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DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

NOV 25 2009

Mr. John Greenewald, Jr.



Dear Mr. Greenewald:

Coordination has been completed with another element of our command and records have been located and returned to this office for our direct response to you. We have reviewed the records and it has been determined that they are partially releasable to you.

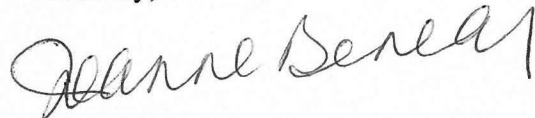
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Sincerely,

A handwritten signature in black ink that reads "Joanne Benear". The signature is written in a cursive style with a large initial "J".

Joanne Benear
Chief
Freedom of Information/Privacy Office



DEPARTMENT OF THE ARMY

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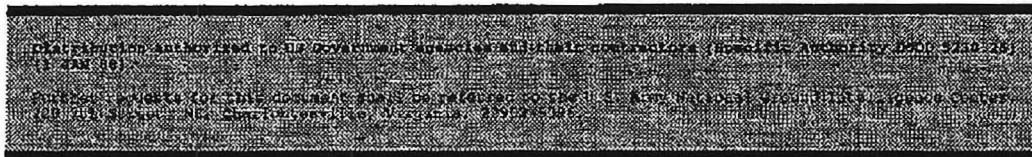
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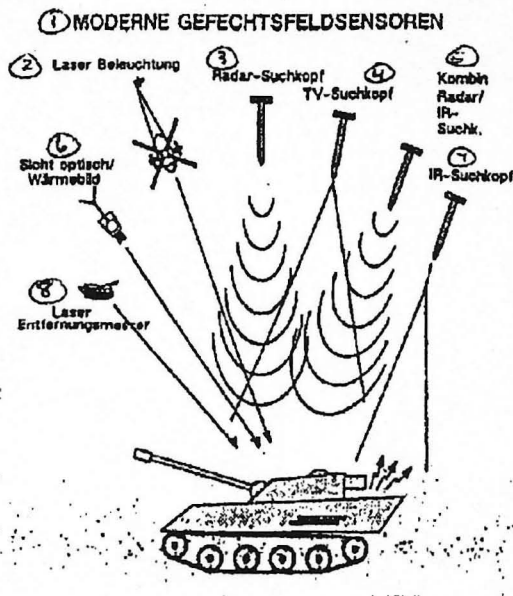
W A R N I N G

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Key: 1 - Modern battlefield sensors; 2 - Laser illumination; 3 - Radar seeker head; 4 - TV seeker head; 5 - Combination radar/TV seeker head; 6 - Optical sight/heat image; 7 - IR seeker head; 8 - Laser range finder

Rudolf Salzeder

Under the Protection of Artificial Fog

Facilitate friendly movement by suppressing enemy fire with the help of the use of fog.

All movements on the battlefield serve in the final analysis to bring the proper forces at the right time to the right place for combat employment. Maneuver is the most important element of a battle next to firepower. The opponent will therefore strive to prevent, or at least influence, movement with all the means available to him. In that regard particular significance must be given to the enemy's use of weapons, as well as the use of barriers. The objective of this contribution by Lieutenant Colonel (Ret.) Rudolf Salzeder is to find ways and means of suppressing enemy fire by means of artificial fog, in order to facilitate friendly movement. Before his retirement he was last assigned to the 23rd Mountain Infantry Brigade. He is today Director of Marketing in the Fronau Technology Center of the Bueks Works.

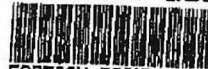
In order to facilitate friendly movement by suppressing enemy fire, it is necessary, in so far as possible, to prevent the following enemy activities on the battlefield:

- Reconnaissance and combat observation,
- Target recognition, target acquisition and target tracking, and
- Weapon guidance to the target.

