Chapter 3
Fundamentals of Camouflage

To remain a viable force on the battlefield, units must understand the fundamentals of camouflage. Camouflage skills are essential to survivability. To camouflage effectively, soldiers must constantly consider the enemy's point of view. What will he see? What characteristics will his sensors detect? Placing a low priority on camouflage because of time constraints or inconvenience could result in mission failure.

Section I. Counterdetection Techniques

3-1. Avoiding Detection. The primary goal of camouflage is to avoid detection by the enemy. However, in some cases camouflage may succeed by merely preventing the enemy from identifying the target. While the enemy may know *something* is there, failure to identify what that *something* is may prevent the enemy from gaining any advantage. The preferred camouflage objective is to avoid detection, but sometimes avoiding identification is sufficient. There are eight rules to follow when considering how to avoid detection or identification:

- Identify the Threat's capabilities.
- Avoid detection by the Threat's routine surveillance.
- Take countermeasures against selected Threat sensors.
- Apply realistic camouflage.
- Minimize movement.
- Use decoys properly.
- Continuously avoid detection.
- Avoid operational patterns.

3-2. Identifying the Threat. Obtain as much information as possible about the enemy's surveillance capability. The S2's intelligence preparation of the battlefield (IPB) should include those sensors the enemy uses in a particular theater. If possible, obtain information on the enemy's tactical employment of the sensors. Next, assess the impact of the enemy's surveillance potential on the target under consideration. This assessment will vary with the relative position of the sensor and target on the battlefield, the role of the target, and the physical characteristics of the sensor and target.

3-3. Avoiding Detection by Routine Surveillance. Sophisticated sensors often have narrow fields of view. Furthermore, sensors can be very expensive and are unlikely to be deployed in such numbers as to enable coverage of the whole battlefield at all times. Sophisticated sensors are most likely to be deployed in those areas where the enemy suspects targets. The enemy may suspect an area either because of detection by less sophisticated, wider-coverage sensors or because of tactical analysis. Therefore, an important aspect of remaining undetected is to avoid arousing the suspicions of routine surveillance.

3-4. Taking Countermeasures. In some cases it might be appropriate to take action against identified enemy sensors. The ability to take countermeasures depends on a number of factors: the effective range of friendly weapons, the distance to the enemy sensor, and the relative cost in resources versus the benefits of preventing the enemy's use of the sensor. An additional factor to consider is that the countermeasure itself may provide the enemy with an indication of friendly intentions.

3-5. Applying Realistic Camouflage. Thecloser the target matches its background, the harder it is for the enemy to distinguish the target from its background. This principle of camouflage applies to all senses and all regions of the EM spectrum. Effective camouflage requires an awareness of one's surroundings, proper camouflage skills, and the ability to visualize those signatures that enemy sensors will detect. The following discusses countering each type of sensor employed by Threat forces:

a. *Visual Sensors. The*most plentiful, reliable, and timely enemy sensors are visual. Therefore, camouflaging to prevent visual observation is extremely important. What cannot be seen is dificult to detect, identify, and hit. BDUs, standard camouflage screening paint patterns (SCSPP), LCSS, and battlefield obscurants enhance visual camouflage. All-around camouflage helps to avoid detection by the Threat. However, when time is short, camouflage to the front, overhead, sides, and then to the rear.

b. *NIR Sensors.* NIR sights are effective at shorter ranges than the Threat's main guns, typically only to 900 meters. While red filters help preserve night vision, they cannot prevent NIR from detecting light from long distances. Therefore, minimize the use of red falters, or use blue-green filters. BDUs, LCSS, battlefield obscurants, and camouflage paints are designed to help defeat NIR sensors.

c. *IR Sensors.* Natural materials and cover (terrain) shield heat sources from IR sensors and break up the shape of cold or warm military objects viewed on IR sensors. Do not raise vehicle hoods to break windshield glare as this exposes a hot spot for IR detection. Even if the IR system is capable of locating a target, the target's actual identity still can be disguised. Avoid building unnecessary fires. Use vehicle heaters only when necessary. BDU dyes, LCSS, IR-defeating obscurants, and chemical-resistant camouflage paints help break up IR signatures but will not defeat IR sensors.

d. *UV Sensors.* UV sensors area significant threat in snow-covered areas. Winter camouflage paint patterns, the arctic LCSS, and terrain masking are the critical means for defending against

these sensors; any kind of smoke will defeat UV sensors. Field-expedient measures, such as the construction of snow walls, also provide a means of defeating UV sensors.

e. *Radar.*

(1) MTI Radar.

