Smoke and Obscurants

Exploiting the electromagnetic spectrum in the 21st Century

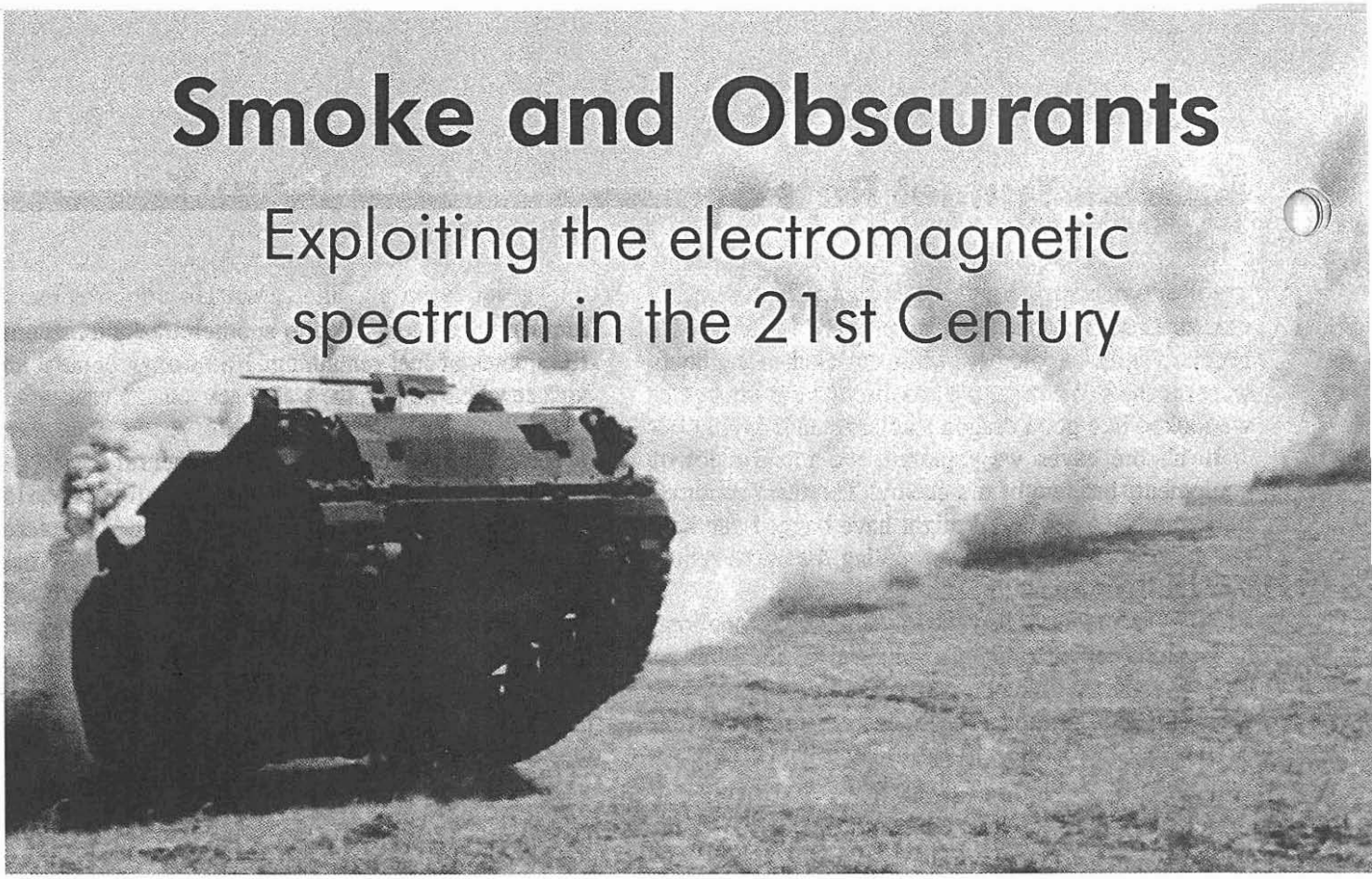


Photo courtesy Visual Information Division, CBDCOM.