One thing is common to all these activities, in order to be effective, they require visual or sensor controlled sight of:

- The soldier - target,
- Recon device, acquisition device, tracking device target,
- Seeker head - target.

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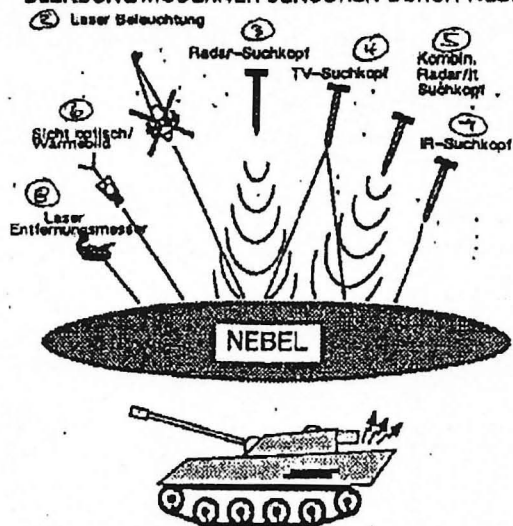
The means of producing this "sight connection" are already more varied today than mere eye observation and will be more so in the future:

- Optical targeting devices and television cameras,
- Recon devices, observation devices, target devices and target seeker heads which operate in the near, middle and long range infra-red areas,
- Laser devices which use the area between 1.06 and 10.6 mm wavelength of the electromagnetic spectrum,
- Seeker heads which operate in the mm wavelengths of the radar area,
- Recon radar and target tracking radar in the cm wave radar area.

If these "multi-spectral lines of sight" can be prevented or interrupted by suitable means, then the expected effect at the target is not possible at all or only to a limited degree.

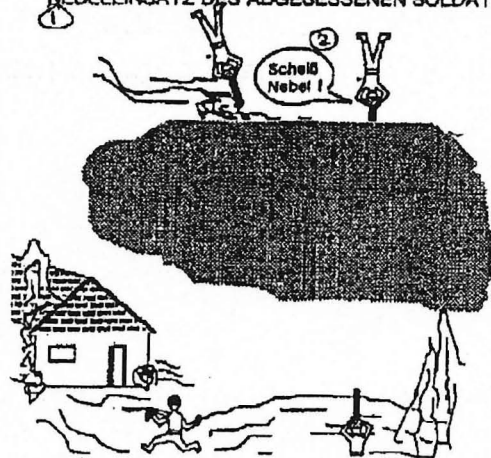
In order to facilitate friendly movement, it is therefore necessary to employ the "means of interrupting lines of sight" before or during the movement to combat. Artificial fog operating in the corresponding spectral ranges is such a means of weapon suppression on a favorable cost basis.

① **BLENDUNG MODERNER SENSOREN DURCH NEBEL**



Key: 1 - Blinding modern sensors by means of fog; 2 - Laser illumination; 3 - Radar seeker head; 4 - TV seeker head; 5 - Combination radar/TV seeker head; 6 - Optical sight/heat image; 7 - IR seeker head; 9 - Fog

① **NEBELEINSATZ DES ABGESESSENEN SOLDATEN**



Key: 1 - Use of fog by dismounted soldiers; 2 - Dama fog!

Types of Movement and Protection

In dismounted combat the soldier, as a rule, moves under cover or from cover to cover. During movement between cover he is primarily endangered by enemy hand-held weapons as well as the weapons on-board combat vehicles.

Reconnaissance, target location and weapon guidance are generally done by visual observation with the help of optical target devices and also at night and during bad weather by residual light amplifiers and thermal image devices.

