LAND FORCE COUNTER SURVEILLANCE (ENGLISH)
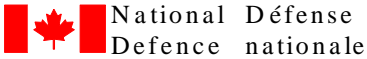
Issued on Authority of the Chief of the Defence Staff

Canada

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National **D**éfense
Defence **n**ationale

LAND FORCE COUNTER SURVEILLANCE (ENGLISH)

Issued on Authority of the Chief of the Defence Staff

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FOREWORD

1.   B-GL-364-001/FP-001, Land Force Counter Surveillance, is issued on the authority of the Chief of the Defence Staff.

2.   Suggestions for amendments should be forwarded through normal channels to Chief Land Staff, attention DAD 8.

3.   Unless otherwise noted, masculine pronouns apply to both men and women.

4.   The NDID for the French version of this publication is B-GL-364-001/FP-002.

PREFACE

AIM

1.   The aim of *Land Force Counter Surveillance* , is to describe the policies, concepts and doctrine for counter surveillance operations in a theatre of operation.

SCOPE

2.   The doctrine and concepts outlined in this publication are applicable to the tactical level of command in war and Operations Other Than War (OOTW). In certain situations the sustainment doctrine and concepts may not apply or may be modified to fit the circumstances.

3.   This manual, *Land Force Counter surveillance*, amplifies and complements both B-GL-300-001/FP-001, Land Force, Volume 1, The Conduct Of Land Operations - Operational Level Doctrine For The Canadian Army, B-GL-300-002/FP-000, Land Operations - Tactical Level Doctrine For The Canadian Army and G-GL-319-000/FP-000, Land Force Protection Doctrine which are the keystone documents upon which is based this doctrine manual.

4.   The terminology used in this publication is consistent with that of B-GL-303-002/FP-Z03, Army Vocabulary and AAP-6(U) NATO Glossary of Terms and Definitions. Important counter-surveillance terms extracted from these references are at Annex B.

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CHAPTER 1
COUNTER SURVEILLANCE CONCEPTS

"And, after all, what is a lie? 'tis but the truth in masquerade. "

George Gordon, Lord Byron (Don Juan Canto XI)

GENERAL

1.   Counter surveillance is the use of camouflage, concealment and deception to minimise the detection or identification of troops, weapons, equipment, and installations. It includes taking advantage of the immediate environment as well as using natural and artificial materials. One of the imperatives of our doctrine is to conserve friendly strength for decisive action. Counter surveillance alone is however not enough, it must supported by sound operations security (OPSEC) and physical protection from attack.

DOCTRINAL CONSIDERATIONS

2.   Using camouflage and concealment will help the commander by :

  a.   **Preventing Detection**. Counter surveillance degrades the effectiveness of enemy reconnaissance, intelligence, surveillance, and target acquisition (RISTA) capabilities. Skilled observers and sophisticated sensors can be defeated by obscuring the telltale signs (signatures) by which units on the battlefield may be detected and identified. Preventing acquisition by enemy observers will make it difficult for enemy forces to determine friendly operational patterns, functions, and capabilities.

  b.   **Improving Protection**. Counter surveillance reduces the enemy's ability to detect, identify, and engage friendly elements, therefore enhancing our protection. Protection encompasses all actions taken to conserve personnel, weapons, facilities, and supplies from the effects of enemy weapons and actions. Protection includes physical

measures such as fighting positions, nuclear, biological and/or chemical defence, armour, camouflage and concealment. It is also supported by operational and tactical measures such as dispersion, fieldcraft, manoeuvre and movement techniques, operational security, communications security, air and missile defence, use of smoke and deception.

c. **Deception**. Camouflage and concealment also enhances the effectiveness of deception in military operations. Camouflage and concealment help mask the real intent of primary combat operations and reinforce the intended deception, therefore, achieving surprise. Counter surveillance measures can delay effective enemy reaction by disguising information about friendly intentions, capabilities, objectives, and locations of vulnerable units and facilities. Conversely, intentionally poor camouflage can project misleading information about friendly operations. Successful deception depends on stringent OPSEC, which includes effective counter surveillance. For more detailed information on deception operations, see B-GL-354-003/FP-001 Land Force Deception Doctrine.

d. **Integrating Smoke Operations**. Smoke and obscurants are effective tools for enhancing other camouflage techniques. Smoke and obscurants can change the dynamics of the battle by blocking or degrading the spectral bands used by enemy target acquisition and weapons systems.

RESPONSIBILITIES

3.   There is no unit specifically assigned or dedicated to conducting counter surveillance. As every soldier and commander is responsible for counter surveillance, all must become proficient in counter surveillance techniques;

4.   **Soldier**. The individual soldier is responsible for concealing himself and his equipment. Just as marksmanship enables soldiers to hit

targets, camouflage and concealment enables them to avoid becoming targets.

5.   **Commander**. Commanders are responsible for the planing, training and execution of counter surveillance and deception measures within their unit or formation.

CAMOUFLAGE PRIORITIES

6.   **Recognising Technological Impact**. Every soldier and unit has an inherent mission of self-protection and should use all available means for counter surveillance. However, counter surveillance measures have become more sophisticated due to advancing technology. Commanders must recognise that advanced technologies have :

      a.   Enhanced the performance of hostile reconnaissance and surveillance equipment.

      b.   Increased ability to use signatures for detecting friendly units.

      c.   Reduced the time available to apply camouflage due to the increased speed at which units must perform nearly all aspects of battlefield operations.

7.   **Determining Priorities**. When time, camouflage materiel, or other resources are insufficient to provide adequate protection to all units, commanders must determine the priorities of counter surveillance. Considerations for establishing these priorities involve using the estimate process. The following factors, as a minimum, are used to determine counter surveillance priorities :

      a.   **Mission**. The mission is always the first and most important consideration. Counter surveillance efforts must enhance the mission but not be so elaborate that they hinder the mission.

      b.   **Enemy**. The enemy's RISTA capabilities will influence the type and amount of camouflage needed to support the unit's mission. Whenever possible, an intelligence

analysis should include the types of RISTA equipment the enemy uses.

c.   **Terrain**. The terrain dictates what camouflage techniques and materials are necessary. Skilful use of the terrain's cover and concealment properties has a decisive significance in camouflage. Different terrain types (such as urban, mountain, forest, plains, desert, and arctic) require specific camouflage techniques.

d.   **Own Troops**. Friendly troops must be well trained in camouflage techniques that apply to their mission, unit, and equipment. A change in environment or mission will often require the retraining of soldiers. Leaders must also consider the alertness of troops. Careless efforts at camouflage are ineffective and may disclose the unit's location. The analysis should take into account how detectable friendly equipment is, as well as the signatures normally transmitted by the unit.

e.   **Time**. Time is often a critical factor. Elaborate camouflage may not be practical for the tactical situation. The type and amount of camouflage needed are determined by the time the unit will occupy the area, the amount of time available to camouflage, and the amount of time necessary to camouflage the unit after it moves.

8.   **Training**. Counter surveillance training is an important element of readiness. It is divided into :

a.   **Individual Training**. Camouflage training must be conducted during every field exercise. Soldiers must be aware that the ennemy can detect, identify, and acquire targets by using technologies well beyond the visual part of the electromagnetic spectrum. Each member of the unit must acquire and maintain specific camouflage skills. These include the ability to analyse and effectively use terrain, to properly select an individual site; and to hide, blend, disrupt, and disguise signatures by using both natural and artificial materials.

b. **Unit Training**. Unit camouflage training refreshes individual and leader skills, introduces the element of team co-ordination, and contributes to tactical realism. If camouflage is to help preserve friendly strength, it must be practised with the highest degree of discipline. Camouflage, concealment, light, noise and communications discipline, as well signal security must be practised and evaluated in an integrated training environment. Camouflage proficiency is developed through practice. Units must incorporate camouflage into their field SOPs that address the who, what, where, when, and how of camouflage. Annex A provides additional guidance on integrating camouflage into unit SOPs and drills.

c. **Training Evaluation**. An evaluation of camouflage training should be as realistic as possible. Integrate unit training with evaluations to provide reinforcement and enhance training. The following techniques will enhance training evaluation :

  (1) Have commanders and leaders evaluate their counter surveillance efforts from the enemy's viewpoint. How a position looks from a few meters away is probably of little importance. Could an approaching enemy detect and place aimed fire on the position? From what distance could the enemy detect the position? Which camouflage principle was ignored that allowed detection? Whenever possible, use binoculars, night vision, or thermal devices to show units how they would look to an enemy.

  (2) Use photographs or videotapes of positions as a method of self-evaluation. Incorporate ground-surveillance radar teams in training whenever possible. Let troops know how the ground surveillance radar works, then have them try to defeat it. Request aerial photography of your unit's positions. These photos will show how the position would look to enemy aerial reconnaissance. Use an opposing force

(OPFOR) on the ground and in the air to make training more realistic. Whenever possible, unit leaders should be allowed to debrief the OPFOR. They should ask what factors enabled the OPFOR to locate, identify, and engage the unit, and what the unit could have done to improve its concealment.

9.   **Fratricide**. Warfare often causes losses resulting from erroneously conducted operations against friendly troops. Fratricide compels commanders to consider the effect camouflage and deception operations will have on the necessity of being recognised by friendly troops.

10.   **Material**. The Canadian Forces policy prescribes that camouflage aids be built into equipment and supplies as much as possible. Standard camouflage material includes, skin creams, fabrics, equipment paints, woodland and winter nets and patches, woodland nets and patches urban camouflage sheeting and camouflage support systems. These camouflage aids, however, are effective only if properly used and are best when integrated with natural camouflage. Camouflage aids should not interfere with the battlefield performance of the soldiers, equipment, and installations they conceal. Technical details of counter surveillance equipment available to the Canadian Forces are found in *C-02-050-012/PT-000, General Technical Aspects of Counter-surveillance, Camouflage and Concealment for the Canadian Forces*.

CHAPTER 2
BATTLEFIELD SURVEILLANCE THREAT

SECTION 1
SURVEILLANCE RESOURCES

GENERAL

1.   The success or failure of enemy operations depends on the accuracy and speed of its target acquisition. Surveillance cannot be universal or constant. The enemy uses a variety of sensors to detect and identify our soldiers, equipment, and supporting installations. These sensors use visual, ultraviolet, infrared (IR), radar, acoustic, and radio technologies. They may be employed by dismounted soldiers or be placed on ground or airborne platforms which are often capable of supporting multiple sensors. As we will rarely know the specific systems the enemy will employ, it is better to protect against all known surveillance sensors, whenever possible. Since most of the technologies discussed below are commercially available we can expect potential enemies to have access to them.

DATA COLLECTION

2.   The enemy collects information about our forces for two basic reasons :

        a.   Target Acquisition. Modern weapons systems often have sensors capable of locating and identifying targets. All soldiers and units should protect themselves from target acquisition.

        b.   Intelligence Production.

            (1)   Predicting Future Activities. The enemy uses its sensor systems to locate and identify large formations and headquarters and to predict their future activities. Detection of activities in the rear area, such as at logistics centres, also reveal our intentions.

