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Marine Corps Combat Service Support Schools
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MTCC 4403

STUDENT OUTLINE

VEHICLE CAMOUFLAGE

LEARNING OBJECTIVES:

- a. Terminal Learning Objective: Provided with the requirement to camouflage vehicles, equipment, and the references, camouflage vehicles and equipment, per the references. (35XX.0303)
- b. Enabling Learning Objective:
- (1) Provided with the requirement to camouflage vehicles, equipment, and the references, identify:
- (a) The threat. (35xx.03.03a)
 - (b) How to avoid detection. (35xx.03.03b)
 - (c) The countermeasure factors.(35xx.03.03c)
 - (d) The factors of detection. (35xx.03.03d)
 - (e) The principles of camouflage. (35xx.03.03e)
 - (f) Camouflage revealing factors. (35xx.03.03f)
 - (g) Vehicle camouflage measures. (35xx.03.03g)
 - (h) How to camouflage equipment using natural materials. (35xx.03.03h)
 - (i) How to camouflage equipment using manufactured materials. (35xx.03.03i)

OUTLINE

1. FUNDAMENTALS OF CAMOUFLAGE

a. Counterdetection Techniques. 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. There are eight rules to follow when considering how to avoid detection or identification.

(1) Identifying the threat. As much information as possible should be obtained about the enemy's surveillance capabilities.

(a) First, if possible, obtain information on the enemy's tactical employment of sensors, such as visual, near-infrared (NIR), infrared (IR), forward-looking infrared (FLIR), ultraviolet (UV), radar, acoustic, and radio.

(b) Next, someone should assess the impact of the enemy's surveillance potential on the target under consideration. This assessment will vary with relative position of the sensor and target on the battlefield, the role of the target, and the physical characteristics of the sensor and target.

(2) Avoiding detection by routine surveillance. An important aspect of remaining undetected is to avoid arousing the suspicions of routine surveillance.

(3) 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, such as:

(a) the effective range of friendly weapons,

(b) the distance to the enemy sensor, and the relative cost in resources versus the benefits of preventing the enemy's use of the sensor.

(c) An additional factor to consider is that the countermeasure itself may provide the enemy with an indication of friendly intentions.

(4) Applying realistic camouflage. The closer the target matches its background, the harder it is for the enemy to distinguish the target from its background. Effective camouflage requires an awareness of one's surroundings, proper camouflage skills, and the ability to visualize those signatures (noise, smoke, flare, heat, vehicle tracks, debris and so forth) that

enemy sensors will detect.

(5) Minimizing movement. Movement is certain to attract attention and also produces a number of other signatures, all of which can be detected by the enemy.

(6) Use decoys. Decoys should be used 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.

(7) Continuously avoid detection. Night no longer provides totally effective protection from surveillance, many sensors operate as well by night as during the day. Anti-detection devices, such as smoke, block night-vision devices, and conceal spoil after excavating a fighting position, should be used during hours of darkness.

(8) Avoid operational patterns. The enemy can often detect and identify different types of units or operations by analyzing the patterns of signatures that accompany its activities. The repetitive use of identical camouflage or decoy techniques will eventually be recognized by the enemy.

b. Factors of Detection. The eight camouflage factors of recognition are characteristics that make an object contrast with its background. These factors of recognition are:

(1) Shape. The natural background is random, while military vehicles have regular features with hard, angular lines. The enemy can easily see objects that are silhouetted. They can see objects against any background, unless care is taken to conceal it.

(2) Shadow. Shadows may reveal the existence and the nature of targets to air or ground observers. Vehicles have distinctive shadows and at times, it may be more important to break up or disrupt the shadow than it is to conceal the object itself. Shadows are divided into two types: cast and contained.

(a) Cast shadows are the type we are most familiar with and are the silhouettes of objects projected against their background.

(b) Contained shadows are the dark pools formed in permanently shaded areas. Examples of contained shadows are those under a truck or inside a slit trench. These shadows show up much darker than their surroundings and are easily detected.

(3) Color. Color aids detection when there is a contrast between the color of an object and its background. Color contrast can be important at close ranges; however, the longer the range the less important color becomes. Additionally, in poor light the human eye cannot discriminate color.