(a) MTI radar is a threat to ground forces near the battle area. Mission dictates the appropriate defense, while techniques depend on the equipment available. Radar-reflecting metal on dismounted soldiers has been reduced. Kevlar helmets and body armor are now radar-transparent. Plastic canteens are standard issue. Velcro and buttons have replaced metal snaps on most field uniforms. A soldier wearing only the BDU cannot be detected until very close to an MTI radar.

(b) Unfortunately, soldiers still carry metal objects to accomplish their mission (such as ammunition, magazines, and weapons), and most radars can detect these items. Therefore, movement discipline is very important. Moving by covered routes (terrain masking) will prevent radar detection. Slow, deliberate movements across areas exposed to radar coverage will assist in avoiding the attention of enemy MTI radar operators.

(c) Vehicles are large radar-reflecting objects. When vehicles move, they can be detected by MTI radar from up to 20 kilometers away. A skilled MTI operator can also identify the type of vehicle. Moving by covered routes protects against MTI radar surveillance.

(2) Imaging Radar. Imaging radar is not a threat to individual soldiers. Setting vehicles behind earth, masonry walls, or dense foliage effectively screens them from imaging radar. Light foliage may provide complete visual concealment; however, light foliage is often transparent to imaging radar. The radar-scattering LCSS also provides effective camouflage. When properly installed LCSS effectively scatters the beam of imaging radars.

(3) CM and CB Radars. The radars used by Threat forces are subject to overload. They are very effective and accurate when tracking single rounds. However, they cannot accurately process data on multiple rounds (four or more) fired simultaneously. Chaff is also effective against CM and CB radars if placed near the radar.

f. *Acoustic Sensors.*

(1) Human Ear. Noise discipline will defeat detection by the human ear. Pyrotechnics or loudspeakers can screen noise, cover inherently noisy activities, and confuse interpretation of sounds.

(2) Sound-Ranging Teams. It is possible to confuse the Threat by screening flashes or sounds. Explosives or pyrotechnics, fired a few hundred meters from a battery's position within a second of firing artillery, will effectively confuse sound-ranging teams. Coordination of fire with adjacent batteries (within two seconds) can also be effective in confusing enemy sound-ranging teams.

g. *Radio Sensors.* The best way to prevent the enemy from locating radio transmitters is to minimize transmissions, protect transmissions from enemy interception, and practice good radiotelephone operator (RATELO) procedures. Methods that ensure transmissions are minimized include preplanning messages, transmitting as quickly as possible, and using alternate communication means whenever possible. Whenever possible, use low-power transmissions, terrain masking, or directional or short-range antennas to protect the enemy from intercepting radio communications. FM 24-33 provides an in-depth review of reducing the threat to friendly communications.

3-6. Minimizing Movement. Movement is certain to attract attention. Movement also produces a number of other signatures (such as tracks, noise, hot spots, and dust), all of which can be detected. Therefore, keep movement to a minimum. In operations that inherently involve movement (such as an offensive), plan, discipline, and manage the movement so that signatures are reduced as much as possible. Disciplined movement includes the techniques identified in Chapter 5.

3-7. Using Decoys. Use decoys to confuse the enemy. The goal is to divert enemy resources into reporting or engaging false targets. An enemy who has identified decoys as *real* is less inclined to search harder for a well-hidden target. FM 90-2 addresses the correct employment of decoys.

3-8. Continuously Avoiding Detection. Many sensors operate as well by night as during the day. Night no longer provides totally effective protection from surveillance. As passive sensors are very dificult to detect, assume they are being used at night. Do not allow antidetection efforts to lapse during the hours of darkness. For example, conceal spoil while excavating a fighting position, even at night. Smoke also blocks night-vision devices.