3.		Tactical Reconnaissance. The enemy uses tactical reconnaissance to gather additional information on our dispositions, to analyse the terrain on which we intend to operate or to identify targets for long-range artillery, rockets, and aircraft.

SURVEILLANCE AND TARGET ACQUISITION RESOURCES

4.		The following resources may be used for purposes of reconnaissance, surveillance and target acquisition :

> a.		Space and Airborne Reconnaissance.

> b.		Electronic Intercept and Direction Finding. This type of EW resource will probably exist at divisional level or higher.

> c.		Long Range Reconnaissance Teams. The teams will also perform sabotage and capture prisoners. They will probably be a divisional or higher resource.

> d.		Motorised Reconnaissance. These troops will be found at unit, brigade and division level.

> e.		Artillery Observation. These units employ acoustic, visual, IR and radar to acquire and engage targets.

> f.		Observation Posts. Enemy doctrine normally provides for each unit to maintain observation posts when in close contact with our forces.

> g.		Patrols. Patrolling is often employed extensively but particularly during offensive operations. The enemy can use patrols to detect the location of command and control installations, indirect and direct-fire weapons, gaps in formations, obstacles and bypasses.

> h.		Raids. Enemy forces can use raids to capture prisoners, documents, weapons, and equipment. A reconnaissance-in-force (usually by a reinforced company or battalion) is the most likely tactic when other methods of tactical reconnaissance have failed. The purpose of the

reconnaissance-in-force is usually to deceive us into thinking that we are being attacked, or to reveal our defensive positions.

5.   Reconnaissance sorties will be flown at altitudes of 100 to 350 metres at speeds between 700 and 900 km per hour. Higher altitudes are used for long range stand-off systems or if there is no threat of air defence.

6.   Modern aircraft are capable of visual, photographic, IR, radar and electronic reconnaissance. The pilot can report on visual in-flight observations or directly transmit digital information when at high altitude or by relay through other aircraft while at low altitudes thus enabling them to reduce their decision cycle.

7.   Specially selected and trained personnel to collect information in rear areas carry out reconnaissance in depth. These teams may consist of :

  a.   air dropped parties;

  b.   stay behind parties;

  c.   infiltrators; and

  d.   local sympathisers.

8.   The teams, equipped to gather information or disrupt the rear area, may position themselves well inside our territory. They however often use a slower reporting system to enhance their survival unless the value of the targets warrants an immediate attack.

9.   Formations and units normally have specialist reconnaissance units equipped with various vehicles or motorcycle combinations. They provide the commander with his integral intelligence gathering capability. A formation may reinforce specialist reconnaissance elements with standard companies or squadrons in the reconnaissance or counter reconnaissance role in order to improve information gathering capabilities.

10.   Targets detected by reconnaissance may be engaged within minutes if the suitable weapon system is within range.

11.   Artillery observers and target acquisition units will employ various systems to locate targets, including manoeuvre units, artillery, rockets and mortar positions.

12.   The type of artillery target acquisition systems which may be available are :

        a.   visual sensors (including Image Intensification);

        b.   IR sensors;

        c.   ground surveillance radar;

        d.   tracking radar;

        e.   sound ranging systems; and

        f.   flash spotting observation posts.

SECTION 2
ELECTROMAGNETIC SPECTRUM

13.   Visible light is a form of electromagnetic energy. As it passes through the atmosphere it is partially absorbed and reflected by all objects in its path. This action creates a pattern of light, shadow and colour which allows us to visually recognise objects. There are, however, many other forms of electromagnetic energy, which are not visible to the naked eye. From Figure 1 it is evident that visible light forms only a minor portion of the overall spectrum. The visible spectrum may be further divided into the different colours of the rainbow.

14.   All electromagnetic waves travel at the same speed (300,000 kilometres per second) but have wavelengths that vary from a few billionths of a millimetre to several thousand metres.

15.   The five main parts or bands of the Electromagnetic Spectrum (EMS) used for surveillance sensors are :

        a.   the ultra-violet (UV) band;

        b.   the visual band;

   c.   near, mid and far infrared (IR) bands;

   d.   radar bands; and

   e.   radio bands.

16.   Noise will be generated by electromagnetic waves but is only audible at a very low frequency. An example is the humming sound emitted from power transmission lines.

17.   The types of sensors that operate in each band will be outlined in the following sections of this chapter. Radio band sensors will not be discussed further as EW is outside the scope of this manual.

WAVELENGTH								NATO Bands		Infrared		Ultraviolet			Gamma Ray		
								Service Radars					X - Ray				
	VLF	LF	MF	HF	VHF	UHF	SHF	EHF		Thermal Sights	Optical Sights		X - Ray				
	10km	1km	100m	10m	1m	0.1m	1cm	1mm									
		Radio Waves		Microwaves		Guided Weapons							X - Ray				
			Radio		Television				Guided Weapons				Nuclear Weapons				
	Long Range Comm			FM Radio		Radar				Lasers							
				Navigational Aids													
	1KHz	10KHz	100KHz	1MHz	10MHz	100MHz	1GHz	10GHz	100GHz	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}	10^{11}	10^{12}

Original concept in *Advanced Technology Warfare*.

Figure 1: Electromagnetic Spectrum

SECTION 3
SURVEILLANCE EQUIPMENT

18.   A thorough understanding of battlefield surveillance equipment is required in order to be able to conduct effective counter-surveillance.

19.   The human eye has proved to be the most productive surveillance asset on the battlefield. Many devices have been developed to aid in the gathering of information, including :

   a.   conventional optical instruments such as binoculars;

   b.   image intensifiers;

   c.   television;

   d.   photography;

      e.   infrared observation devices and weapon sights;

      f.   radar;

      g.   acoustics;

      h.   sound ranging;

      i.   seismic;

      j.   intrusion alarms; and

      k.   lasers.

20.   Surveillance sensors may be separated into two categories :

      a.   <u>Passive Sensors</u>. This type of sensor does not emit energy that can be detected by the enemy. Examples are binoculars, cameras and sound ranging equipment; and

      b.   <u>Active Sensors</u>. Energy, which can be detected by the enemy, is emitted from the sensor and the reflection is measured. Some examples are radars, searchlights and laser range-finders.

SECTION 4
VISIBLE LIGHT SURVEILLANCE

GENERAL

The primary means of surveillance in all armies will continue to be in the visual spectrum. This section describes visual optical aids that extend the capabilities of the human eye. Fog, smoke, haze and darkness will adversely effect observation in the visible band.

THE UNAIDED EYE

21.   The human eye changes light energy into nerve impulses that the brain transforms into a three-dimensional colour picture. In darkness, the amount of light energy is inadequate for the eye to distinguish colours. The

eye requires approximately 45 minutes to become fully adapted to darkness. However, 60% dark adaptation may be achieved in 15 minutes. Three minutes are required for the eye to fully adapt from darkness to daylight conditions. It is estimated the human eye can distinguish 200 shades of grey and over a million colour differences.

BINOCULARS

22.   Telescopes and binoculars are the simplest and oldest means of enhancing the capabilities of the eye. Improved lightweight versions provide magnification up to a factor of 14. All types of binoculars are passive but may be aided by active devices such as searchlights and flares. Variants of binoculars are employed as weapon sights. Recent developments of binoculars provide a gyro-stabilised sightline that overcomes the problem of blurred vision encountered while observing from a moving platform.

IMAGE INTENSIFIERS (II)

23.   Image intensifiers are devices that electronically amplify very small amounts of light available at night in the visible and near infrared portions of the spectrum. The final image is up to 250,000 times brighter than the original image. Image intensifiers are a passive surveillance device and cannot be detected when in use. The types of image intensifier systems are listed in Table 1.

TYPES OF IMAGE INTENSIFIERS	DETECTION RANGE		WEIGHT OF SYSTEM
	Personnel	Tanks	

Night Vision Goggles	300m	600m	Less than 1 kg
Individual Weapon Sights	300m	600m	Less than 0.5 kg
Night Vision Binoculars	600m	1200m	Less than 2.0 kg
Crew Served Weapon Sights	800m	1500m	Less than 3.5 kg
Night Observation Device	1500m	6000m	Less than 12 kg

Table 1: Types of Image Intensifier Systems

24.   Rain, haze, smog and fog will degrade the performance of image intensifiers considerably. The field of view is less than 200 mils for most devices. The image may be distorted temporarily by a bright light, but an automatic light reduction mechanism will minimise distortion.

TELEVISION (TV)

25.   Components. A television system is comprised of a TV camera, a viewing screen and a communications link between the two. Modern TV camera will function at night even in overcast starlight.

26.   From a surveillance point of view there is no limit to the range at which normal vision can be extended by television providing there is no interference with the signal transmission. The TV coverage of space activities is a good example.

27.   The following characteristics of a TV system should be considered when employed as a surveillance device :

       a.   It may be employed in a ground surveillance mode or mounted on manned or unmanned aircraft. A TV camera may also be used as a guidance system for air to surface missiles. A pilot selects his target on a small TV monitor in his cockpit, and locks onto it with the TV camera in the nose of the missile.

b.   Although the picture definition obtained is not yet as good as photographic print, the brilliance and contrast of the picture may be adjusted to assist recognition.

c.   The system provides immediate visual information that may be recorded and played back with additional facilities.

d.   Good vision can be achieved on dark nights. Detection out to 6 km is possible when coupled with an image intensifier.

e.   Charge Couple Device (CCD) TV systems are now small, light and require a small power supply. The main limitation is the size of lens. Long-range systems are usually incorporated in vehicles or aircraft while short-range systems could be used as unattended sensors or in small weapon systems.

28.   There are two types of TV systems :

a.   Closed Circuit. In a closed circuit TV system cables connect the camera to the screen. Although passive and secure from enemy interception or interference, the connecting cables are vulnerable to damage and limit the distance between the camera and the screen

b.   Remote TV. With a remote TV system, the camera and the screen are connected by data link. Line of sight transmissions are normally required unless relay stations are used. The system is active and may be intercepted or jammed.

PHOTOGRAPHY

29.   The advantage of photography is that it stops time and allows an area to be studied in detail. It is mainly used in the aerial reconnaissance role. It is also useful on reconnaissance patrol missions provided the film processing is instantaneous. Photographs may be taken at night using electronic flashes.