(4) Texture. Texture refers to the ability of an object to reflect, absorb, and diffuse light. A rough surface will appear darker than a smooth surface, even if both surfaces are the same color.

(a) An important field application of texture is vehicle tracks. Vehicle tracks change the texture of the ground, leaving track marks clearly visible.

(b) In extreme cases, the texture of glass or other smooth surfaces will cause a shine that acts as a beam. Under normal circumstances, very smooth surfaces stand out from the background. Therefore, eliminating shine must take a high priority in camouflage.

(5) Patterns. There are two types of patterns, equipment and terrain.

(a) Equipment patterns 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 vary, it is very difficult to paint equipment with a pattern that will always allow it to blend with its background.

(b) The overall terrain patterns 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, trucks, and other activities with the terrain pattern.

(6) Movement. Movement will always attract attention against a stationary background. Slow, regular movement is usually less obvious than fast or erratic movement.

(7) Temperature. Sophisticated IR sensors can detect differences in temperature between military vehicles and surrounding vegetation and background.

(8) Radar return. Radar can detect differences in an object's ability to reflect radio waves. Since metal reflects radio waves and they are still an integral part of military activities, radar return is an important detection factor.

c. Camouflage Principles. There are three camouflage principles that we must follow to prevent detection by the enemy forces, they are: site selection, concealment, and camouflage discipline.

(1) Site selection. The selection of the proper site is most important, because proper site selection can eliminate or reduce many of the factors of recognition. For example, if a vehicle is positioned under foliage, its exhaust will disperse and cool as it rises, reducing the thermal signature and blending with the background. There are three factors that should be taken into consideration in site selection.

(a) Mission. A particular site may be excellent from a camouflage standpoint, but it is only useful if it permits the unit to accomplish its mission. THE MISSION IS THE MOST IMPORTANT CONSIDERATION.

(b) Dispersion. The requirement for dispersion will dictate the size of the site. A site is useless if it will not permit enough dispersal for survivability and effective operations.

(c) Terrain 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 is to consider 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. There are four general terrain patterns.

1. Rural terrain is recognized from the air by its peculiar checkerboard pattern. This is the result of the different types of crops and vegetation found on most farms.

2. Urban terrain, as pictured from the sky, is characterized by more or less uniform rows of houses with interwoven streets and punctuated by carefully located trees and shrubs.

3. Wooded terrain as pictured from the sky, presents to the observer a natural, irregular work of nature unlike the pattern of the man-made rural or urban terrain.

4. Barren terrain, like wood terrain, presents the observer with an uneven, irregular work of nature, without the defined patterns of rural and urban areas.

(2) Camouflage concealment has four different methods.

(a) Hiding is the complete concealment of an object by some form of screen. Some different ways to hide are: placing sod over mines in mine fields, placing objects beneath tree canopies, placing equipment in defiled positions, covering objects with nets, and hiding roads or obstacles with linear screens.

(b) 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 is the breaking up of an object's characteristic shape to avoid recognition because of shape, contrast, shadow, or radar or thermal signature.

(d) Disguising 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 a lesser or greater significance.

1. A clever disguise can mislead the enemy about the identity, strength, and intentions of friendly forces.

2. Disguised objects (decoys) will draw enemy fire away from the real object.

(3) Camouflage discipline is the avoidance of activity that changes the appearance of an area or reveals the presence of military activity.

(a) Camouflage discipline is a continuous, around the clock necessity that applies to every individual. It is a continuous requirement that calls for strong leadership which produces a disciplined camouflage consciousness throughout the entire unit.

1. If the prescribed visual and audio routines of camouflage discipline are not observed, an entire camouflage effort may fail.

2. Vehicle tracks, spoils, and debris are the most common signs of military activity. Their presence can negate all efforts of proper placement and concealment.

(b) There are three types of camouflage discipline: light and heat-source discipline, noise discipline, and spoil discipline.

1. Light and heat-source discipline, though important at all times, is crucial at night.

a. Lights that are not blocked out at night can be observed at long distance.

b. Threat surveillance can detect heat from engines, stoves, and heaters.

c. When moving at night, vehicles in the forward combat area should use ground guides or blackout lights.