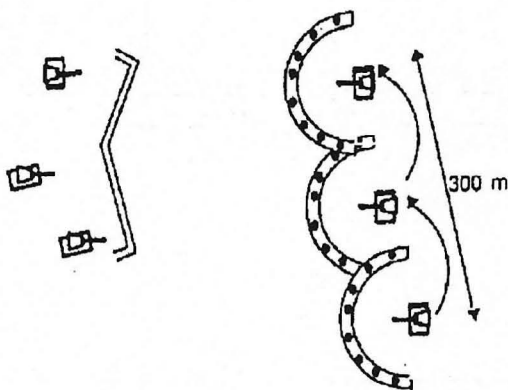
Protection

If the soldier could use a fog grenade or a fog round from a launcher device similar to the manual incendiary round which forms a fog in the optical and/or infra-red range within seconds, he would be protected at least from aimed fire while changing positions.

The means of employment already exist in the Federal Armed Forces. They must only be outfitted with a corresponding fog device.

Movement of Individual Combat Vehicles

The individual combat vehicle usually moves from covered position to covered position, be it involved in a recon role or in engaging the enemy in a process involving mutual overwatch or in an evasive movement during a delay. Depending on the character of the terrain, an open area extending up to 300 to 400 m must be crossed, in order to arrive at the next suitable position. The main threat during the movement phase is posed by anti-tank gun rounds and anti-tank guided missiles. In addition to optical target devices these gun weapons are equipped with laser range finders and thermal image devices. The anti-tank guided missile can be guided optically, or they can use optical and infra-red television cameras and they can be terminally guided with infra-red and/or millimeter wave seeker heads.



Protection

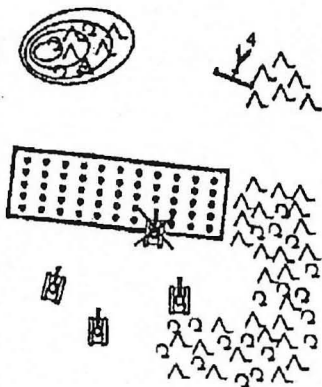
Here effective protection can be obtained by interrupting the "multi-spectral" line of sight of the target device - target or seeker head - target by the timely use of fog which obscures the optical, the infra-red and the laser spectrum. This wall of fog can be produced by the fog launcher of the vehicle's self-protection system.

The millimeter wave range is covered by the optical, IR fog due to the fact, that the millimeter wave seeker head is suited only for several 100 m in the atmosphere up to the point of terminal guidance because of its limited sensor range. In order to acquire a target, a millimeter wave seeker head must be led exactly on course to 100 m of the target with the help of an optical, infra-red guidance procedure. If that is precluded by the timely use of fog, the millimeter wave seeker head can not acquire the target.

Of extreme importance for effective protection by fog using a self-protection device is the matter of a timely release.

When threatened by gun weapons, a hit can not be avoided after the gun is fired following precise aiming at the target. Therefore the wall of fog is needed immediately before or when leaving cover. Protection is thereby also afforded against anti-tank guided missiles. In order to be able to cross large open areas of several 100 m under the protection of fog, repeated use of the self-protection device must be possible. The self-protection system being developed for the air defense systems GEPARD and ROLAND can be fired four times without reloading and with each release produces a fog wall 100 m wide with a protective effect lasting one minute.

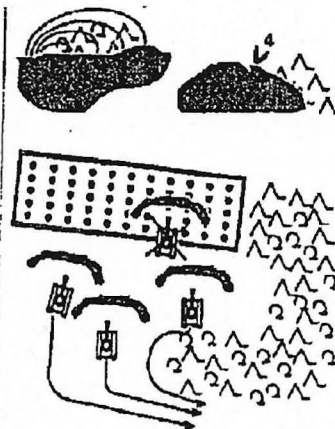
Movement of a tank platoon up to an obstacle which is secured by an ATGM platoon and an artillery FO.



Operation of the fog round launcher of the self-protection device for self-protection in the immediate area.



Fog use in a large area to protect the evasive movement of a tank platoon.