30.   There are two types of aerial photographs :

    a.   Oblique Photographs (Figure 2). These photographs are taken at a low level. They are easier to interpret but are relatively difficult to relate to a map.
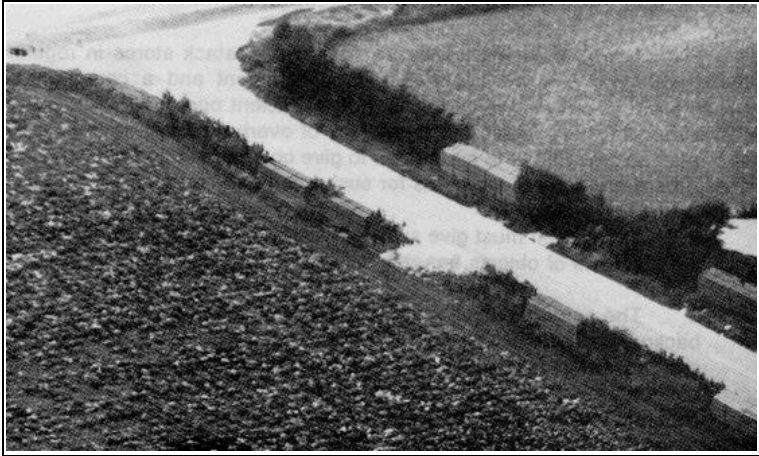
Figure 2: Oblique Aerial Photographs

    b.   Vertical Photographs (Figure 3). These photographs must be taken at a high altitude in order to cover a large area of ground. A skilled interpreter is required to ensure effective detection and identification of targets. Interpretation is normally done using stereo pairs of photographs to determine the relief of the terrain. In general, tactical air reconnaissance photographs taken at altitudes up to 20 km achieve ground resolutions of less than 30 cm.
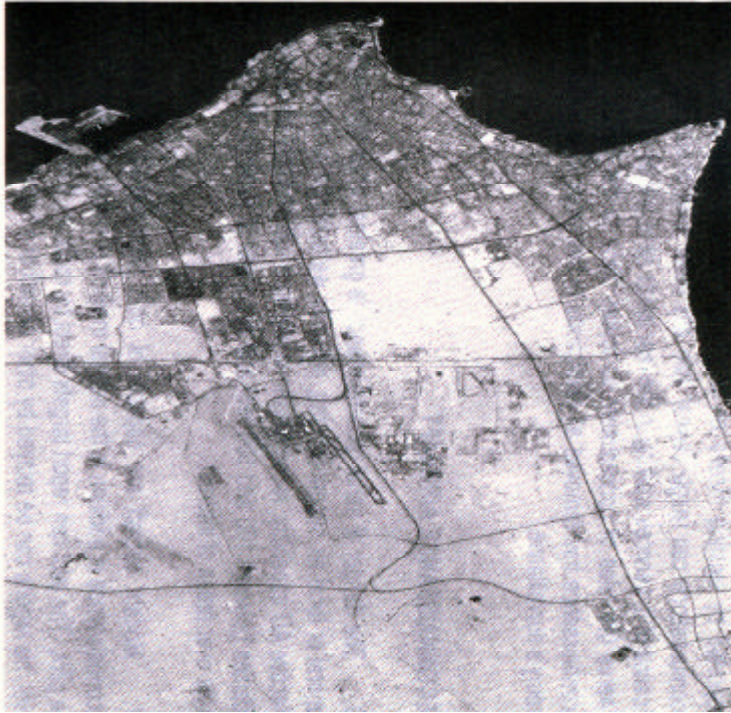
Figure 3: Vertical Aerial Photographs

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SECTION 5
INFRA-RED (IR) SURVEILLANCE

</div>

GENERAL

31.   The IR band of the electromagnetic spectrum lies between visible light and the radar band. The IR band is divided into three parts; near, mid and far IR:

32.   Near IR. At these wavelengths (generally considered to be below one micron), light behaves similarly to white light but cannot be observed with the naked eye. Special IR viewing devices or IR photography is required.

33.   Mid IR. At these wavelengths (generally considered to be three to five microns), the thermal signature of a target is detected. This signature is however dependant on the time of day and therefore is more difficult to interpret than Far IR images. The advantage of devices using these wavelengths is based on the fact that they do not require cooling to operate.

34.   Far IR. This part of the spectrum (generally considered to be eight to twelve microns), is used for detecting the thermal signature of a target notwithstanding the time of the day. These devices however require cooling to operate.

ACTIVE NEAR IR SYSTEMS

35.   Near IR night viewing equipment uses an IR sensor in conjunction with an IR energy source. The sources will normally be a white light fitted with a suitable IR filter. The IR sensor measures the reflected IR energy from the target. These systems are no longer used by western armies, except for older types of equipment such as :

        a.   individual weapons sights;

        b.   vehicle headlights;

        c.   armoured fighting vehicle driving periscopes; and

        d.   tank search lights.

36.   The viewing range of the equipment depends on the power of the IR source used and can vary from several metres for vehicle headlights to 1000 metres or more for a searchlight. Aerial reconnaissance is possible at ranges of five to 10 km with an active IR source.

37.   Since this system relies on an illuminating IR source it is an active system that may be easily detected. The source can be detected from a greater distance than the range at which the sensor can detect the target. Near IR devices, except for airborne surveillance, are likely to be replaced with passive systems because they can be detected by image intensifiers and special IR sensors.

NEAR IR PHOTOGRAPHY

38.   The amount of reflected IR energy from natural vegetation is far greater than other materials. Green foliage contains chlorophyll which has high reflectance in the near IR spectrum and makes leaves and grass appear to be intensely lit against a sky background that is normally black in this part of the spectrum. By the application of special film emulsions and an IR filter a standard camera may take photographs of a near IR image. When viewing camouflaged objects against a vegetated background, the colours may match in the visible spectrum, but they will not match in the near IR spectrum. Near IR photographs may be taken with special colour or black and white film.

39.   The Canadian Forces woodland camouflage net, combat clothing and vehicle that have a theatre specific disruptive pattern were created by using paints of specified IR reflective values and colours so that they may not be distinguished from natural vegetation. Use of vegetation will give the best match with the background. It should be noted that vegetation would wither visibly before it loses its IR reflectivity.

MID AND FAR IR

40.   All objects radiate energy and these emissions may be recorded to build a thermal image of the object. Thermal image devices may detect temperature differences of less than 0.1? C at ranges of up to several thousands of metres through smoke and mist. Note that smokes that degrade the capabilities of surveillance devices are now being fielded.

41.   A thermal image may be viewed directly through the sensor, displayed on a TV screen or recorded on film. As the technique makes use of energy radiated from the target it is a passive system. Hot objects such as vehicle engines and gun barrels after firing can stand out clearly. Hot targets may be detected, depending on weather, background, clutter etc , through a limited amount of cover by day or night.

42.   Thermal sensors are used for surveillance and weapon sights. They can also be mounted on armoured fighting vehicles, helicopters and fixed wing aircraft. The two types of thermal image devices are :

      a.   Forward Looking Infrared (FLIR). The real time image is a two dimensional thermal scan which can be displayed

on a TV screen. There are hand held versions that are capable of detecting vehicles at ranges up to 5 km.

b.   Infrared Line Scan (IRLS). The imagery taken by IRLS equipment may be real time or developed and printed in the same way as ordinary film and transformed into a direct display. The system may be mounted on an aircraft or drone and scans the ground perpendicular to the flight path. Each successive scan registers a new piece of ground. At altitudes of one km the resolution is normally less than one metre.

SECTION 6
ULTRA VIOLET (UV) SURVEILLANCE

43.   Snow covered ground is characterised by very high reflection in the visual as well as UV ranges of the spectrum. Filters that have a high transmittance of UV and no transmittance of visible light will be used for UV photography. Articles not having similar levels of UV reflectance will be easily detected. Man made white materials reflect on 5% to 10% of UV light whereas snow reflects 60% to 100%.

44.   Canadian Forces winter camouflage nets, winter appliqué patches and white vehicle paint have the required UV reflectance values to blend with a snow environment.

SECTION 7
RADAR SURVEILLANCE

GENERAL

45.   Radar is an abbreviation for Radio Detection and Ranging. Radar sets work by transmitting a radio signal that strikes a target and is reflected back towards a receiver. The reflected signal, known as the echo or return, can be heard audibly and/or displayed on a screen. Returns are also received from trees, buildings, ground, heavy rain or clouds which may be unwanted clutter.

46.   There are two main types of radar :

a. Pulse Radar. This system measures the time for the radar pulse to travel to the target and return. Pulse radar will determine the range, bearing and elevation of the target.

b. Continuous Wave (CW) Radar. This system is used for the detection of moving targets. The movement of a target will change the continuous signal frequency (known as the Doppler effect). The amount of frequency change is proportional to the speed of the target. CW Radar can only detect moving targets eliminating the clutter returns from terrain.

GROUND SURVEILLANCE RADARS

47. CW Radar are normally used in the ground surveillance role. They have the following characteristics :

a. a line of sight is required between the radar and the target.

b. the narrow beam width will only detect moving targets such as vehicles up to ranges of 30 km. Personnel may be detected at a range of 14 km. 6400 mils surveillance is possible with some systems. Accuracy are $\pm$ 20 metres for distance measurement and $\pm$ 10 mils for direction.

c. a skilled operator can manually and some modern equipment can automatically distinguish between tracked, wheeled and foot movement.

d. radar is not effected by smoke, fog or darkness but may be degraded by heavy rain and falling snow.

e. radar systems are active devices and are easily detected.

GROUND TO AIR SURVEILLANCE

48. Radar is used for air surveillance and target acquisition. These systems are normally associated with AD Systems in the army. Countering these systems is critical to our ability to conduct effective joint and air operation.

AIR TO GROUND SURVEILLANCE

49.   Radar may also be used for reconnaissance from the air. Systems mounted in aircraft look out sideways, thus the name, "Sideways Looking Airborne Radar" (SLAR). An aircraft may fly behind the forward line of troops (FLOT) and scan the enemy side of the battlefield. There are two separate SLAR modes :

   a.   Imaging or Mapping Mode. Use of SLAR in the imaging or mapping mode produces an image similar to a poor definition aerial photograph. It will show all terrain features but being line of sight will also show areas of dead ground as black shadows. Effective ranges are as great as 300 km with a metre resolution,

   b.   Moving Target Indication (MTI) Mode. In the MTI mode, ground features are suppressed and details of moving targets are enhanced (see Figure 4). The white dots on the image indicate moving vehicles Effective ranges are as great as 300 km with a metre resolution.
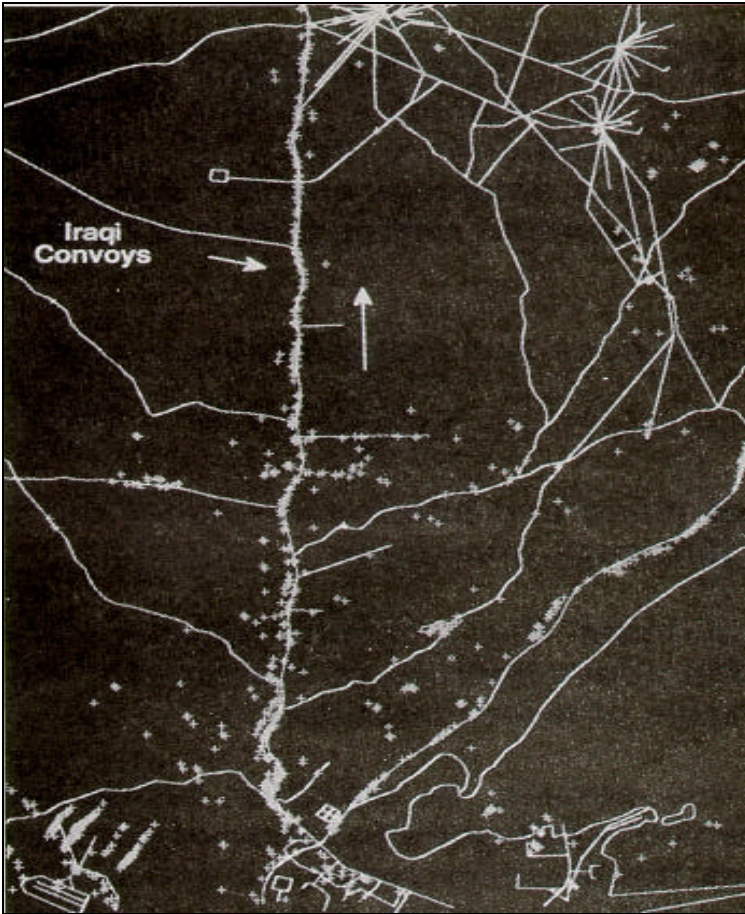
Figure 4: MTI Radar Image

50.   The resolution of SLAR is limited by the size of the antennae. In order to achieve fine grain resolution at longer ranges, aircraft can make use of Synthetic Aperture Radar (SAR) which electronically simulates larger antennae and therefore increase the stand-off range or resolution as required.