2. Individuals should remain conscious of actions that produce noise and take precautions to avoid or minimize noises.

3. 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.

a. Vehicle tracks are clearly visible from the air; therefore, tracks and movement discipline are essential.

b. Existing roads and tracks should be used as much as possible. When new paths are used, they must fit into the exiting terrain pattern.

2. CAMOUFLAGING VEHICLES TO PREVENT DETECTION AND DESTRUCTION

a. A vehicle that is badly concealed or camouflaged can lead to much more than just a lost vehicle, it may mean the discovery of a unit or the disclosure of a tactical plan. To prevent vehicle detection, the following revealing factors must be considered.

(1) Tracks are especially revealing to aerial observers. By observing tracks, aerial observers can locate and identify the types of vehicles, determine the approximate number of vehicles, and even the intention of the unit.

(a) Track planning should be established and plans made before any vehicle enters into a new area.

(b) Track planning is accomplished by following existing routes whenever possible, and taking advantage of overhead cover and shadow-casting lines.

(2) Shine, if not eliminated from equipment surfaces, can nullify the best site and finest track discipline and must take a high priority in the camouflaging of equipment.

(a) Shine is always present whenever there is light, whether it be from the sun, moon or the light of flares.

(b) To overcome shine, mud, blankets, shelter halves, or burlap should be placed on the headlights, mirrors, cab windows, lights, and the light paint of the vehicle insignia.

3. TECHNIQUES OF CAMOUFLAGE

a. Natural Condition. The proper use of terrain and weather is a first priority when employing camouflage. Concealment provided by the terrain and conditions of limited visibility is often enough to conceal units. The maximum use of natural conditions will minimize the amount of resources and time needed to camouflage equipment and sites.

(1) Terrain.

(a) Forests generally provide the best type of natural screen against optical reconnaissance, especially if the crowns of the trees are wide enough to prevent aerial observation of the ground.

(1) Move along roads and gaps covered by tree crowns.

(2) Use shade to conceal vehicles, equipment, and personnel from aerial observation.

(a) In the Northern (Southern) Hemisphere, the northern (southern) edge of forests are shaded most of the time.

(b) Open terrain. Limited visibility is an especially important concealment tool when conducting operations over open terrain. When using conditions of limited visibility to cross open terrain, supplement your concealment with artificial materials and smoke.

(c) Dead space. Units should never locate or move along the topographic crests of hills or along other locations where they are silhouetted against the sky.

(2) Limited visibility.

(a) Weather. Conditions of limited visibility (fog, rain, and snow) hamper reconnaissance by optical sensors. Dense

fog is impervious to both visible and NIR radiation, making many threat night-surveillance devices unusable.

(b) Smoke operations. Smoke is an effective tool for enhancing other camouflage techniques. Smoke and obscurants can change the dynamics of the battle by blocking or degrading the spectral bands used by threat target-acquisition and weapon systems.

(c) Data sources. Commanders must be capable of evaluating natural conditions in their area to effectively direct unit concealment.

1. They must know the terrain and weather conditions prior to mission execution.

2. In addition to terrain-factor overlays, weather reports, and topographic maps, the commander must use aerial photographs, reconnaissance, and information gathered from local inhabitants to determine the terrain's concealing properties.

b. Artificial Materials. The use of natural conditions is the first priority of camouflage, while the use of artificial materials enhance camouflage efforts. Available artificial materials include pattern-painted equipment, LCSS, vegetation, expedient paints, and decoys.

(1) Pattern paints for equipment. Pattern-painted vehicles blend well with the background and can hide from optical sensors better than those painted a solid, subdued color.

(a) Pattern-painted equipment enhance anti-detection by reducing shape, shadow, and color signatures.

(b) Improved camouflage paints resist chemical agents and protect against detection by NIR sensors.

(c) While a patterned paint scheme is most effective in static positions, it also tends to disrupt aiming points on a moving target.

(2) Lightweight camouflage screening system (LCSS).

(a) Capabilities. The LCSS does not only reduce a vehicle's visibility; it defeats radar sensors.

