities of these units is in Appendix D.

The platoon is the lowest echelon of command for smoke units that is self-sufficient. Table 2, below, out-

lines the smoke coverage capabilities of smoke platoons.

Tactics, Techniques, Procedures, and Unit Guidelines

Smoke tends to draw enemy attention and fire especially when used over friendly areas. The effect of enemy fire can be minimized by detailed planning, synchronizing all smoke assets with firepower, and

limiting exposure of smoke assets to that fire.

Tactics, Techniques, and Procedures

The commander that "owns" the terrain is responsible for controlling the smoke. Place smoke before the enemy can pinpoint targets. Employ smoke during hours of darkness and limited visibility periods (rain, fog, ice fog, snow, sleet) to enhance its effectiveness. Synchronize all smoke assets for maximum impact

Table 2. Smoke platoon coverage capabilities.

Stationary Smoke	No. of Generators	No. of Point Sources	Average Cloud Parameters			
			Crosswind Width		Downwind Depth	
			Haze	Blanket	Haze	Blanket
	24	24	1.00–3.40 km	0.50–1.70 km	0.65–10.00 km	0.65–10.00 km
	24	12	0.50–1.70 km	0.30–0.90 km	0.65–10.00 km	0.65–10.00 km
	12	6	0.30–0.90 km	0.15–0.50 km	0.65–10.00 km	0.65–10.00 km
Mobile Smoke	12	6	0.55–1.40 km	0.50–1.20 km	0.15–3.60 km	0.05–1.40 km
	14	7	0.60–1.50 km	0.55–1.30 km	0.15–3.60 km	0.05–1.45 km

against the enemy. Coordinate smoke employment with adjacent units and all units in the operational area to minimize friendly unit degradation.

Understand that smoke compresses the battlefield by limiting visibility. Training soldiers to operate in smoke reduces the degradation caused by smoke. It also reduces psychological impact such as confusion, fear, and isolation on troops.

Smoke cloud size should be large enough to prevent the enemy from saturating the entire smoked area with fire. The target should be offset from center within the smoke. A rule of thumb is for the screen to be five times the size of the target. Avoid patterns for smoke employment. Avoid placing smoke over the center of your target every time. Maneuver using the flanks and edges of the smoke alternatively with the center.

To support tactical deception, employ smoke over other likely areas to dilute the volume of fire and draw attention to the areas of little or no importance. The smoke should approximate the principal smoke cloud in size. Establish and enforce mobile smoke control measures. The smoke control officer controls the smoke operation from a vantage point allowing target observation, ensuring it is completely concealed by smoke. When using self-defense smoke, ensure the entire squad, section, or platoon uses the smoke simultaneously to preclude drawing attention to a lone vehicle.

Start the smoke mission prior to operation start time and continue well beyond the end of the operation. For example, a river crossing is scheduled for the time from 0500 to 0700. Start smoke at 0400 and stop smoke at 0800 to confuse the enemy as to the exact crossing time and size of the force.

Limited visibility positions, preplanned and previously prepared, will minimize degradation caused by friendly or Threat use of

smoke. Rehearsal of displacement under smoke will help you avoid confusion and disorientation and rapidly restore engagement capability.

Unit Guidelines

Smoke units are vulnerable to enemy direct fire weapons. Use the following guidelines when employing smoke generator units. Smoke units should, whenever possible, avoid prominent terrain features and locations that would permit accurate map firings or fire through adjustment from a known point.

Do not use mobile smoke vehicles to lead the attack. Use them to screen the flanks or main body maneuvering forces. Do not employ smoke units less than a platoon-size element. Use stationary smoke units to conceal rear area facilities and light infantry forces.

Command and Support

Smoke units operate under two types of relationships: command and support. A command relationship reflects the chain of command and degree of authority. A support relationship represents the manner in which the maneuver unit is to be supported.

In the tactical planning process the staff recommends the appropriate command or support relationship between the chemical unit and the supported unit. This relationship defines the specific responsibilities between supporting and supported units. Generally, smoke units at corps and division levels establish support rather than command relationships. Direct support (DS) is the preferred support relationship for company-size and larger chemical units. Attachment is the preferred command relationship for chemical platoons.

Organization and Principles

Smoke units work most efficiently under the control of a parent chemi-

cal unit. This organization permits close control and the most productive use of all assets. The commander continuously monitors the progress of assigned tasks. He shifts elements where the need is greatest throughout his area of operations. On the other hand the supported unit commander at the lowest level gets greater responsiveness when the chemical unit is under his direct control. He determines the task organization and gives missions directly to the units under him.