INDIRECT FIRE LOCATING RADAR

51.   The basis of indirect fire locating is the two-point method that assumes a parabolic flight path. The radar fixes two points on the trajectory and records the time interval between them. The position of the fire unit is deduced from this data.

52.   A typical range of a locating system is 20 to 30 km with a location accuracy $\pm$ 0.5% of the range.

MILLIMETRE WAVE RADAR

53.   The millimetre wave portion of the electromagnetic spectrum is part of the RADAR band corresponding to a very short wavelength (one to 10mm). Millimetre waves have a higher resolution than most radar but experience greater attenuation and absorption in fair weather conditions. They are normally used as guidance radar for missile or as homing device on the missiles. The range of millimetre wave radar is 10 to 20 km that may be reduced by rain and fog.

54.   Other advantages to millimetre wave radar are :

      a.   A superior penetration through smoke, fog and rain than other electronic devices such as image intensifiers and thermal imagers;

      b.   A very small system that may be incorporated in aircraft and missiles;

      c.   A relatively wide band width with several windows to increase immunity to electronic jamming;

      d.   A narrow beam width that provides high resolution and is difficult to detect.

55.   Millimetre wave technology is relatively new. Most applications will be used for target tracking and as homing devices for terminal guidance weapons.

56.   Most large vehicles have a natural millimetre wave signature. A passive millimetre wave sensor has recently been developed to detect characteristic millimetre wave signatures of different types of vehicles.

SECTION 8
REMOTE SENSORS

ACOUSTICS

57.   Even a skilfully camouflaged object can be detected by sound. Listed below are the audible distances of some military activities :

        a.   Gunfire up to 15 km;

        b.   Rifle fire up to 3 km;

        c.   Tank on dry ground up to 2 km;

        d.   Tank on pavement up to 4 km;

        e.   Normal voice up to 200m;

        f.   Loud voice up to 1 km.

SOUND RANGING

58.   To locate artillery weapon systems a baseline of microphones is placed immediately behind the FEBA. The recording of each microphone determines a bearing to the gun location. Accuracies are possible within 100 metres out to ranges exceeding 30 km.

59.   Sound ranging systems can simultaneously process data on 50 targets and display locations within 10 seconds.

SEISMIC SENSORS

60.   Geophones are capable of detecting seismic disturbances generated by moving personnel, trucks and tanks. Portable geophones have a

detection range of 30 to 300m. A seismic sensor may be remoted to a control station by line or transmit radio signals at ranges up to 1.5 km.

61.   A seismic sensor is passive and may be employed in jungle or mountainous terrain that prevents line of sight surveillance. More sophisticated versions may be emplaced by artillery and aircraft.

INTRUSION ALARM SYSTEMS

62.   Large areas may be observed with small remote devices that detect the presence of personnel and vehicles. Where line of sight surveillance is not possible, an IR or microwave fence may be established to detect an intruder.

63.   IR Intrusion System. A small IR beam (40mm wide) may be projected between a receiver and a transmitter positioned up to 200 metres apart. Several such sensors may be remoted to a control station.

64.   Microwave Fence. A microwave beam may be projected between a receiver and a transmitter positioned up to 100 metres apart. The beam is up to 2.5 metres high and the same thickness. The microwave fence will operate satisfactorily in rain, fog or snow and has a high activation to birds, small animals and wind blown debris.

SECTION 9
LASER SURVEILLANCE

GENERAL

65.   Lasers have been adapted to assist in target acquisition, thermal guidance and photography. A laser is an active system that produces a very narrow coherent beam of radiation and includes a receiver that can detect the reflected laser radiation from the target.

66.   Concentrated laser radiation can provide a high level of illumination in a very small area. This provides high resolution for surveillance devices and permits very accurate weapon guidance. Several wavelengths within the visible, UV and IR portions of the spectrum may be used. Lasers are an active system and may be easily detected.

LASER RANGE-FINDERS

67.   The distance to an object that reflects the laser beam can be determined by comparing the emitted and received signals. Note that the target must be observed by some other means before the range finder is employed.

68.   Laser range finders are available in binocular, crew served weapons and armoured fighting vehicles. Typical ranges are 5 to l0 km with accuracy within $\pm$ 10 metres. Ranges will be computed in less than one second.

LASER LINE SCANNER AND LASER RADAR (LADAR)

69.   In principle the laser line scan and LADAR perform the same function as their radio counterpart in a different part of the EM spectrum.

LASER DESIGNATOR

70.   Although not a surveillance device, a laser designator works on the same principle as a range finder. Laser guided rockets, bombs and artillery rounds contain a homing device that locks onto the reflected laser radiation.

71.   Man-portable systems weighing 4.5 kg will project a laser designation beam up to 20 minutes in duration over a 10 km range with a 5 m accuracy. Future lasers will be capable of a tuneable wavelength to defeat laser decoys.

72.   Laser designators have also been fitted to some small arms to be used in combination with night vision goggles. A rifleman wears image intensifier goggles to observe a target. He then aligns the rifle and switches on the laser spot projector which projects a spot of light at ranges up to 300 metres. The rifle the spot is placed on the desired target by aiming with the rifle. The advantage to this system is :

        a.   the system is passive until the laser spot projector is activated. The laser will only be active for two or three seconds until the target is engaged;

b.　　the lightweight spot projector (200 gr) is less cumbersome than fitting a night vision scope to the weapon.

SECTION 10
UNMANNED AERIAL PLATFORMS

GENERAL

73.　　The use of unmanned aerial platforms overcomes many of the disadvantages of ground based sensors. Most sensory devices are light enough to be placed on small aerial platforms that are not easily detected due to their size and speed of movement. It is possible to carry out a detailed survey of an area at short notice with no limitations other than the range of the platform.

74.　　The three unmanned systems that carry surveillance sensors are remotely piloted vehicles, drones and satellites.

DRONES

75.　　A drone is an unmanned aircraft that flies a programmed path. Typical performance characteristics of drones are :

a.　　range up to 150 km;

b.　　endurance up to seven hours;

c.　　navigational accuracy $\pm$ 150 metres;

d.　　speed up to 750 km/hour;

e.　　response time 60 to 90 minutes;

f.　　types of sensors include FLIR, IRLS, TV, Low Light TV radio direction finding, laser designator or any other payload that can be flown; and

g.　　operational height between 300 and 4000 metres.

76.   The most common sensory head is a vertical camera that has the ability to scan an area of 500 square metres. As there is no datalink capability, the response time is similar to tactical air reconnaissance missions.

REMOTELY PILOTED VEHICLES (RPV)

77.   A RPV flight path is controlled by a human operator. There are fixed wing and rotary wing versions. The command and datalink capability provides real time results to a control station. The same type of sensors fitted to a drone can be carried by RPVs. RPVs with a wide variety of operational ranges and endurance are currently being fielded.

SATELLITES

78.   Satellites have been in use since the 1960s for surveillance of large areas that are of strategic interest such as ICBM installations. The high speed of a satellite enables surveillance of large areas in a short period of time. Due to the high operational altitude, several thousand square kilometres can be photographed in a single frame. Until now most of these images were available to a limited number of users due to their security classification. They are now commercially or readily available on the Internet. Commercial ventures include mid resolution (down to one m accuracy), multi-spectral and near real time imagery. This important capability will have a serious impact on strategic and operational level counter surveillance as the systems provide a net advantage in information gathering.

79.   Near real time imagery is available in the visible, IR and radar bands. High resolution is possible with military systems and mid resolution with commercial systems. Vehicles, buildings, equipment and detailed activities are identifiable on commercial imagery.

CHAPTER 3
FUNDAMENTALS OF CAMOUFLAGE AND CONCEALMENT

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 1
COUNTER SURVEILLANCE TECHNIQUES

1.   Counter surveillance is an integral part of tactical operations. The counter surveillance factors must be integrated into the estimate process at all echelons. Camouflage and concealment is a primary consideration when planning protection and deception measures. The skilful use of all counter surveillance techniques is necessary if the unit is to conceal itself and survive.

2.   Chapter 2 described the various types of sensors that may be used to identify targets on the battlefield. However, all equipment and the human element have their limitations that must be exploited. In battle, the time required to collect, interpret and disseminate surveillance information is critical. It may not be possible to deny all information from the enemy, but time and effort may be prolonged to the point where it is uneconomical to obtain further information.

3.   Avoiding Detection. The primary goal of camouflage is to avoid detection by the enemy. In some cases however, camouflage may succeed by merely preventing the enemy from identifying the target. While the enemy may know something is there, failure to identify what it 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 ten rules to follow when considering how to avoid detection or identification:

        a.   identify the enemy surveillance priorities;

b.   determine the type and tactical employment of enemy sensors;

c.   avoid detection by the enemy routine surveillance;

d.   establish counter surveillance priorities and integrate them with the deception plan;

e.   take countermeasures against selected sensors;.

f.   apply realistic camouflage;

g.   minimise movement;

h.   maintain track discipline;

i.   use decoys properly;

j.   continuously avoid detection;

k.   treat night as day; and

l.   avoid operational patterns.

4.   Identifying the Threat. Obtain as much information as possible about the enemy's surveillance capability. The intelligence preparation of the battlefield (IPB) should include those sensors the enemy uses in a particular theatre. 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 both the sensor and the target.

5.   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.

6.   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 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.

      a.   Applying Realistic Camouflage. The closer 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 sensors and all regions of the EM spectrum. Effective camouflage requires an awareness of one's surroundings, proper camouflage skills and the ability to visualise those signatures that enemy sensors will detect.

7.   Minimising Movement. Movement must be minimised as it 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.   Plan, discipline, and manage the movement so that signatures are reduced as much as possible, particularly in operations that inherently involve movement (such as an offensive). Disciplined movement includes the techniques identified in Chapter 5.

8.   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. *B-GL-354-003/FP-001 Land Force Deception* addresses the correct employment of decoys.