1. Stainless steel fibers in the plastic garnish material absorb some of the radar signal and reflect most of the remaining signal in all directions.

2. Radar-scattering capabilities are effective only if there is at least two feet of space between the object and the object is completely covered.

(b) Characteristics. There are three LCSS color patterns: desert, woodland, and arctic.

1. Both sides of each type of LCSS have slightly different patterns to allow for seasonal variations.

2. LCSS employs modular construction, allowing the capability to cover various sizes of equipment.

3. Vegetation. Use branches and vines as temporary concealment for vehicles, equipment, and personnel.

a. Attach vegetation to equipment, using camouflage foliage brackets or spring clips.

b. Use cut foliage to complete or supplement natural, growing vegetation.

c. Also, use cut foliage to augment the artificial camouflage materials, such as placing branches on LCSS to break up its outline.

d. Replace cut foliage often because it wilts and changes color rapidly.

e. Living vegetation is easily obtainable and its color and texture make it a good blending agent.

f. Dead vegetation such as dried grass, hay, straw, or branches should be used for texturing.

g. Expedient paints. Earth, sand, and gravel can be used to change or add color and to provide a coarse texture.

4. DESCRIPTION OF THE LIGHTWEIGHT CAMOUFLAGE SCREEN SYSTEM (LCSS)

a. The camouflage screen system is a modular system consisting of a hexagon shaped screen, diamond shaped screen, support system, and repair kit. The screens are made of synthetic, lightweight, water resistant material, and can be fastened together by a quick connect to facilitate the joining and separation of the screens.

b. The camouflage screen system is used to conceal stationary target signatures, weapons, vehicles, and semi-permanent positions in situations where natural cover and concealment may be absent or inadequate.

c. There are two different models of the camouflage screen system, the radar scattering and radar transparent.

(1) The radar scattering camouflage screen system must not be placed over active radar equipment because it will seriously interfere with the operations of any radar equipment underneath it. This system is used to prevent the location and identification of the camouflaged items by the enemy using visual, photographic or radar devices.

(2) The radar transparent camouflage screen system is designed for placement over most active radar equipment and will inhibit the detection of the concealed items by visual and photographic means.

d. The only difference between the two screens is that the radar scattering screens have stainless steel filaments (0.170 inch long x 8 microns in diameter) impregnated in the garnish material. Because of their minute size, the filaments cannot be detected. The only way to identify the systems is by their identification tags.

(1) The radar transparent screen has a five-sided tag attached to the screen at every other corner.

(2) The radar scattering screen has a rectangular tag attached to the screen at every other corner.

e. Both radar camouflage screens consists of a hexagon shaped screen, diamond shaped screen, and repair kit.

(1) The modular system consists of a hexagon shaped screen and diamond shaped screen of the following dimensions:

(a) The length of the diamond shaped screen is 27.9 feet, width is 16.1 feet, and covers an area of 224.5 square feet.

(b) The hexagon shaped screen is 32.2 feet long, 29.9 feet wide, and covers an area of 673.6 square feet.

(c) The modular system also contains a repair kit with sufficient material to perform repairs to the screen.

(2) The support system for both screens consist of the following items:

(a) Twelve four foot aluminum or plastic pole sections used to support the screens.

(b) Eighteen aluminum or steel stakes for securing the screens to the ground.

(c) Eighteen batten spreaders for connecting the poles to the screens.

(d) Six spreader adapters for locking the batten spreaders to the poles.

f. The camouflage screen systems come in three seasonal patterns: woodland, snow, and desert.

(1) The woodland and snow screens come in seasonal patterns of spring and summer on one side and fall and winter on the other side.

(2) The desert screen has an arid (dried-up) side and a semi-arid side.

g. Erection of the Camouflage Screen System

(1) Prior to placing the camouflage screen system over the vehicle, the operator must first complete the following to prevent the equipment from being detected when it is covered with the screens:

(a) First, the operator must cover the lights with brush and the windshield with a tarp to prevent shine.

(b) Next, on trucks with a canvas top, lower the canvas flap at the back of the truck to hide the shadow inside the truck.