3-9. Avoiding Operational Patterns. An enemy can often detect and identify different types of units or operations by analyzing the patterns of signatures that accompany its activities. For instance, an offensive operation is usually preceded by the forward movement of engineer obstacle-breaching assets; petroleum oils and lubricants (POL); and ammunition. Movements are very difficult to conceal; therefore, an alternative is to modify the pattern of resupply. The repetitive use of identical camouflage or decoy techniques will eventually be recognized by the enemy.

Section II. Detection Factors

3-10. Factors. To camouflage effectively, you must constantly consider the Threat's viewpoint. Prevent patterns in antidetection measures by applying the eight recognition factors to your tactical situation. Determine which signatures the enemy's sensors are capable of detecting. The eight recognition factors are characteristics that make an object contrast with its background. These recognition factors are--

- Shape.
- Shadow.
- Color.
- Texture.
- Patterns.

- Movement.
- Temperature.
- Radar return.

3-11. Shape. The natural background is random, while military equipment has regular features with hard, angular lines. Even a camouflage net, when erected, takes on a shape with smooth curves between support points. The Threat can easily see objects if they are silhouetted, but they can also see objects against any background unless you take care to conceal them.

3-12. Shadow. Shadow can be divided into two types: cast and contained. Cast shadow is the type we are most familiar with and is the silhouette of an object projected against its background. Contained shadows are the dark pools of shadow formed in permanently shaded areas. Examples of contained shadows are those under the track guards of armored fighting vehicles (AFVs), inside a slit trench, inside an open cupola, or under a vehicle. These shadows show up much darker than their surroundings and are easily detected by the enemy.

3-13. Color. Color contrast can be important at close ranges; however, the longer the range the less important color becomes. At very long ranges, all colors tend to merge into an even tone. Additionally, in poor light the human eye cannot discriminate color.

3-14. Texture. A rough surface will appear darker than a smooth surface, even if both surfaces are the same color. An important field application of texture is vehicle tracks. Vehicle tracks change the texture of the ground, leaving track marks clearly visible. In extreme cases the texture of glass or other very smooth surfaces will cause a shine that acts as a beacon. Under normal circumstances, very smooth surfaces stand out from the background. Therefore, eliminating shine must take a high priority in camouflage.

3-15. Patterns.

a. *Equipment Patterns.* Equipment patterns often differ considerably from background patterns. The critical relationships that determine contrast between a piece of equipment and its background are the distance between the observer and the equipment and the distance between the equipment and its background. Since these distances usually vary, it is very difficult to paint equipment with a pattern that will always allow a piece of equipment to blend with its background.

b. *Terrain Patterns.* The overall terrain pattern and the signatures produced by military activity on the terrain are important recognition factors. If a unit's presence is to remain unnoticed, the unit must match the signatures produced by stationary equipment, trucks, and other activities with the terrain pattern.

3-16. Movement. Movement will always attract attention against a stationary background. Slow, regular movement is usually less obvious than fast or erratic movement.

3-17. Temperature. As Chapter 2 indicated, sophisticated IR sensors can detect differences in temperature between military equipment and surrounding vegetation and backgrounds.

3-18. Radar Return. Radar can detect differences in an object's ability to reflect radio waves. Since metal more completely reflects radio waves and metals are still an integral part of military activities, radar return is an important recognition factor.

Section III. Camouflage Principles

3-19. Site Selection. Site selection is extremely important; by itself it can eliminate or reduce many of the recognition factors. For example, if a tank is positioned so it faces probable enemy sensor locations, the thermal signature from the hot engine compartment is minimized. If the vehicle is positioned under foliage, its exhaust will disperse and cool as it rises, again reducing the thermal signature and blending with the background. Placing equipment in defilade (dug-in) positions will prevent detection by ground-mounted radars. The following factors govern site selection:

a. *Mission.* The mission is paramount. A particular site may be excellent from a camouflage standpoint, but useful only if it permits mission accomplishment.

b. *Dispersion.* The requirement for dispersion dictates site size. A site is of limited usefulness if it will not permit enough dispersal for survivability and effective operations.

c. *Terrain Patterns.* Every type of terrain, even an apparently flat desert, has a discernible pattern. Terrain features can conceal, or at least blur, the signatures of military activity. By using terrain features, you can enhance your camouflage's effectiveness without relying on additional materials. The primary factor to consider is whether using the site will disturb the terrain pattern enough to attract the enemy's attention. The goal is not to disturb the terrain pattern at all. Any change in an existing terrain pattern will indicate the presence of activity, so minimize change to the terrain pattern. Terrain patterns have distinctive characteristics that are necessary to preserve. There are four general terrain patterns:

(1) Rural. Rural terrain has a checkerboard pattern when viewed from aircraft or using aerial photography. This is a result of the different types of crops and vegetation found on most farms.