9.   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 difficult to detect, assume they are being used at night. Do not allow counter surveillance 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.

10.   Avoiding Operational Patterns. An enemy can often detect and identify different types of units or operations by analysing the patterns of signatures that accompany its activities. For instance, the forward movement of engineer obstacle-breaching assets, petroleum, oils and lubricants (POL), and ammunition usually precedes an offensive operation. 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 recognised by the enemy.

NATURAL CONDITIONS

11.   Natural Conditions. The proper use of terrain and weather is a first priority when employing camouflage. Concealment provided by the terrain and by conditions of limited visibility is often enough to conceal units. The maximum use of natural conditions will minimise the amount of resources and time devoted to camouflage. The number and quality of natural screens, as well as terrain patterns determine the concealment properties of terrain.

      a.   Terrain

          (1)   Forests. Forests generally provide the best type of natural screen against all types of reconnaissance, especially if the crowns of the trees are wide enough to prevent aerial observation of the ground. Forests with undergrowth also hinder ground observation. Deciduous (leafing) forests are not effective during the months when trees are bare, while coniferous (evergreen) forests preserve their concealment properties all year round. Move along roads and gaps covered by tree crowns. Use shade to conceal vehicles, equipment and personnel from aerial observation. In the northern (southern) hemisphere, the northern (southern) edge of forests is shaded most of the time.

          (2)   Open Terrain. Limited visibility is a particularly important concealment tool when conducting operations over open terrain. The enemy will, however, conduct reconnaissance at these times

with night surveillance devices, radar, IR sensors, and terrain illumination. When using conditions of limited visibility to cross open terrain, supplement your concealment with artificial materials and smoke.

(3)   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. Instead, reverse slopes of hills, ravines, embankments, and other terrain features are effective screens for avoiding detection by ground-mounted sensors. The IPB concealment, terrain-factor overlays should identify areas of dead space. If the overlays are not available, use the line-of-sight method to identify areas of dead space. Dead space for radar sensors is smaller than that of optical sensors. Determine the size of these areas by reducing the rear boundary of visual dead space by 25 percent.

b.   Limited Visibility.

(1)   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. Dense fog and clouds are impenetrable to thermal sensors (IR). Rain, snow, and other types of precipitation hinder optical and radar sensors.

(2)   Smoke. 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 weapons systems. Near- and midterm developments of smoke and obscurants will include the capability to degrade non-visual sensor systems.

c.   Data Sources. Commanders must be capable of evaluating natural conditions in their area to effectively direct unit concealment. They must know the terrain and weather conditions prior to mission execution. In addition to IPB terrain-factor overlays, weather reports, and topographic maps, use aerial photographs, reconnaissance, and information gathered from local inhabitants to determine the terrain's concealing properties.

SECTION 2
DETECTION FACTORS

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

a.   shape;

b.   shadow;

c.   texture;

d.   colour;

e.   patterns;

f.   movement;

g.   noise;

h.   temperature; and

i.   radar returns.

13.   Shape. The natural background against which military equipment is viewed is normally random and variegated. However, the equipment itself has regular features and angular lines that the experienced eye easily identifies. Even a camouflage net may take on a shape with smooth curves between its point of contact. These distinguishable outlines must be

concealed or distorted. In urban areas straight lines occur throughout the background and should be matched.

14.   Shadow. A shadow may be more revealing than the object itself. A shadow may be cast or projected against a background resulting in the silhouette of the object. Contained shadows are those areas permanently in the shade such as the inside of a slit trench or the cargo area of a vehicle. It is important to break up or disrupt the shadow of an object.

15.   Texture. The texture of an object will either reflect, absorb or diffuse light. Smooth surfaces such as glass or shiny surfaces will act as a beacon by reflecting sunlight that sharply contrasts the background. Obliteration of shine from windows, mirrors, binoculars and other such surfaces must be a high priority in camouflage. A rough surface will also contact with a smooth background as in the case of a vehicle track in grass or snow. Every effort should be made to minimise the texture difference.

16.   Colour. A contrast between colour of an object and the background is most noticeable at short ranges. At very long ranges colours tend to merge into each other. Colour alone will not usually identify an object, but it is often a factor in the initial detection. Usually, darker shades of a given colour will be less likely to attract an observer than lighter more brilliant shades (depending on background). Additionally, in poor light the human eye cannot discriminate colour.

17.   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.

18.   Movement. With a stationary background, movement will always attract attention. The enemy observer may be concentrating his attention on some other area but he will not fail to detect a sudden movement in another area through his peripheral vision. Slow, regular movement is usually less obvious than fast erratic movement. Movement also produces dust, tracks and heat, all of which may be detected.

19.   Noise. Sudden noise may contrast with the normal quiet of a battlefield. Land noises such as the firing of artillery or the running of generators can pinpoint locations.

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

21.   Radar Return. Radar can detect differences in an object's ability to reflect radio waves. Metal more completely reflects radio waves and, as it is an important component of military hardware, it is a significant recognition factor.

SECTION 3
CAMOUFLAGE PRINCIPLES

22.   The factors of detection are interrelated and when considered together allow equipment to be observed and identified. To remain hidden it is necessary to blend with the environment by using the following basic rules:

        a.   careful siting of equipment,

        b.   camouflage discipline, and

        c.   proper use of camouflage material

SITING

23.   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 minimised. Placing equipment or moving in defilade will prevent detection. 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. As any change in an existing terrain pattern will indicate the presence of activity, change to the pattern should be minimised. 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 characterised by uniform rows of housing with interwoven streets and interspersed trees and shrubs.

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

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

24.   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 equipment and personnel in buildings, 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, e.g., camouflage stick face paints for a soldier's skin, burlap and live vegetation for a helmet. The same type of blending can be done with equipment and structures to make them inconspicuous.

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.

25.   Initial selection of a position will be done from a map. There will be locations that are tactically superior to others. However, the most

attractive positions will also be obvious to the enemy and should be avoided provided the assigned task could still be accomplished.

26.   Before a position is occupied a detailed ground reconnaissance must be conducted to ensure the equipment and personnel can blend with the existing ground pattern.

27.   The best means to obtain complete concealment is to hide in buildings. In fact built-up areas have many counter surveillance advantages, as the enemy will expect some non-military activity in these areas which may be blended with military activity.

28.   Wooded areas provide good cover but IR (far) sensors have some penetrative power. Camouflage nets should always be used to add to the protection provided by tree foliage. This is especially important over engines, generators and stoves that must be kept running. In the winter, heat sources will stand out even more prominently. The lack of foliage in winter months will require special measures for cover from aerial observation. Bare trees will still break up the outline of equipment at ground level.

29.   When no overhead cover is available the maximum use must be made of shadows. It must be remembered that shadows move with the sun, therefore, equipment must be repositioned as well.

30.   Maximum use should be made of dead ground, especially to cover movement. Dead ground will give complete protection from ground surveillance including radar. The very low altitude at which tactical aerial reconnaissance now operates makes it difficult to observe in dead ground. Dead ground will also shield noise and heat signatures.

DISCIPLINE

31.   Successful camouflage requires constant attention to detail and frequently involves tedious and time-consuming work. The need for camouflage discipline is based on a thorough appreciation of the surveillance threat. One mistake can ruin the best camouflage plan. The most important aspects of camouflage discipline are:

        a.   use of drills and procedures;

b.   track and movement discipline;

c.   control of heat, light and noise sources;

d.   noise discipline;

e.   spoil discipline; and

f.   self discipline.

32.   Drills. If simple drills are followed to complete everyday tasks then the chance of mistakes can be minimised. Drills may be developed for events such as:

      a.   Halts. Vehicles should never halt in the open but get off the road under cover of trees or into the shadows of hedges or buildings. There may not be time to use camouflage nets but reflecting surfaces such as windows and mirrors should be covered.

      b.   Harbours. The reconnaissance of a good harbour location should determine:

           (1)   a rigid track plan;

           (2)   the position for each vehicle preferably in a standard layout;

           (3)   a cushion area for vehicles to be held while being moved into the harbour area; and

           (4)   a location to conceal visitors' vehicles.

33.   Track and Movement Discipline. Vehicles and personnel must adhere to a track plan. Existing roads and tracks should be used whenever possible. New tracks should be made to fit into the existing pattern. Movement is observed easily and should be planned and coordinated in order to minimise the possibility of detection.

34.   Heat, Light and Noise Sources. Use of vehicles, generators, cooking facilities and lighting must be minimised and shielded from likely surveillance sensors. Hot engines and exhausts should be pointed away

from the enemy and positioned in dead ground when possible. Strict observance of blackout rules including closure of hatches, entrances and windows must be enforced. Revealing noises may be muffled by stronger sounds if they cannot be dampened. 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 campfires (light) from distances up to 8 km and vehicle lights from up to 20 km. Threat surveillance can detect heat from engines, stoves, and heaters from these same distances. Allow smoking and electric light use only under cover. When moving at night, vehicles in the forward combat area should use ground guides or blackout lights. Control the use of heat sources and, when their use is unavoidable, use terrain masking and other techniques to minimise thermal signatures from fires and stoves.

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

36.   Spoil Discipline. The prompt and complete policing 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.

37.   Self-discipline. Successful camouflage depends on the action of the individual soldiers. Carelessness and laxness will undoubtedly reveal the position to the enemy. Development of unit standard operating procedures (SOPs) that assign responsibility to certain individuals will assist in the enforcement of camouflage discipline. Many aspects of camouflage make the soldier's life more uncomfortable, for example:

a.   Do not sit in the sun but remain in the shadow;

b.   Never light a cigarette at night in the open;

c.   Do not take short cuts but follow the track plan;

d.   Do not look at aeroplanes flying overhead;

e.   Minimise, plan, and coordinate all movement. Take full advantage of cover and dead ground.

USE OF CAMOUFLAGE MATERIAL

38.   Many camouflage materials are permanently incorporated into the equipment such as disruptive pattern painting. The most common temporarily attached camouflage materials are vegetation and camouflage nets.

39.   Colour. The basic colour of equipment must match that of the background in which it is being used. The surface texture should be such as to eliminate shine.

40.   Clothing. Disruptive pattern combat clothing provides some personal camouflage in the visual and near IR for most operational environment. There is in service clothing for arctic, temperate and arid regions.

41.   Disruptive Painting. In order to deceive the eye, a disruptive pattern must be visible but it should not contain any colour that is greatly different from its background. Pattern painting an object with large unrecognisable shapes using contracting colours can be effective. Black paint is used to distort the normal shadow areas of equipment. In general the patterns should be bold and extend across all vehicle surfaces. Patterns should break up areas of contained shadow. Standardised Camouflage Paint Patterns (SCAPP) are developed and available to provide the optimum camouflage effect on vehicles. Theatre specific SCAPP is applied to CF vehicles and equipment during the preparation phase of an operation.