By CPT Douglas W. Wishart

As the expected smoke and obscurant technology and employment criteria emerge in the 21st Century, the field commander's offensive and defensive combat capabilities will expand exponentially. This article highlights those capabilities that the US Army Chemical School is currently investigating for possible inclusion in the Force XXI Operations Concept for Smoke and Obscurants.

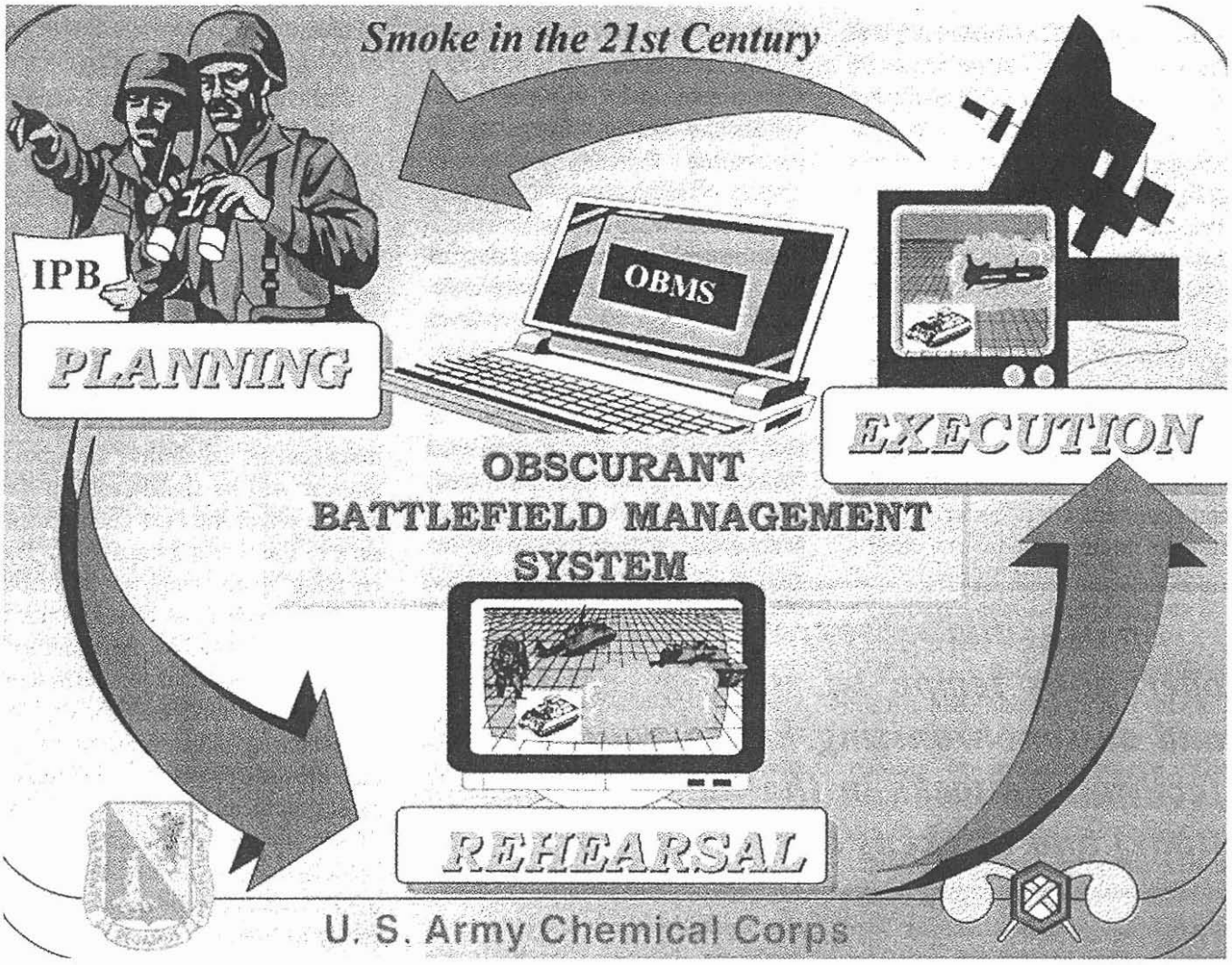
These issues reflect developments spawned by user requirements that effectively exploit electromagnetic capabilities in support of the Force XXI concept of future combat. It amplifies future program concepts and developments in four areas:

- Combat Capability.
- Support to Force XXI patterns of operation.
- Automated obscurant battlefield management system.
- Impact on key areas of DTLOM (doctrine, training, leader development, organization, and materiel).