Providing smoke units in a command or a support relationship is a balance between the needs of the higher commander for flexibility and the needs of the subordinate commander for responsiveness. The corps may provide each committed heavy division with one motorized and one mechanized smoke company. Light infantry divisions are normally provided a dual-purpose smoke/decontamination company. Units are provided in either a command or support relationship.

For brigades already in contact or when contact is imminent, it is also appropriate for the division to allocate chemical units in an OPCON or attached status. Brigades, in turn, can provide chemical assets directly to their battalion task forces only when they receive the chemical assets from the division in a command relationship. Otherwise, the chemical unit commander deploys his subordinate elements based on his estimate.

At each echelon, commanders use organizational principles, derived from the AirLand battle imperatives, to guide the employment of chemical units. These principles include the following:

- Task organize to meet requirements. Mission requirements drive size and composition of task forces. A mix of chemical units is often necessary to achieve the proper balance of capabilities.
- Task organize by platoons.
- Give priority to the main effort. There are not enough chemical assets on the battlefield to handle all

tasks. Chemical units are not spread evenly across the battlefield but are concentrated with the main effort to ensure its success.

- Integrate chemical support with maneuver and fire. The scheme of maneuver governs the use of smoke and reconnaissance assets.
- Do not hold smoke units in reserve. Smoke assets are too scarce and valuable to be held out of the fight. They must refit quickly and return to their primary mission.
- Make logistically sustainable plans. Resources are always limited. The availability of fuel and fog oil restricts chemical unit ability to execute smoke missions. Conduct detailed planning for chemical unit sustainment and supporting logistics.
- Maintain effective command and control. Effective plans use all available controlling headquarters and hand off operations smoothly between them.

Responsibilities

When supported by a smoke generator unit, both the maneuver unit commander and the smoke unit commander have specific sets of responsibilities for planning and coordinating the smoke mission. Smoke missions involve close coordination between the supported unit commander and staff and the smoke unit commander. Commanders must use the same troop-leading procedures for smoke assets as they will for their maneuver units, ensuring smoke unit commanders have adequate time and resources to plan and prepare for smoke support.

Maneuver Unit Commander's Responsibilities

The maneuver unit commander is responsible for the overall tactical

operation. This commander must execute coordination with all units participating in or influenced by the smoke operation. He defines smoke support requirements to include—

- His intent.
- Visibility criteria within the smoke.
- Location and size of the smoke target.
- Time for effective smoke to be on the target.
- Duration of effective smoke on the target.
- Security of smoke assets.
- Immediate support available for the mission.
- Preparation of a smoke annex for the operation.

Smoke Unit Commander's Responsibilities

When the smoke plan calls for support from a smoke generator unit, the commander of the smoke unit is responsible for all activities concerning establishing and maintaining smoke on the designated target. Based upon information from the maneuver commander, the smoke unit commander performs the following tasks:

- Plans for map, air, or ground reconnaissance.
- Coordinates the mission with supported and adjacent units.
- Selects and coordinates smoke lanes (mobile smoke) or smoke lines (stationary smoke).
- Coordinates communications nets.
- Provides input for the smoke annex.
- Identifies additional support requirements within the limitations of command or support relationships.

Chemical Staff Officer's Responsibilities

The chemical staff officer plans and monitors the execution of the

smoke plan, in coordination with the FSO and smoke unit commander. The procedures for smoke planning have been discussed. The procedures for monitoring execution are—

- Direct the chemical staff in monitoring the smoke support plan.
- Monitor planned smoke engagement by fire support assets:
 - Coordinate with FScell.
 - Determine whether planned fire was executed.
 - Make changes as necessary.
 - Report changes as required.
 - Update status displays.
- Monitor planned smoke engagement by smoke unit assets:
 - Monitor the smoke unit net.
 - Determine success (Smoke on target on time? Did it achieve purpose?).
 - Make changes as necessary.
 - Report changes as required.
 - Update status displays.
- Monitor planned smoke employment by maneuver units (for example, VEES and smoke pots):
 - Monitor the appropriate command or maneuver unit net.
 - Determine success (Smoke on target on time? Did it achieve purpose?).
 - Make changes as necessary.
 - Report changes as required.
 - Update status displays.
- Monitor immediate calls for smoke:
 - Monitor the appropriate net (FScell and smoke unit).
 - Determine if smoke support is required.
 - Determine the best asset to engage. (Note: Fire support assets have the quickest response time.)
 - Respond if necessary to coordinate smoke support from other than fire support assets.
 - Update status displays.