42.   Camouflage Nets.

     a.   Camouflage nets are used to break up the shape of a target and help blend with the background. A net is preferable, when against a natural background, to a solid sheet that will be observed as a solid patch when viewed from a distance. Although a net may appear transparent from a short distance it will provide good camouflage when viewed from normal ranges if correctly erected and

supported. The opposite is true for camouflage against a manmade background, where a sheet is often preferable as shown by the in service urban camouflage sheeting.

b.   The woodland camouflage net has one side garnished with predominantly light green surroundings and other side is for dark green foliage to provide the necessary variance to deal with spring, summer and fall camouflage.

c.   The use of vegetation will assist in giving a natural look to camouflage. Its main disadvantage is that it wilts and requires periodic replacement. Vegetation retains its natural IR reflectivity until it has wilted. Some types of foliage wilt in a matter of hours while other types last for days. In general the following points should be remembered when cutting foliage for camouflage:

(a)   branches growing in direct sunlight will last longer;

(b)   cut foliage with leaves that feel tough to the fingers;

(c)   place foliage in the same attitude as when growing. Don't allow underside of leaves to show;

(d)   coniferous tree camouflage lasts longer; and

(e)   foliage should not all be cut from a single area.

43.   Vegetation. Use branches and vines as temporary concealment for vehicles, equipment, and personnel. Attach vegetation to equipment, using camouflage foliage brackets or spring clips. Use cut foliage to complete or supplement natural, growing vegetation. Also use cut foliage to augment other artificial camouflage materials, such as placing branches on woodland nets to break up its outline. Take care to place green vegetation correctly. The underside of leaves present a lighter tone in photographs. Replace cut foliage often because it wilts and changes colour rapidly. Table 2 lists the approximate periods those different types of foliage can be expected to

retain their camouflage values. When selecting foliage for camouflage, consider the following: Coniferous vegetation, if available, is preferred because it will not wilt as rapidly as deciduous vegetation. Foliage cut during periods of high humidity (at night, during a rainstorm, or when there is fog or heavy dew) will have higher moisture content. Foliage with leaves that feel tough to the fingers and branches with large leaves are preferred, as they stay fresher longer. Branches that grow in direct sunlight are tougher and will stay fresher longer. Branches that are free of disease and insects will not wilt as rapidly.

    a.   Living Vegetation. Living vegetation is easily obtainable, and its colour and texture make it a good blending agent. However, the foliage requires a large amount of maintenance to keep the camouflage material fresh and in good condition. If branches are not placed in their proper growing position, they may give away your position to enemy observers. As cutting large amounts of branches can also reveal the site, all cutting should be done away from the camouflaged area. As the branches wilt, they lose both their colour and NIR-blending properties.

    b.   Dead Vegetation. Use dead vegetation, such as dried grass, hay, straw, or branches, for texturing. While dead vegetation is usually readily available and requires little maintenance, it is flammable and offers little camouflage against NIR sensors.

    c.   Expedient Paints. Use earth, sand, and gravel to change or add colour, to provide a coarse texture, to simulate cleared spots or blast marks, and to create shapes and shadows. Mud makes an excellent field expedient for toning down bright and shiny objects (for example, glass, bayonets, and watches). Add clay (in mud form) of various colours to crankcase oil to produce a field-expedient paint.

44.   Camouflage Support System. The use of a prefabricated camouflage support system makes the erection and take-down of the camouflage equipment faster and it ensures the proper stand-off between the equipment and the net. This system includes poles, spreaders and base plates. When not issued an expedient system should be fabricated to simplify the camouflage task.

Land Force Counter Surveillance

Species	Hours in Sunlight Without Water	Days in Sunlight With Water
Adler Apple	3 to 4	1 to 2
Apple	8 or more	6 or more
Ash	2 or less	Less than 1
Aspen (Poplar)	2 or less	Less than 1
Australian Pine***	24 to 72	8 to 16
Basswood (Linden)	5 to 7	3 to 5
Beech	5 to 7	3 to 5
Birch	3 to 4	1 to 2
Black Locust	2 or less	Less than 1
Blueberry*	8 or more	6 or more
Butternut*	2 or less	Less than 1
Cherry	3 to 4	1 to 2
Chestnut	5 to 7	3 to 5
Coconut Palm Leaves***	72 to 144	4 to 8
Elderberry	2 or less	Less than 1
Elm	3 to 4	Less than 1
Fishtail Palm Leaves***	72 to 144	4 to 8
Hawthorne	8 or more	5 or more
Hickory*	3 to 4	1 to 2
Lilac	5 to 7	6 or more
Mangrove***	12 to 24	0.5 to 1
Maple	8 or more	1 to 2
Palomaria***	72 to 144	8 to 16
Privet**	8 or more	6 or more
Screw Pine***	72 to 144	3 to 6

Species	Hours in Sunlight Without Water	Days in Sunlight With Water
Sumac*	2 or less	3 to 5
Sycamore (Plane)	3 to 4	1 to 2
Walnut	2 or less	Less than 1
White Oak group	5 to 7	3 to 5
Willow	2 or less	Less than 1
Yellow Poplar (Tulip)	3 to 4	1 to 2
*North America only **Europe only ***Tropics only		

Table 2: Retention of Camouflage Values for Cut Vegetation

COUNTER SURVEILLANCE PRIORITIES

45.   Counter surveillance plans must not be done in isolation from the operational plan. It may be the intent for a particular formation to act as a strong deterrent. To act as show of force a relatively low priority may be given to camouflage and high priority given to dummy resources in order to convince the enemy that a high degree of risk would be involved in attacking that particular formation. Another formation with a counter-attack role may be well camouflaged in order to surprise a successful enemy thrust.

46.   Deception, in particular, must be planned at the highest level possible in order to ensure a unity of effort in the attempt to mislead the enemy. Uncoordinated deception plans may alert the enemy to increase his surveillance measures.

47.   Degrees of Counter surveillance. To specify the degree of camouflage, concealment and deception to be employed commanders may use the following terms ratified in QSTAG 213:

        a.   Degree 1. Full attention will be paid to fieldcraft, siting and basic camouflage discipline. This includes correct

positioning of material, track discipline, light discipline and use of cover;

b.   Degree 2. This is Degree 1, plus the use of natural and locally available material and/or sealed camouflage material. This includes the use of camouflage nets and unit held decoys.

c.   Degree 3. This is Degree 2, plus the use of additional camouflage equipment, troops and material that will be specified at the time. This includes the use of additional camouflage nets, smoke, disguise equipment, decoys and special paints that are not normally held by the units.

GENERAL COUNTER SURVEILLANCE MEASURES

48.   Treat Night as Day. Many sensors such as IR (near and far), image intensifier (II), and radars will be possible to operate day and night. Night will no longer give complete protection as it has in the past, many of the sensors are passive it must be assumed that they are being used at night as well as day.Consequently the same countermeasures must be used.

49.   Minimise Movement. Movement certainly attracts attention in the visual spectrum, and it could be detected by Doppler radar. Movement also results in tracks, noise, hot engines and dust; all of which can be detected. Every effort should be made to minimise movement.

50.   Blending with the Environment. The closer the characteristics of a target match those of its background the harder it will become to distinguish the target from the background. Natural near IR and UV signatures have been built into vehicle points and camouflage nets to blend with the environment. However, the reduction of thermal signatures requires a major design modification of equipment. When practical it is best to disguise heat signatures by locating in built-up areas or by screening with buildings and dead ground in rural areas.

SUMMARY

51.   Camouflage and concealment may be divided into four phases in any operation:

     a.   planning;

     b.   occupation;

     c.   maintenance; and

     d.   redeployment.

52.   Camouflage discipline must be maintained during all phases. Even after a unit has left an area, the enemy may gain useful information from the traces left behind. Therefore, discipline must be maintained throughout an operation.

CHAPTER 4
OFFENSIVE OPERATIONS

1.   Counter surveillance measures implemented during an offensive prevent the enemy from discovering friendly units' locations, actions, and intentions. Successful counter surveillance contributes to achieving surprise and reduces subsequent personnel and equipment losses.

2.   Counter surveillance during offensive preparations.

    a.   Considerations. The main counter surveillance concern in preparing for an offensive is to mask unit deployment. While camouflage and concealment is the primary means of masking these activities, deception operations frequently achieve these goals.

    b.   Signatures. Offensive operations create signatures that the enemy can detect. Further analysis of these signatures may alert the enemy to our offensive operations (such as planning and location). Commanders at all levels should be aware of the signatures their operations emit and strive to conceal them from enemy surveillance. These signatures include:

        (1)   Increased scouting and reconnaissance activity;

        (2)   Preparation of traffic routes;

        (3)   Forward movement of supplies and ammunition;

        (4)   Obstacle breaching and crossing;

        (5)   Preparation and the occupation of assembly areas;

       (6)   Preparation and occupation of forward artillery positions;

       (7)   Increased radio communications.

3.   Preparations.

a.   Assembly Areas. Assembly area preparations should be conducted during conditions of limited visibility. Any indication (signatures) of preparation activities should be concealed as quickly as possible.

(1)   Location. Designate assembly areas on terrain with natural screens and a developed network of roads and paths. Thick forests and small towns and villages often provide the best assembly locations. In the absence of natural screens, use spotty sectors of the terrain or previously occupied locations. Place equipment on spots matching it's colouring, and take maximum advantage of artificial camouflage materials.

(2)   Movement. Designate concealed routes for movement into and out of the area. Mask the noise of movement by practising good noise discipline. For instance, the noise of armour movement can be muffled by the thunder of artillery fire, the noise of low-flying aircraft, or the transmissions of sound broadcast sets.

(3)   Camouflage.

(a)   Vehicles. Position vehicles to take full advantage of the terrain's natural concealment properties, and cover them with the nets. Apply touch-up paint and cut vegetation to vehicles to enhance camouflage at the assembly area and during battle. As assembly areas are particularly vulnerable to aerial detection, strictly enforce track and movement discipline. Take care to remove any tracks by covering or sweeping them with branches. Strictly enforce radio discipline.

(b)   Personnel. While at the assembly area, personnel should apply individual camouflage. Application of stick paint

and cut vegetation will enhance camouflage during all phases of the operation.

b.   Decoys. The enemy may interpret decoy construction as efforts to reinforce defensive positions. Activities such as laying fake minefield and building bunkers and positions can conceal actual offensive preparations and give the enemy the impression that defences are being improved. If necessary, conduct engineer preparation activities on a wide front so as not to reveal the area of the main attack.

c.   Movements of Troops and Supply. Move troops, ammunition, supplies, and engineer breaching equipment forward at night and under other conditions of limited visibility. Although the enemy use of radar and IR aerial reconnaissance hinders concealed operations at night, darkness remains a significant concealment tool. Select routes that take full advantage of the terrain's screening properties. Commanders must understand how to combine darkness and the terrain's concealing properties to camouflage troop and supply movements.

(1)   Movement Orders. When conducting a march the route must be selected to offer best possible cover form enemy ground and airborne observation. Convoy commanders must strictly enforce routes, blackout requirements and the order of march. Guidelines concerning lighting, march order, and other requirements are usually published in SOPs or operation orders. Required lighting conditions usually vary depending on the type of movement (convoy versus single-vehicle) and the unit's location (such as forward edge of the battle area (FEBA), division area, and corps rear area). Inspect each vehicle's blackout devices for proper operation.