Combat Capability

Developing technologies can significantly expand the application of smoke and obscurants in combat operations. Military leaders should expect future adversaries to use visual, infrared, thermal, and millimeter wave targeting and acquisition systems. The US continues to develop new obscurants that are better able to defeat, control, and dominate the multi-spectral battlespace of future conflicts. Currently, smoke is employed exclusively as a passive defense measure. Doctrinally, smoke is employed to deny the threat the use of his optical and visual devices, thereby limiting his capability to develop an accurate picture of the battlespace and acquire targets. The Force XXI concept seeks to exploit the multiple aspects of smoke and obscurant capabilities throughout the entire electromagnetic spectrum.

The US will expand its passive defense capabilities to deny threat forces the ability to perceive the battlespace from the ultraviolet wave level through the extremely low frequency wave level. Ongoing



investigations into bi-spectral and multi-spectral smokes and obscurants, particularly at the millimeter wave level, are uncovering reliable battlefield methods/materiels to mask friendly forces from detection and targeting.

These methods/materiels do not alter or suppress the target signature, but rather reduce the amount of energy reaching the sensor from the target; that is, change the target's apparent signature. The goal is to open and close the threat's windows of observation (while maintaining uninterrupted friendly observation) onto the battlespace.

The US is also pursuing active measures to target and attack threat sensor arrays and seeker mechanisms. Smoke and obscurants designed for this mission would attenuate those frequencies used for target acquisition, target lock, guidance, control, and arming or activation.

These methods include the use of specific band width obscurant technology, high power microwave and directed energy weapon technologies. These 21st Century EM weapons will attenuate precision guided munitions by masking normal electronic signals, generating false signals, or overloading the system by saturating the sensor. The goal is to deposit enough energy into smart weapons to induce failure.

The Army continues to develop non-lethal capabilities to destroy the threat's communications and electronics network through the use of non-nuclear electromagnetic pulse, high-energy lasers, and DEWs. These systems direct their energy into weapon emitter and collector devises causing circuitry overload, leading to meltdown and permanent system failure.

These aggressive and non-lethal developments in the smoke and obscurant concept can provide the commander another tool to affect the threat's decision-making cycle

and control the operations tempo of the battle. However, we must be vigilant in our quest to achieve spectral supremacy. As these new technologies become weaponized, the designers must ensure that friendly weapons systems and capabilities are not degraded. Achieving this includes expanding our knowledge and ability to control the radiation footprint of smokes and obscurants.

Commanders require the tools to neutralize, on demand, those effects that degrade their weapons. Joint and combined coordination will ensure we do not impede each other's warfighting capabilities. By exploiting the capabilities of 21st Century smoke and obscurants, we will seek to achieve spectrum supremacy.

Support to Force XXI Patterns of Operations

This concept supports all patterns of Force XXI operations. To achieve success, the future Army must dominate the battlespace in all six dimensions. During force projection operations, the campaign of denying the adversary critical battlefield information begins. Friendly forces control visual and non-visual observation, targeting, and acquisition by dominating the EM spectrum. Threat forces are denied battlefield observation; enemy systems "can't hit what they don't see."

Smoke and obscurants provide a four-dimensional obstacle that shapes the enemy's image of the battlespace. Friendly forces will display what they want to be seen, and conceal what they want to conceal (deception). Smoke and obscurants support a counter-reconnaissance campaign that enhances force protection and deception operations.

They are the tactical commander's quick response tools to open and close four-dimensional "windows" in the visual, infrared, and millimeter wave spectrums. Smoke and obscurants disrupt enemy operations tempo by slowing, confusing, and de-synchronizing his operations. This facilitates attacks in the fourth dimension (time) and thickens the fog of war.