(c) Finally, place shrub underneath the vehicle to break up recognizable shadows cast by the vehicle.

(2) When erecting the camouflage screen system, the net structure should be kept as small as possible to aid in the prevention of detection.

(3) The netting should be maintained at a minimum of two feet above the camouflaged object's surface and eye-catching steeples and shadows should be avoided.

(a) Under no circumstances should the screen be draped over a vehicle. Draping the screen over the vehicle will show the outline of the vehicle and will allow immediate recognition of the vehicle, this defeats the purpose of camouflaging. The support system must be used at all times.

(b) The shape of the screens should be disrupted as much as possible by placing the support assemblies underneath the screens at various positions and heights, but always remembering to maintain the two feet minimum space between the vehicle and the screen.

(c) The screen should extend completely to the ground and all the way around the structure to prevent creating unnatural shadows that can be easily detected. This will ensure that the camouflage screening system effectively disrupts the shape of the vehicle, actually absorbing and scattering radar energy thus gaining protection from enemy sensors.

(4) Care must be taken when erecting the camouflage screen over antennas and vehicle exhausts. The radar scattering screen will ignite and burn if it comes near or touches a hot exhaust pipe or an antenna of a radio that is transmitting. If radio transmission and vehicle operation are required when the equipment is under a screen, the screen must be prepared as follows:

(a) First, mark a sixteen inch diameter circle in the material where the antenna or exhaust pipe will be located.

(b) Next, the screen should be cut for a distance of approximately three-fourths of the circle's circumference. The flap created from the cutting of the screen should be secured to the screen with plastic straps from the repair kit.

(c) After the hole has been cut in the screen, the screen should be placed over the vehicle with the antenna/exhaust pipe located in the center of the cut screen with approximately eight inches between the antenna/exhaust and the material at all times.

(d) Finally, all aluminum support poles must be placed a minimum distance of four feet from the antenna.

(5) Previously, we discussed the size of each type of screen, diamond and hexagon, found in the screen system and the components that make up each module. Now we must determine how many screen modules will be needed to cover a certain item.

(a) The first step in determining the number of screen modules needed to cover a certain vehicle or structure is to determine the dimensions (height, width, and length) of the vehicle or structure. Example: The M923 with canvas is approximately 10 feet high, 8 feet wide, and 25.5 feet long.

1. To figure out how many modules will be required to cover the vehicle the following formulas will be used:

$$A = 2h + W + 5ft \text{ or } 2(10) + 8 + 5 = 33 \text{ feet}$$

$$B = 2h + L + 5ft \text{ or } 2(10) + 25.5 + 5 = 50.5 \text{ feet}$$

2. Now that you know the total feet for both formulas, the module determination chart can be used to identify how many screen modules are needed for the M923; in this case two modules are required to camouflage a M923.

(b) Each screen module consists of one diamond and one hexagon screen and support system components to hold the screens over the item that we are trying to prevent from being seen.

(6) The first step in the construction of the camouflage screen system is to join the required number of screen modules needed to cover the vehicle. To join the screens, the edges must be clipped together with the lanyard cord and quick-disconnect pins with all pins pointing in the same direction.

(7) Once the correct number of screen modules have been connected, spread the screens out on the ground and stake the corners.

(a) When staking the corners, allow one foot of slack between each corner.

(b) When staking the corners of module units, overlap each of the corners and secure them with one stake.

(8) With the screen staked to the ground, the spreaders must be assembled and inserted into their pole sections.

(a) First, the spreader must be placed over the top of the pole and pushed down until it is firmly seated on the pole.

(b) Next, loosen the nut on the top of the spreader, extend the arms of the spreader and tighten the nut.

(c) The poles can be assembled next and extended to the required height, placing them under the screening where necessary.

1. The poles should be staggered to disrupt straight lines.

2. The length of the poles must also be adjusted to maintain the minimum distance of two feet between the screen and equipment.

REFERENCES:

1. *AETM, Applicable Equipment Technical Manuals*
2. *FM 20-3, Camouflage*
3. *TM 5-1080-200-13&P, Lightweight Camouflage Screen Systems and Support Systems*