(2)   Speed of March. Enemy aerial reconnaissance usually focuses on open and barely passable route sectors. Therefore, when on the march, vehicles should pass these types of sectors at the

highest possible speeds. If prolonged delay result from encountering an unexpected obstacle, halt the column and disperse into the nearest natural screens. If vehicles break down during the movement, push them off the road and camouflage them.

(3)   Movement During Times of Good Visibility. When marches must be conducted under conditions of good visibility, consider moving by infiltration (single or small groups of vehicles released at different intervals). Movement in stages, from one natural screen to the next, will further minimise possible detection. Use smoke screens at critical crossings or choke points.

(4)   Halts. When stopping briefly, quickly disperse vehicles under tree crowns or other concealment along the sides of the road. Strictly enforce camouflage discipline. Particularly important points to avoid are glare from vehicle windshields, headlights or reflectors, and the control of troop movement on the road or in other open areas. Conduct reconnaissance to select areas for long halts. The reconnaissance party should select areas large enough to allow sufficient camouflage and dispersion. The quartering party should predetermine vehicle placement, develop a vehicle circulation plan, and guide the vehicles into suitable and concealed locations. The first priority, however, is to move vehicles off the road as quickly as possible, even at the expense of initial dispersion. Use the Net and support system as well as the natural vegetation to enhance camouflage. Carefully camouflage dug-in positions.

(5)   Traffic Control. Traffic control personnel have a crucial role in enforcing convoy camouflage. Commanders should issue precise instructions to their traffic control personnel to stop passing

vehicles and have the drivers correct the slightest violation of camouflage discipline. Convoy commanders are responsible for the convoy camouflage discipline.

d.   Passage of Line. Pass through friendly obstacles at night, in fog, or under other conditions of poor visibility. As these conditions will not protect against many types of sensors, use smoke screens. Lay smoke on a wide front and several times before actually executing the passage of lines. Doing this will help to deceive the enemy about the time and place of attack. Camouflage lanes through obstacles from enemy view.

e.   Deception Operations. Conduct demonstrations and feints to confuse the enemy as to the actual location of the main attack. Such deception operations will be effective only if prior reconnaissance activities were conducted on a wide front, thereby preventing the enemy from pinpointing the likely main attack area.

CAMOUFLAGE DURING THE BATTLE

4.   When conducting battle, units should adapt to the terrain. Deploying behind natural vegetation, a terrain feature, or a man-made structure will maximise concealment from enemy observation. Make optimum use of concealed routes, hollows, gullies, and other terrain features that are dead-space areas to enemy observation and firing positions. A trade-off, however, usually exists in terms of a slower rate of movement when using these types of routes.

a.   Movement Considerations. Movement techniques emphasising fire and manoeuvre will aid in preventing enemy observation and targeting. Avoid dusty terrain, as clouds of dust will alert the enemy to your presence. When natural cover and concealment are unavailable or impractical to use, the coordinated employment of smoke, suppressive fires, speed, and natural limited-visibility conditions will minimise exposure and avoid enemy fire. However, offensive operations under these conditions present unique training and command and control

challenges. Commanders may need to employ decoy convoys in the rear area to hide his real intent from airborne surveillance systems.

b.   Breaching and Crossing Operations. Breaching and crossing operations require the concealment of the unit conducting the breach. Use conditions of poor visibility and plan the use of smoke and suppressive fires to screen breaching operations. Deliberate river crossings present a unique challenge. Plan the coordinated use of terrain masking, smoke, decoys, and deception operations to ensure successful crossings.

CHAPTER 5
DEFENSIVE OPERATIONS

GENERAL

1.   Defensive operations require a great deal of emphasis on OPSEC. Proper OPSEC denies the enemy information about our order of battle. Particularly important is the counter-reconnaissance battle, during which defensive forces seek to blind the enemy by eliminating its reconnaissance forces. The winner of this preliminary battle is often the winner of the main battle. Counter surveillance, by virtue of its inherent role in counter-reconnaissance efforts, plays an important role in both battles.

COUNTER SURVEILLANCE DURING DEFENSIVE PREPARATIONS

2.   Objectives. The purpose of counter surveillance during defensive preparations is to mask key or sensitive activities. Successful camouflage of these activities will lead to an enemy force that is blinded and, therefore, more likely to attack into the strengths of our defence. These activities include:

> a.   Location of reserve and counter-attack forces;

> b.   Preparation and trace of survivability positions and obstacles;

> c.   Nature of any engineering work;

> d.   Manoeuvre of forces.

3.   Signatures. There are a number of signatures that may indicate to enemy forces that we are making defensive preparations. The enemy analyses these signatures to determine the outline of our defensive plan. Specific signatures that could reveal our defensive plans include:

> a.   Work on defensive positions;

> b.   Preparation of minefield and other obstacles;

c.   Movement of different types of materiel into prepared positions;

d.   Preparation of routes and facilities for defensive forces;

e.   Construction of strong points or hardened artillery positions;

f.   Use or patterns of smoke and obscurants.

4.   Reserve and Counter-attack Forces.

a.   Planning. Due to the similarity of missions, the concerns for camouflaging counterattack and reserve forces are similar to those of manoeuvre forces engaged in offensive operations. Considerations concerning assembly areas, troop and supply movements, passages of lines, and deception operations were stated in Chapter 4. This information is also useful as a guide when planning camouflage for a counterattack. Proper planning is essential to ensure the greatest chance of avoiding enemy detection and preventing successful enemy analysis of the engineering effort integral to defensive preparations. As engineer equipment creates significant signatures, minimise its use on any mission to a level commensurate with available labour and time resources. Disperse any engineer equipment not required at the job site. Complete as much work as possible without heavy equipment and allow heavy equipment on site only when necessary. Engineers should minimise their time on site by conducting thorough and extensive planning and preparations. Additional signatures that should concern camouflage planners include:

(1)   Arrival and departure of supplies, personnel and vehicles into the unit area;

(2)   Construction of survivability positions;

(3)   Smoke and heat from kitchens, fires, and stoves;

(4)   Operation of communications facilities.

b.   Movement. Reserve forces should move along planned, concealed routes. They should also move and occupy selected locations at night or during other conditions of limited visibility. Harbour parties should select individual positions and guide vehicles and personnel to assigned locations. Light, noise, and track discipline are essential, but they are the most difficult to control during this phase. The harbour party should also develop a traffic plan that minimises movement of vehicles and troops to and from the unit area. Strictly enforce the plan to minimise movement and signatures, both of which are easily detected. Arriving units should immediately begin to conceal their positions. Commanders should detail the priorities for camouflage, based on their assessment of which signatures present the greatest opportunity for enemy detection. Those sections in Chapter 4 which dealt with camouflage of assembly areas and troop and supply movements also apply to reserve forces.

c.   Assembly Areas. While assembly area camouflage actions are similar to those of counter-attack and reserve force positions, the latter positions are more likely to be occupied for a longer period. Therefore, camouflage needs are more intensive and extended for counterattack and reserve forces. In fact, their camouflage operations are often indistinguishable from those of support units that routinely deploy to positions located behind the forward line of own troops (FLOT). Reserve and counter-attack forces awaiting employment should capitalise on available time to conduct rehearsal and training. They must however ensure proper concealment of these exercises. While essential, these activities are prone to be detected by enemy sensors. Observe camouflage discipline at all times and locations.

d.   Placement and dispersal site selection is crucial when concealing the engineer effort. Proper placement and dispersal of equipment and operations are essential. Use natural screens (terrain masking); however, urban areas often provide the best concealment for counter-attack and reserve forces. Chapter 7 covers placement and dispersal in more detail. When using forests as natural screens, carefully consider factors such as the height and density

of the vegetation, the amount and darkness of the shadows cast by the screen, and the appropriateness of the particular screen for the season. The condition and quality of natural screens have a decisive effect on the capability to conceal units. Commanders should include the evaluation of natural screens during engineer reconnaissance missions and conduct these missions on a timely and extensive basis. The possibility of detection increases considerably when survivability positions are prepared. Detection is made easier due to the increased size of the objects to be camouflaged, the easier detection of contrasting upturned soil, and the difficulty of camouflaging a construction operation in progress. Despite these considerations, the enhanced protection afforded by survivability positions usually dictates their use. To minimise the possibility of detection, conceal construction sites with a combination of natural screens and overhead nets.

5.   Use the nets and patches to camouflage vehicles, tents, shelters, and equipment. Use vegetation to further distort the outline of the object, rather than completely hide it. Ensure vegetation is not removed from one location, leaving a signature for enemy detection. Gather vegetation sparingly from many nearby areas. This technique allows your immediate area to remain relatively undisturbed.

6.   Stoves and Fires. Strictly control use of stove and fire. Fires and stoves produce visual and thermal signatures that enemy sensors may detect. In cases where fires are necessary, permit them only during daylight hours. Place fires in dead ground or under dense foliage. Using nets and other expedient thermal screens will also serve to dissipate heat, reducing a fire's thermal signature.

7.   Camouflage Discipline. Strict camouflage discipline will allow the continued concealment of a unit's position. The longer a unit stays in one location, the harder it is for the unit to maintain camouflage discipline. Extended encampments require constant command attention to camouflage discipline. Evacuation of an area also requires camouflage discipline to ensure that evidence (such as trash and vehicle tracks) is not left for enemy detection.

SURVIVABILITY POSITIONS AND OBSTACLES

8.　　　Description. Survivability positions include fighting positions, protective positions (shelters) and connecting communication trenches. They are usually constructed of earth and logs but may also be composed of man-made building materials such as concrete and corrugated iron sheets.

9.　　　Siting. Proper siting of positions and obstacles is the single, most important camouflage consideration. When possible, site positions and obstacles out of the direct view of enemy forces. An excellent example of this technique is the reverse-slope defence. Site positions and obstacles at night or under other conditions of limited visibility.

10.　　　Backgrounds. Select backgrounds that do not silhouette positions or obstacles or that provide colour contrast. Use shadows to make detection by enemy forces more difficult. Place positions or obstacles under overhead cover, trees, or bushes, or in any other dark area of the terrain. This technique will prevent disruption of terrain lines and possible aerial detection. When using the terrain's natural concealment properties, avoid isolated features that usually draw the attention of enemy observers. Similarly, do not construct positions directly on or near other clearly defined terrain features (such as tree lines, hedgerows, and hillcrests). Offsetting positions into tree lines or below hillcrests not only avoids silhouetting against the background, but also counters enemy fire.