Smoke and obscurants disrupt enemy operations tempo by slowing, confusing, and de-synchronizing his operations. This facilitates attacks in the fourth dimension (time) and thickens the fog of war.

Smoke and obscurants can be used to either conceal, or draw attention to friendly operations. When integrated into a comprehensive deception plan, these assets help deceive the enemy as to friendly intentions.

The bottom line: smoke and obscurants support all patterns of operations in the Force XXI concept. Smoke and obscurants in active defense and non-lethal attack operations will help establish spectrum supremacy for Force XXI forces and ensure the success of allied and coalitions forces throughout 21st Century land combat.

Automated Obscurant Battlefield Management System

The future smoke and obscurant planner must have the capability to develop an effective plan, conduct rehearsals, and monitor their execution. For planning purposes, the planner must know and understand how the threat sensors and seekers are arrayed and the threat's capability to use the electromagnetic spectrum.

With a responsive obscuration management capability, the smoke planner will be significantly better able to select the best countermeasure to the threat's capability. The resulting plan employs available smoke and obscurant assets at critical times and locations on the battlefield.

A battlefield management system also requires modeling capabilities for planning and wargaming to ensure the desired results. This model must graphically portray the effects of smoke and obscurants on the battlefield. The smoke planner can then determine if the desired effects are achievable.

Finally, and maybe most importantly, the smoke planner must be able to monitor the execution and effectiveness of the smoke mission. From the planning headquarters, the smoke operation is monitored with assessments of effectiveness made with real time data. The obscurant battlefield management system must be automated and integrated into the maneuver control system. The obscurant battlefield management system ensures that missions are planned, rehearsed, and executed to meet the commander's intent.

Impact on DTLOM

As concept designers continue massaging and molding these con-

cepts into a joint and combined philosophy, it is critical to assess their impact on our ability to absorb them into the current combat paradigm. This section highlights some of the major concerns and deficiencies that need to be overcome in order to facilitate an orderly and efficient evolution.

Doctrine: When transforming smoke from a passive defense role to an attack role, doctrine developers must identify new employment criteria that describe which smoke systems operate most effectively from which locations and times on the battlefields. Tactics, techniques, and procedures must describe the battlefield use of these new capabilities and technologies.

Training: Due to the current tactical perception of smoke, prevalent environmental concerns, and the dwindling availability of training funds, field units conduct only very limited, meaningful smoke training. Leaders must therefore train the force to execute its wartime mission in a limited visibility environment.

Implementing mission training plan programs and incorporating both passive and active smoke operations are essential for developing an elite fighting force. Simulation techniques are required that are less costly and less hazardous to both our soldiers' health and the environment. All our soldiers, particularly our smoke specialists, require quality and realistic training to develop the skills needed for 21st Century warfare.

Joint, multinational, and interagency training exercises are critical to mission success. The force must train as the team it will fight as. This is especially true when several international partners operate in a shared multi-spectral battlespace. The tactical and strategic ramifications of smoke and obscurants demand a well-rehearsed and synchronized team on the initial day of hostilities.

Leader development: Those individuals (the smoke planner at the brigade, division, and corps level) who have the responsibility for planning and recommending smoke and obscurant missions, require an in-depth knowledge of how the threat arrays his sensors and seekers. This knowledge will facilitate proper employment of these new capabilities. With our goal to dominate the EM spectrum, smoke and obscurant personnel need significant training to fulfill their role as the smoke and obscurants supremacy manager.

Organization: The development of an automated smoke management system and its implementation at the unit level would require a significant support package. This capability requires additional operators and maintenance support personnel at the unit and higher levels. This addition may also require an increase in unit transportation assets to ensure the unit's mobility.

The other structure change identified for further study carries over from the previously published smoke concept—namely, the addition or conversion of selected smoke generator assets to provide projected smoke. The increased use of obscurants in training and combat operations may require some force structure refinements at echelons above corps and possible adjustments to the active/reserve component mix.

As additional smoke force structure is added to the total Army, the overall capability to supply fog oil and JP8 (or other smoke agents and fuel sources) must be closely monitored to ensure sufficient personnel, vehicles, and maintenance support remain available.

