

2nd Place
Chemical Corps
Annual Writing Contest

Smoke Units Viable to IBCT and Objective Force— *Informational Dominance Denial Through Use of Advance Obscurants*

By Mr. Frank D. Chapman

Introduction

Army Vision 2010, Joint Vision 2010, Joint Vision 2020, National Security Strategy for New Century, December 1999: National Military Strategy, 1997 Force XXI Division Organizations and Operations, and the Initial Brigade Combat Team (IBCT) Operation and Organization are based on informational superiority/dominance.

There are two components of informational superiority that are required for the Army of Today and the Future to operate and win on the battlefield. These components are gain situational awareness and deny threat/adversary situational awareness, which provide information for answering the following questions:

Gain Situational Awareness

- Where am I?
- Where are friendly forces?
- Where is the threat/adversary?
- What is the environment (weather, terrain)?—

Often left out of conversations and planning

Deny Threat/Adversary Situational Awareness

- Where am I?
- Where are friendly forces?
- Where is the threat/adversary?
- What is the environment (weather, terrain)?

The deny threat/adversary situational awareness part of the information superiority capability is especially important in defeating the adversary's ability for situational awareness though informational dominance. This is accomplished through an integrated multidiscipline (chemical, engineer, armor, infantry, intelligence, signal, air defense, and aviation) effort that degrades/limits the adversary's informational/situational awareness capabilities across a broad spectrum of missions and situations. The need to degrade the ability of other nations and groups to gather and process data for political and military requirements has been demonstrated repeatedly in recent years. Examples of this ability to gain informational awareness includes, but is not limited to, (1) a private company buying satellite photographs of key military bases and missile sites of the United States and other nations with a resolution of 3 meters and (2) the ability of adversaries during Operation Desert Storm and the air campaign in Kosovo to gather and process information on the status of the combat operations by accessing international news organizations cable satellite systems.

Army General Wesley Clark recently stated, "...escalation strategies, unloved by Air Force leadership, may be the wave of the future. The Air Force shouldn't assume it will be given free rein to target all the sites it deems necessary unless allied survival is at stake, because operations such as Desert Storm are likely to be anomalies in the future. 'Desert Storm was a clean battlefield.' Operation Allied Force may be more indicative of what combat will be like in the

future, complete with noncombatants, a capital city rife with strategic complications, and targets such as bridges that serve both military and civilian purposes,” he cautioned. These types of missions are tailored for the commander to limit damages and loss of life.

With the development and fielding of the IBCT and Division, the need to deny the adversary situational awareness takes on new meaning and importance. With the rapid proliferation of information technology systems and advance weapons across national boundaries, now more than ever, the commander must be cognizant of not only his situational/informational awareness but also that of the adversary’s. This is becoming increasingly harder as missions go from combating organized national armies to rebel, drug, or terrorist groups. These groups are well financed and ably led by fanatics.

Background

Information dominance is and has been one of the most important missions of the Chemical Corps’s smoke and obscurant operations. Until recently, the Corps has been effective in the visual arena of operations only. During the last 20 years, the Chemical Corps and the research and development community have been actively seeking and developing advanced materials to provide warfighters with the edge in the informational dominance battle. One of the elusive goals of the obscurant community has been to provide our nation’s warfighters with a single obscurant material that provides protection in multiple energy bands. Several factors that contribute to making this an elusive goal to achieve are that—

- The ideal material from the standpoint of operational capability is within the respiratory range and is suspect for toxicity.
- The ideal material is fibrous and conductive, which is a concern from the environmental aspects.
- Traditional manufacturing methods for particles within the ideal size range are expensive.
- Traditional materials generally fall into the category of finely divided metals and are flammable, particularly when dispersed in air.
- Traditional materials have very low yields on dissemination and are logistically impractical.

Another goal is to produce an obscurant that is tailored for a specific sensor wavelength range. Several factors make this even more elusive to achieve:

- The ideal material from the standpoint of operational capability is within the respiratory range and is suspect for toxicity.
- Other nations’ systems currently operate in the same sensor ranges.
- Current materials are broad-banded in the desired wavelength ranges.
- Materiel system developers do not share

information on system wavelengths with others in the research and development community.