Effective protection against anti-tank guided missiles is also possible after launch, when the fog wall is so released, that when the target is lost the guidance or seeker head of the missile is no longer on the exact target course. For that purpose, however, a sensor would be required inside the vehicle being protected which would detect the incoming missile in a timely manner and

immediately cause a release by the self-protection device. Specialized firms are working on such a sensor. The corresponding developments appear to promise success.

The self-protection device for the GEPARD/ROLAND anticipated this type of operation; the connection point for such a sensor has been integrated and the reaction time from release until the full fog effect is obtained amounts to two seconds.

Movement of Troop Combat Formations

As a rule troops move in formation during the approach, during the penetration and during combat in depth; but closed units can also move in formation during evasive movements in a delay and in the mobile defense.

In these combat situations fire power has priority over protection. It is a matter of bringing the most guns on the enemy. But it is also important to keep the movement fluid, in order not to endanger the coordination of the time and spatial conduct of the battle.

In these situations the threat is varied and often can not be localized and it comes from three dimensions. In essence it consists of:

- Secured barriers and obstacles,
- Anti-tank positions with guns and missiles on the flanks and in the front,
- Combat helicopters, combat aircraft and combat drones.

Protection

All of these threats can be significantly prevented or significantly reduced, when the "multi-spectral sight" can be taken away from the weapon system by means of wide area use of fog or when the round is diverted to a simulated target.

Secured Barriers and Obstacles

Mine barriers impede movement. They usually appear suddenly in front of advancing forces and stop them, often in open terrain.

Mine barriers are almost always secured from covered or concealed positions with anti-tank guns or missile weapons and/or mortar and artillery observers.

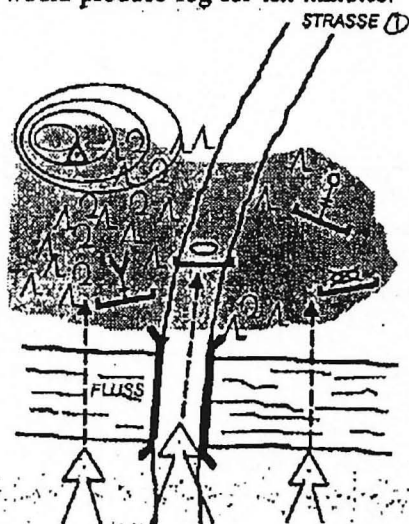
For the mounted troops it then becomes a matter of seeking cover with the individual vehicles; in doing that they would rob the enemy of his sight by means of the fog launcher on the self-protection device.

However, in order to bring the entire unit out of the danger zone or to recover vehicles which have hit a mine or merely to clear a lane in the mine-field, large area, rapidly deployable, long lasting, "multi-spectral" use of fog is required to overcome the obstacle.

- Rapidly deployable: after the end of the fog effect from the self-protection devices, four to five minutes, the large area fog effect must be in place.
- Large area: based on an evaluation of terrain and observation of the firings, the operational area of the barrier and/or the forward observer can roughly be estimated, but frequently not the exact position with the result, that larger sections of terrain must be blinded.
- Long lasting: off-loading soldiers and the recovery or clearing of mines can take a long time.
- Fog with multi-spectral effects: on the modern battlefield one must always consider the use of thermal imaging observation devices and the use of target seeking ammunition.

Water obstacles are known in advance and are therefore usually overcome in a planned manner. If the opposite bank is occupied by the enemy, the forcing of the waterway often takes a lot of casualties in the crossing force. By means of massive, large area use of fog on the opposite bank, friendly losses will almost certainly be reduced considerably.

Mortars and tube artillery are well suited for the rapid deployment of a large area fog effect. For pre-planned use at the tactical and operational levels, the rocket artillery is the best means. For example, a multiple rocket warhead could deliver up to 90 kg of fog substance on the target which would produce fog for ten minutes.



Use of fog when crossing water

Key: I- Road

Tube/Missile Anti-tank Positions

Just as was the case with forces securing an obstacle, anti-tank positions, too, are difficult to localize with the result, that they must be knocked out with aimed fire. Often the area of the positions can only be made out in rough terms because of only individual rounds being fired and

the nature of the terrain. That means that the use of explosive ammunition requires a large expenditure of ammunition with only slight results.