Materiel: Materiel developments will drive 21st Century smoke and obscurant capabilities. Industry and the Department of Defense have joined, in a cooperative effort, to develop these areas. Materiel developments are needed in five areas.

- Fog oils/materials
- Obscurant particles/tuning materials
- Delivery means.
- Simulation/modeling software.
- Unit-level meteorological data acquisition and interface.

There are few current substitutes for fog oils. The single fuel forward concept has limited the force's capability to produce smoke. The field lacks sufficient alternative media to suspend spectral attenuating material; supplementary material is required for increased survivability.

Continued development of obscurant particles/tuning materiel is inherent to the success of Force XXI smoke and obscurants. Since the reduction in atmospheric transmission is wavelength dependent, a smoke that significantly degrades one wavelength may have no effect on another. Therefore, smoke must be tuned to obscure the desired wavelength.

This is accomplished by controlling the particle size and materiel. Multi-spectral obscurants and/or the ability to tune, as needed on the battlefield, would significantly improve friendly combat capability. The US Army begins fielding graphite-enhanced smoke systems, capable of visual through mid-infrared wave attenuation, in the near

future. Experimentation should continue, at the current level of effort, on economical and environmentally friendly millimeter wave smokes.

Previous studies have neglected many significant user requirements. Future programs in dissipation and clearing, and programs dealing with attenuation of directed energy and thermonuclear weapons require an increased level of effort to support these user needs.

Current barriers to the technical success of the smoke and obscurants program include identifying materiels that meet both attenuation and environmental constraints, the development of packaging technology that lends itself to high efficiency dissemination, and the development of nondestructive dissemination techniques that preserve the necessary particle characteristics.

Simulation and modeling software require efforts directed to increase the overall level of understanding of how and why clouds build, travel, and spread. This knowledge is key to the development of prediction solutions and the subsequent development of an automated management system.

The other element imperative to accurate battlefield cloud predictions is an improved, up-to-date meteorological information interface system at the unit level. A possible way to achieve these needs would be to expand the scope of the Joint Nuclear, Biological, and Chemical Warning and Reporting Network (JWARN) program to include smoke and obscurants prediction and tracking.

The current JWARN operational concept describes a system that automatically transfers data to and from units on the battlefield and provides commanders with analyzed data, additional data processing capability for the production of plans and reports, and access to specific NBC information. This concept should support an automated meteorological database and smoke prediction capability. Future JWARN upgrade proposals should include the study of this capability.

Conclusion

Smoke and obscurants in the 21st Century will be a critical element of combat power. The US Army will expand its doctrine and tactics, techniques, and procedures for the employment of smoke and obscurants. Smoke and obscurants will no longer be used as a limited passive measure degrading both friendly and enemy forces equally. The smoke and obscurant concept provides force protection by several means to include attacking and defeating sensors and seekers. It includes methods/materiels for non-lethal destruction with high energy and directed energy weapons. Smokers in the 21st Century require the best obscurant battlefield management system for planning and implementing both defensive and offensive operations. Commanders require a mix of smoke and obscurant capabilities for employment in front line and rear areas and for a variety of effects. The 21st Century smoker will dominate the EM spectrum and assume the critical role of smoke and obscurants supremacy manager.

This is the emerging vision for smoke and obscurants in Force XXI operations—a vision that provides commanders with aggressive new combat tools.

At the time this article was written CPT Wishart was the Obscurant Control Officer, Directorate of Combat Developments, at USACMLS. His previous assignments include Commander, HHD, 23d Chemical Battalion, Camp Carroll, ROK; brigade chemical officer, Aviation Brigade, 2d Infantry Division, Camp Stanley, ROK; platoon leader, 1/11th Chemical Company, Fort McClellan, Alabama; battalion chemical officer, 5-21th IN, 7th Infantry division, Fort Ord, California; battalion chemical officer, 1-72 AR, 2d Infantry Division, Camp Casey, ROK. CPT Wishart has a BS in mechanical engineering at the Virginia Military Institute. He is a graduate of the chemical officer basic and advanced courses, Airborne School, and the observer/controller qualification course at the National Training Center.