Current Capabilities

Currently, obscurants have only a limited ability to perform informational-dominance missions. This ability has been successful in limiting visual informational gathering for more than 200 years. In the 1990s, with the introduction of infrared obscurants, forward-looking and passive infrared systems have been defeated or severely limited in effectiveness when such obscurants are employed. In 2005, the ability to defeat selected (wavelength) radar systems will become a reality. Some unique aspects of obscurant operational use consist of the ability to select the size of the area to be denied and the system’s ability to continue operating effectively unless you are located inside or behind the obscurant cloud. There is no effective countermeasure to defeat obscurant effects (not including wind and weather) unless you move out of the cloud (if inside) or from behind it. Obscurants are a cheap and effective force multiplier to the commander while using small numbers of personnel and equipment.

Future Capabilities

Leap-ahead technologies are being explored. This will be the foundation for the next-generation obscurant systems required by the Army and as envisioned by the Army Chief of Staff to achieve his concept of a rapidly deployed, precision-strike capability force. Critical drivers for this type of operations are the reduction of the logistics tail and development of new delivery platforms. For obscurants, this means higher-performance materials that reduce quantities required to achieve success. With the research and development of new, advanced obscurant materiel and delivery systems—such as an unmanned ground vehicle (UGV) with a rapid obscuration system and/or an unmanned aerial vehicle (UAV)—the commander will gain new flexibility in the deployment of and the capability to integrate obscurants across the battlefield and/or peacekeeping operations. No longer will high-value targets be placed off limits because of their locations (near hospitals, religious shrines, and buildings). These targets can and will be attacked without producing unacceptable collateral damage through the use of advanced obscurants.

We are on track to produce particles, which are designed to defeat a specific sensor, that screen more efficiently at millimeter and other wavelengths. As each particle is described and produced, our goal is to provide a measurement of ever-increasing efficiencies. Polyacrylonitrile-based carbon fibers, our present standard millimeter wave obscurant, have an extinction coefficient of about 2 m²/gm. Fibers have been measured with extinction coefficient in an order of magnitude above

that. Within 2 years, we hope to advance another order of magnitude. This increased coefficient lowers the logistical requirement (amount disseminated) needed to provide the same or increased capability.

New materials being developed show promise with their ability to defeat systems operating in the ultraviolet through digital communication spectrum. Natick and Army research laboratories have been investigating electrospun nanofibers (Figure 1) for applications in various aspects of protection and advanced materials design. The fibers produced by this process are morphologically ideal for applications in obscuration, particularly as multispectral screeners. Natick has developed an approach that provides electrospun fibers of polymers with conductivities on the order of graphite. This gives us a novel class of tailorable, multispectral obscurants that are environmentally and toxicologically benign. Additional materiel under research includes, but is not limited to, dendrimer and bioorganic fibers that may lead the U.S. Army throughout the twenty-first century.

What We Can Do for the Warfighter

Current Operations

Five concepts of operation found within the Chemical Corps Vision—sense, shape, shield, attack, and deceive—provide the basic start point for support to the warfighter today and beyond 2010. Within these five pillars, obscurants support the warfighter by providing him with a weapon that is a force multiplier of unparalleled capability and effectiveness when used in combination with all units on the battlefield or in a peacekeeping mission. Take a look at these pillars in context of supporting the medium-weight force.

Sense is the identification of reconnaissance, intelligence, sensors, and target acquisition (RISTA) and units through all-source intelligence assets by requiring the use of husband assets. With the limited ability to fight in a direct head-to-head matchup, high priority must be given to identifying and locating the adversary's situational/informational awareness systems and combat forces.