(2) Urban. Most urban terrain is characterized by uniform rows of housing with interwoven streets and interspersed trees and shrubs.

(3) Wooded. Woodlands are characterized by natural, irregular features, unlike the geometric patterns of man-made, rural, and urban terrains.

(4) Barren. Like wooded terrain, barren terrain presents an uneven, irregular work of nature, without the defined patterns of rural and urban areas.

3-20. Concealment. There are four methods of concealment:

a. *Hiding.* Hiding is the complete concealment of an object by some form of screen. Examples of different ways to hide are: placing sod over mines in minefield, placing objects beneath tree

canopies, placing equipment in defilade positions, covering objects with nets, and hiding roads or obstacles with linear screens. Make every effort to hide all operations. If possible, hide operations by conditions of limited visibility or by using terrain masking.

b. *Blending.* Blending is the arrangement or application of camouflage material on, over, and around an object so that it appears to be part of the background. Blending is important when trying to defeat all sensors.

c. Disrupting. Breaking up an object's characteristic shape to avoid recognition because of shape, contrast, shadow, or radar or thermal signature, is considered a disruption technique.

d. *Disguising.* Disguise is the application of materials to hide the true identity of an object. The purpose of disguise is to change the appearance of an object to resemble something of lesser or greater significance. For example, a missile launcher can be disguised to resemble a cargo truck. Clever disguise can mislead the enemy about the identity, strength, and intentions of friendly forces.

3-21. Camouflage Discipline. Camouflage discipline is the avoidance of activity that changes an area's appearance or reveals the presence of military equipment. Camouflage discipline is a continuous necessity that applies to every soldier. If the prescribed visual and audio routines of camouflage discipline are not observed, an entire camouflage effort may fail. Vehicle tracks, spoil, and debris are the most common signs of military activity. Their presence can negate all efforts of proper placement and concealment. SOPs prescribing camouflage procedures aid in enforcing camouflage discipline. The SOP should list specific responsibilities for enforcing established camouflage measures and discipline. It should detail procedures for individual and unit conduct in operational positions, assembly areas, or in any other situation that may be appropriate to the specific unit. Appendix A provides additional guidance for developing a camouflage SOP. Camouflage discipline is a continuous requirement that calls for strong leadership which produces a disciplined camouflage consciousness throughout the entire unit.

a. *Light- and Heat-Source Discipline.* Light- and heat-source discipline, though important at all times, is crucial at night. As long as visual observation remains one of the main reconnaissance methods, concealment of light signatures will remain an important camouflage measure. Lights that are not *blacked out* at night can be observed at great distances. For example, the human eye can detect camp fires (light) from distances up to 8 kilometers and vehicle lights from up to 20 kilometers. Threat surveillance can detect heat from engines, stoves, and heaters from these distances also. Allow smoking and electric light use only under cover. When moving at night, vehicles in the forward combat area should use ground guides or black-out lights. Control the use of heat sources and, when their use is unavoidable, use terrain masking and other techniques to minimize thermal signatures from fires and stoves.

b. *Noise Discipline.* Individuals should remain conscious of actions that produce noise and take precautions to avoid or minimize such noises. For example, muffle generators with shields, terrain masking, or defilade positions.

c. Spoil Discipline. The prompt and complete police of debris and spoil, while necessary for sanitary reasons, is an essential camouflage measure. Proper spoil discipline removes one of the key signatures of a unit's current or past presence in an area. Usually, vehicle tracks are clearly visible from the air; therefore, track and movement discipline are essential. Use existing roads and tracks as much as possible. When new paths are used, they must fit into the existing terrain pattern. Minimize, plan, and coordinate all movement. Take full advantage of cover and dead ground.