At the same time attacks must be made into the unknown without any satisfactory reconnaissance results or there are too few forces, e.g., for flank security.

In such situations the use of fog delivered by mortar, artillery and rocket artillery in coordination with the movement of units can lead to a much higher chance of combat success.

Indirect Fire Weapons with Conventional Ammunition

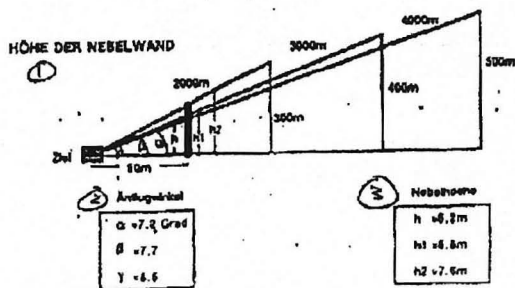
Mortars and artillery are usually used against troops on the move with the assistance of forward observers. If one knocks out the forward observer, the fire is also knocked out.

The forward observer is either located in a mounted position on an observation vehicle or dismounted in an observation post. Unless he acts improperly in a combat situation, he almost never can be located and therefore not directly engaged. However, terrain sectors suitable for observation posts usually can be recognized.

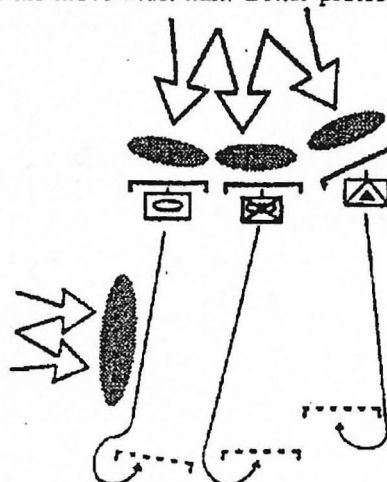
If one can succeed in covering these suitable terrain sectors with a large area fog effect coordinated in time and space with the movement of combat troops, the forward observers are blinded and the mortars and artillery are shut off. This type of delivery operation is also the mission of the mortars, artillery and rocket artillery and can occur spontaneously or as a result of pre-planned fire.

Indirect Fire Weapons with "Smart" Munitions

The use of fog against vertically attacking weapons (e.g. SMART) promises less success, in part caused by the weather and also because the troops on the move must halt. Better protection is afforded here by using simulated targets.



Key: 1 - Height of the fog wall; 2 - Incoming angle; 3 - Height of wall



Use of fog when disengaging from the enemy and when flanks are threatened

Combat Helicopters, Combat Aircraft, Combat Drones

When threatened by this type of system which in general follow the principle - as low as possible, as high as necessary - the use of fog can also have a great protective effect, when it occurs close to the threatened vehicle, i.e., by use of the self-protection device.

For a steep angle of attack only, simulated targets offer sufficient protection.

Movements of Troops on the March in March Columns

When in march columns troops as a rule march outside the effective range of direct fire weapons. The threat occurs from individual, suddenly appearing recon vehicles, steep angle firing weapons and aircraft.

Protection

Effective protection can be obtained with the same means as was previously described for steep angle of attack weapons, combat helicopters, aircraft and combat drones.

Summary

Artificial fog effective in the optical and infra-red areas can be employed prudently and in a sufficient amount to facilitate the movement of friendly troops; in many combat situations it is the only known means to take the sight, even in the sensor range, away from the enemy. That applies to the protection of the individual combat vehicle as well as large area use for the protection of troop formations.

The use of large area fog effects in situations in which the artillery missions, "block, eliminate, suppress and harass" require gigantic mounts of ammunition can achieve a similar result with considerably less expenditure of resources.