Shape is the control and management of obscurants on the battlefield. This management is paramount for the IBCT in determining whether it must employ obscurants to defeat the RISTA and adversary formations or provide protection to friendly elements based on identification and location of these threats. A major attribute of

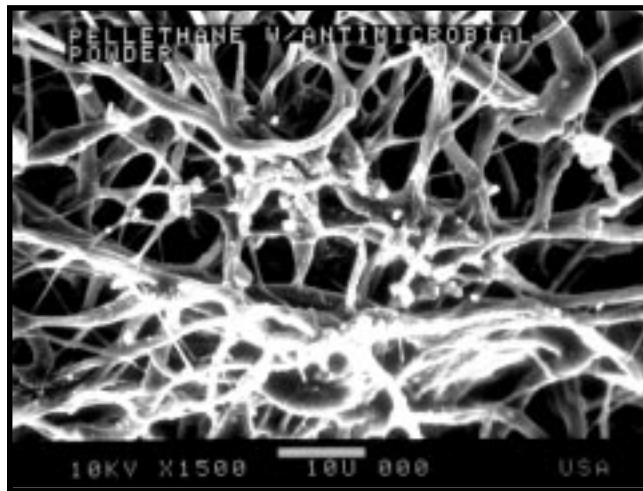


Figure 1. Nanofibers

obscurant management is assuring that obscurant operations are planned and integrated throughout the battle staff and that they support the commander's intent of operation at the tactical and operational level.

Shield provides protection against attacks from conventional and advance munitions by adversary forces. It also denies the adversary situational/informational awareness and/or dominance by RISTA elements. This

becomes more critical for the IBCT because of the nature of survivability, given the lack of armor and numbers of vehicles on the battlefield. Onboard vehicle obscurants can provide limited protection in an attack, but survivability is limited because of the number of obscurant munitions onboard and the length of time that vehicles operate in a killing zone. This creates an increased unacceptable risk without other effective obscurant protection.

Attack is the most overlooked aspect of obscuration operations today. Attack has two distinctive areas of operation unique to obscurants—counter-RISTA and fight. Counter-RISTA is a synergistic approach that denies the adversary any information on friendly elements, location, size, and activity. This informational dominance gives the commander greater latitude in developing the situation and ensuring that friendly forces have the element of surprise. Because of the size and duration of large-area obscurant systems, intelligence only has to identify that there is a likely threat in a general area without having to pinpoint its exact location. This ensures that the commander has situational dominance though denying the adversary informational awareness.

In a fight, obscurants are placed directly on the adversary or between it and friendly forces. This limits the adversary's ability to decisively target and thus engage friendly forces. Also, friendly forces can maneuver through or around choke points, killing zones, and barriers without the adversary knowing the exact location of the friendly forces and being able to adjust to the attack. Because of the limited number of artillery/mortar systems available for delivery of obscurant munitions, large-area obscuration becomes the best available method to provide this valuable weapon.

Deceive conceals the true size, actions, location, or intent of friendly forces from the adversary to fix threat forces in one location, causes redirection and movement to cover different axes, uses hoarded assets to penetrate

deception, or spreads threat forces thin over a larger area. This operation, when used with other medium-force assets, allows friendly forces to deny the adversary situational awareness and causes its forces to be employed improperly to prevent decisive engagement of friendly forces.

Future Concept of Operations

From 2010 through 2020 and beyond, future obscurant missions will be conducted under five doctrinal concepts of operation and will provide the commander with new, unparalleled capabilities. This is accomplished across the full spectrum by increasing survivability, sustainability, mobility, and deployability while balancing force protection. The ability to select the windows of opportunity through new, advanced obscurants provides the commander with the unique capabilities to select not only the time and location of the obscurant but what windows to open to allow friendly systems to penetrate the obscurant cloud while inhibiting adversaries.

Informational dominance is the ability to deny information that supports the adversary's efforts to either collect RISTA or provide command and control operations. Missions that give the commander this capability are—

- Placing selected UAV as an obscurant over a target area that uses digital communication wavelengths, thus creating a communication blackout for a specific time. The target could be in an area that normal weapons could not hit, due to location.
- Placing selected UAV as an obscurant over a long front, which defeats ground surveillance radar systems without knowing exact locations of systems.
- Emplacing selected obscurants along an aerial insertion or exit route to defeat air defense early warning systems.
- Countering battery fire protection by putting obscurants in front of or over the adversary's artillery counterfire detection systems.

Immediate protection (on demand) consists of onboard vehicle systems, hand-controlled munitions, artillery/mortar munitions, manned large-area systems, and UGV and UAV systems for rapid employment. This type of obscuration mission's employment time frame consists of an operational duration of 30 seconds to 25 minutes. The primary mission is to provide immediate on-demand obscuration from direct/indirect fire and smart munitions and observation to individual vehicles/personnel. Missions that give the commander and soldier this capability are—

- Urban operations for mounted and dismounted soldiers.
- Breaching and obstacle emplacement operations.
- Force on force (vehicle versus vehicle or emplaced soldiers).

- Smart-weapon attack from indirect fire or infrared/millimeter wave/acoustic minefields.
- Special operations.
- Direct fire.
- Soldiers ambushed by advanced and conventional weapons and combatants.
- Stealth vehicle penetration of friendly forces protection through defeating its special capabilities (tagging/highlighting).
- On-demand delivery to deny the adversary short-term observation.

Long-term protection (on call) consists of large-area obscuration with a duration of more than 15 minutes over an area of a minimum of 1 by 5 kilometers. Missions that give the commander and soldier this capability are—

- Employing obscurants directly on, or in front of, the adversary to deny RISTA and/or target engagement.
- Providing overhead protection from UAVs, aircraft, and space-based sensors from RISTA through "canopy obscurants."
- Providing overhead protection from direct and indirect or smart weapons through canopy obscurants.
- Providing protection for river and choke points from all types of adversary RISTA and target-acquisition systems.
- Protecting high-value targets from all types of adversary RISTA and engagement systems (aerial ports of debarkation, seaports of debarkation, ammunition, and resupply points).

Deception provides new capabilities while keeping the overall intent to deceive, which has stayed the same as currently employed by the warfighter. This technique of informational dominance of the battlefield will deny the adversary the data required to assess or act promptly to the situation leading to total success of the operation. With the ability of the UAV/UVG to employ advance obscurants, the commander can—

- Selectively cover far-ranging and in-close ground-surveillance systems that would compromise the mission.
- Defeat the adversary's radio communications located near and far away from the deception mission.
- Affect selected command, control, communications, computers, and intelligence systems as part of the operation.
- Degrade the command-and-control network and limit the adversary's ability to grasp and/or process all the information required.
- Increase the ability of the commander to force the adversary into making the wrong judgment on who, what, or where when employed with other theater/service assets.

Integration matrix

(Figure 2) shows the interaction between the five concepts of operation and the four types of missions envisioned to take obscurants into 2010 and beyond. Each mission has a direct link to one of the five concepts (sense, shape, shield, attack, and deceive) but also supports the key elements of the others.

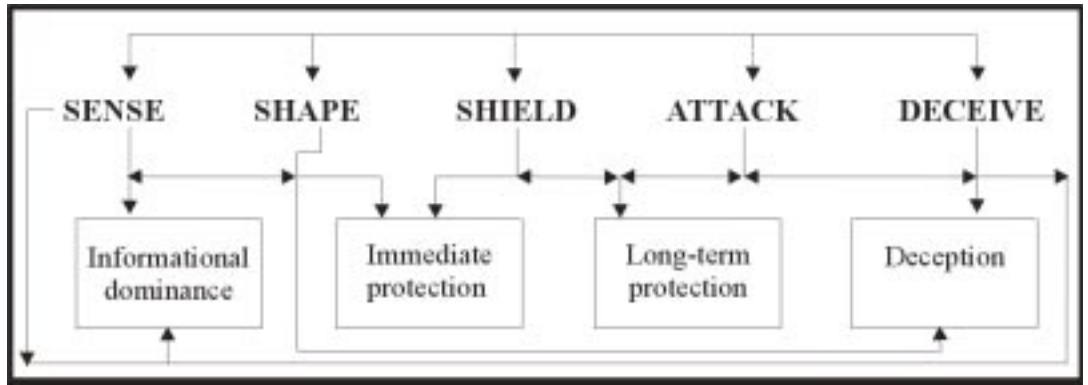


Figure 2. Integration matrix

Sense is a critical part of each and every mission. It is the key aspect of “the know” for informational dominance which, in turn, leads to the who, what, when, and where of the adversary at all times. With this information, the effectiveness of the adversary’s plans and operations is limited, but the friendly forces’ ability to accomplish the mission rapidly while minimizing the loss of personnel and/or equipment is increased. In immediate and long-term protection, the key is to know the who, when, and—in some cases but not in all—where, which increases overall survivability without increased manpower or other types of assets when used effectively. For deception to be effective on the battlefield, you must know the who, what, or when to conduct the mission to allow friendly forces to accomplish their other missions. Additionally, you must know where the most effective location is to conduct the mission. This ensures that the adversary is fooled into either moving assets or employing reserved assets to determine if the threat is real or not.

Shape is used to force the adversary to react to your actions, not for you to react to its. This requires situational awareness of friendly and adversary forces. To accomplish this, informational dominance is not only critical but also required, and when used with the deception mission, it provides an overlapping and continuous operational superiority across all spectrums.

Shield provides protection at all levels of operation for personnel, equipment, and facilities from RISTA and direct or indirect fires. This protection is found primarily in immediate and long-term protection by obscurants. The key for shield is to know the who, what, when, and where. Deception also can play a decisive role in providing protection by causing misdirection of RISTA activities and direct or indirect fire from actual targets.

Attack places obscurants directly on the adversary or between it and friendly forces. This is accomplished through informational dominance and requires the commander to know the who, what, when, where, and how. Immediate and long-term protection work hand in hand with attack, because of the adversary’s reaction to

the obscurants being placed directly on or between it and friendly positions. Immediate protection is the most important of the two protection missions.

Deceive is an integral part of full spectrum dominance throughout the battlefield. This mission requires the commander to know the who, what, where, and when not only of the adversary forces but also of friendly forces. Therefore, informational dominance plays a critical role in assuring that the adversary is fooled and reacts according to the users’ wants and needs.

Conclusion

Smoke and obscurants have come a long way in a short time. The challenges for the U.S. Army Chemical Corps are far-reaching and have many pitfalls along the path through the twenty-first century. These challenges start with new doctrine that is responsive and updated continually to exploit the advances in obscurants and technology. This doctrine must alleviate the fear of obscurants defeating both friendly and adversary systems. This is a true statement in its purest form, but a sad excuse for poor planning and execution by both the chemical officer in the planning stage and the unit in its operation. Another challenge is that when planning obscurant operations, we look primarily for obscurants in the defense—such as a shield for immediate protection—and more.

Obscurants are weapons in the truest sense. A weapon is “any instrument or device for attack or defense.” Obscurants can be used to attack as well as defend, so they complete both missions. As an attack weapon, they defeat or incapacitate the adversary’s capabilities (just like a bullet or active jammer) to operate other weapons and intelligence platforms that use the visual, infrared, and—in the near future—millimeter wave portions of the electro-optical spectrum. The chemical officer and NCO must be taught how to plan and implement these capabilities. Then they must show commanders and other officers that obscurants on the battlefield are inexpensive weapons with outstanding overmatch capabilities per the number of platforms required.

In the future, obscurants should allow us to operate our systems, without degradation from the ultraviolet through the digital communication spectrum. To ensure that we need to dominate the electro-optical spectrum now and in the future, we must be forward thinkers. We should not support the idea that if our forces do not ask for a certain capability, then it is not needed or required. To do this would be a dereliction of our responsibilities in a world developing and exporting advanced technology at a rate never imagined just 20 years ago.

References

General Wesley Clark. Comments were from an article published by AP news service after his retirement as overall commander of the forces used to force Serbs from Kosovo.

Figure 1. Conductive Nanofibers for Multispectral Obscuration: This research was proposed for S&T support and initially conducted by Erica R. Valdes, ECBC, and Heidi L. Schreuder-Gibson, U.S. Army Natick Soldier Center.

Chemical Vision 2010, dated July 1999, is the basis for the Five Concepts of Operation on pages 13 and 14.