11.　　　Natural Camouflage Materials

　　　　　a.　　　Use natural materials to supplement artificial materials. Before constructing positions or obstacles, remove and save natural materials (such as turf, leaves, and humus) for later use in restoring the terrain's natural appearance. During excavation, collect spoil in carrying devices for careful disposal. Avoid disturbing the natural look of surroundings. Use nets and support system, and natural vegetation to further distort the outline of a position or to hide the bottom of an open position or trench, as well as to mask spoil used as a parapet. To further avoid detection, replace natural materials regularly or as wilt and colour change set in.

　　　　　b.　　　Consider the effect of back blast from rocket launchers, missile systems, and antiarmour weapons. Install

concealed open space to the position's rear to accommodate backblast. The backblast area should not contain material that will readily burn or generate large dust signatures.

c. Use natural materials to supplement camouflage of machine gun positions. Machine guns are priority targets, and their concealment is an essential combat task. Although camouflage is important, placement is the primary factor in concealing machine guns.

d. Place mortars in defilade positions. Proper placement, coupled with artificial and natural camouflage materials, will provide the maximum possible concealment. Also consider removable overhead concealment.

e. Use decoy positions and obstacles to draw enemy attention away from actual survivability positions and obstacle traces. Decoys serve the additional function of drawing enemy fire, allowing easier targeting of enemy weapon systems.

12. Camouflage During Battle. Camouflage during the defensive battle is essentially the same as that for the offence. While a majority of the battle is normally fought from prepared, camouflaged positions, defensive forces will still manoeuvre to prevent enemy breakthroughs or to counterattack. When manoeuvring, units should adapt to the terrain, making optimum use of concealed routes. Select and improve concealed routes to provide defensive forces a manoeuvre advantage. Plan smoke to provide additional concealment for manoeuvring forces.

CHAPTER 6
CONCEALMENT OF THE INDIVIDUAL

GENERAL

1.	Soldiers must know how to take measures to conceal themselves from ground and air observation both by day and by night. Soldier must adapt their dress to blend with the background and use the ground carefully to conceal movement.

2.	The background is the controlling element in individual camouflage and governs every concealment effort. The soldiers clothing must blend with the predominant colour of the background. Skin and light coloured equipment must be toned down for the same purpose. Soldiers must practice blending with the background by hiding in shadows and avoiding a contrast between their silhouette and the background.

3.	The most common fault made by soldiers when endeavouring to conceal themselves from air observation are:

	a.	failure to visualise what the ground looks like from above;

	b.	failure to hide spoil and concealed weapon pits, equipment and tracks; and

	c.	looking up at aircrafts.

SKIN CAMOUFLAGE

4.	Camouflage cream, mud, burnt cork or something similar should be put on the face, neck and hands. The nose, tips of ears and forehead should be toned down in particular. More camouflage must be applied at night. The entire face should not be darkened; rather a disruptive pattern of different colours running across the face is preferable to break the symmetry of the face.

HELMET

5.   The outline of the helmet is one of the striking characteristics of a soldier's equipment as its curved familiar shape may be easily identified.

6.   A helmet cover with a disruptive colour pattern is provided to eliminate the shine from the helmet. Each side of the helmet cover provides a colour scheme more suitable for light or dark coloured foliage.

7.   The helmet should be garnished with local vegetation or scrim (sandbag) and secured with a helmet band- in order to break the shape.

PERSONAL WEAPONS

8.   The shiny metal or wooden portions of a weapon may be camouflaged by binding scrim or hessian to the weapon. Care must be taken that the sight picture is not blocked. Scrim or hessian should not be left on weapons for long periods of time or rust may result.

9.   In the winter a weapon may be camouflaged by wrapping it with mine tape or discarded winter applique patches.

PERSONAL EQUIPMENT

10.   Age and repeated cleaning will fade canvas equipment. When this occurs it should be darkened with mud, paint or charcoal to reduce the tonal contrast.

11.   A white camouflage cover is provided for the rucksack for use in snow covered terrain.

12.   Winter and woodland camouflage screens are also issued to soldiers to enhance personal camouflage.

SHINY OBJECTS

13.   Reflection from shiny objects is a common breach of camouflage discipline. All shiny objects should be concealed including watches, rings,

belt buckles and mess items. To prevent glare, goggles should not be worn on the helmet but removed completely if not required.

CAMOUFLAGED CLOTHING

14.   Issued disruptive pattern camouflage clothing provides soldiers an enhanced camouflage effectiveness of their combat clothing to match the terrain background in their theater of operation.

15.   White camouflage clothing is normally available for use in snow covered terrain. Jacket and trousers may be worn separately to blend with the background.

USE OF GROUND

16.   The soldier should look around or through cover rather than over it. If cover must be looked over, no straight line should be broken with the silhouette of a helmet.

17.   Every effort should be made to stay in the shadows. When observing or firing from a window, the soldier should ensure he is far enough back from the window to be hidden in the shadow.

18.   Skylines such as rooftops or ridges should be avoided.

19.   Isolated objects that provide obvious cover should be avoided.

CHAPTER 7
CONCEALMENT OF FIELD DEFENCES

GENERAL

1.   The tactical situation and characteristics of the weapon system will determine the general location of field defences but the detailed siting should primarily consider the concealment of the fortification. Emplacements should avoid creating silhouettes against the sky or against a background of contrasting colour. The most common fault of camouflage is the failure to visualise what the ground looks like from the air. To avoid observation from the air, field defences should ideally be located under trees or bushes, in buildings or in dark areas of terrain.

2.   Natural terrain lines, such as edges of fields, fences, hedgerows, rural cultivation patterns, and edges of urban areas are excellent sites for emplacements to reduce the possibility of observation from the air. Regular spacing and geometric layouts should be avoided. As well, a single conspicuous hiding place such as a lone clump of vegetation should not be used for cover, as it will probably draw enemy fire. Every effort should be made not to disturb the appearance of natural terrain.

RECONNAISSANCE

3.   Movement and unnecessary tracks made during reconnaissance and siting of a position may indicate to the enemy points to watch. The final reconnaissance of a position should be made on foot and the track plan decided at this stage.

4.   Concealment of a position should be planned and executed systematically:

        a.   site trenches with the natural ground pattern;

        b.   make a communication trench plan following the same pattern;

        c.   enforce this as the only track plan;

d.   when digging a trench roll the turf and the weathered surface away from the trench and keep it free from spoil. Layer the spoil evenly around the trench as it is dug;

e.   roll the turf back and replace old surface dirt over freshly dug spoil to hide it;

f.   remove excess spoil to nearby cover such as trees and shrubs;

g.   where trampling is unavoidable, disguise it afterwards;

h.   avoid observation from the air by constructing a light trench cover from natural or artificial material; and

i.   overhead protection (OHP) offers concealment and protection from splinter effects of low air burst shelling. The shelter should be constructed at ground level to avoid detection.

SUPPORT WEAPON POSITIONS

5.   Machine Guns. Support weapon positions will receive close attention by the enemy, so careful concealment is essential. The desire to increase the fields of fire of machine guns results in a tendency to mount the machine gun high on a parapet above which the heads and shoulders of a gunner are revealed. The bipod or tripod provides adequate ground clearance for the gun. It should be kept as low as possible to avoid presenting a silhouette. To avoid detection the following measures should be taken:

a.   camouflage any raised cover over the machine gun;

b.   guard against dust creation;

c.   screen the rear area over the gun shelter to avoid outlining the weapon and operator; and

d.   avoid a contained shadow caused by the gun shelter.

6.   **Anti-Tank Positions.** The shiny barrel of the weapon may identify these positions or the large back blast area. The barrel of the weapon should be disguised with hessian or other camouflage material. An overhead cover will also provide concealment and crew protection. The areas in front of and behind the position should be kept damp or covered with hessian to reduce dust from the blast discharge.

7.   **Mortar Positions.** There should be no difficulty in finding a suitable location for mortars, as there is no requirement for line of sight between the weapon and the target. Mortars are easily detected by radar. When practical they should be located behind features that will prevent detection of the entire trajectory of the mortar round. There may be a requirement to shoot and scoot in order to avoid detection. Otherwise, mortars must be dug in for protection from counter-mortar fire. Irregular spacing of mortar pits will detract from attention although it may complicate the survey requirement. Camouflage nets should cover mortar pits except when firing.

FIELDS OF FIRE

8.   Fields of fire should be created with minimum interference to existing growth. Vegetation should be disturbed in an irregular manner and only to a sufficient height to allow the siting of a weapon.

9.   Troops must be trained to require only a view of the enemy's legs when using fire lanes; they can judge where the rest of the enemies' body is and engage it through growth sufficient to stop view but not bullets.

WIRE OBSTACLES

10.   Wire impedes the movement of personnel and vehicles but is difficult to blend with the natural terrain. Tracks from patrolling and the initial construction may be visible from the air. Wire must therefore closely follow existing terrain patterns. A heavily wired hedgerow, the line of a bank, a roadside or other usual divisions will not be obvious and will gain surprise.

11.   In the open, low single strands of wire set out on stakes in triangular pattern are easy to conceal within grass. Crops and scrub generally offer good concealment to loose wire.

12.   Noise from creating wire obstacles is revealing and will lead to detection if not minimised. Wiring parties should work in silence using procedures to muffle sound such as rubber mallets, sand bags over the ends of pickets or inserts in thumpers.

MINEFIELDS

13.   While laying a minefield many vehicles and equipment may be involved. Movement of vehicles laying mines and dumping mines may assist the enemy in determining the exact location of the minefield. As well, the regular pattern of the minefield may be easily recognisable especially if mechanically laid. The subsequent movement of vehicles through safe lanes may lead to a concentration of these vehicles.

14.   To avoid enemy detection the following measures should be taken:

    a.   The number of vehicles involved with the laying of the minefield should be kept to a minimum. In the case of small protective minefields, mines should be dumped on the perimeter and hand carried into position.

    b.   Concealment of mine rows in mechanically laid minefields is possible by using existing furrows in farmland. If such terrain is not the case, then deception techniques should be employed such as random tracks and furrows to disguise the exact location of the mines. The use of phoney minefields will also be important.

    c.   The movement of vehicle though safe lanes should be strictly controlled.

CHAPTER 8
CONCEALMENT OF VEHICLES,
WEAPON SYSTEMS AND AIRCRAFT

REVEALING FACTORS

1.　　　A badly concealed vehicle may lead to the detection of an entire unit. Camouflage of vehicles depends not only on concealing the vehicle but also their tracks and dust caused by movement.

2.　　　Tracks. A military signature is often provided by a vehicle track. The type, location, strength and even the intentions of a unit may be determined by the tracks.

3.　　　Track plans should closely follow hedges, fences, cultivated fields and other natural terrain lines in order to remain inconspicuous from the air. When tracks are used for deception they must continue past the actual vehicle position to a logical destination.

4.　　　Concealed routes rarely exist. Reconnaissance parties should locate roads and harbour areas that provide at least partial concealment. On short stretches of exposed route, screening material may be used to conceal traffic or tracks once the traffic has passed. Specially constructed concealed routes will require sentries to ensure minimal disturbance.

5.　　　In snow covered terrain, concealment of tracks is a major problem. Even in light snow, tracks make strong shadow lines visible from great distances. The following measures should be taken to minimise detection of tracks in snow:

　　　　　a.　　avoid sharp turns that cause high ridges of snow and result in heavier shadows;

　　　　　b.　　follow natural terrain shadows such as tree lines and embankments;

　　　　　c.　　all vehicles follow the same track; and

　　　　　d.　　drive directly into or away from the sun to temporarily reduce track shadows.

SITING AND DISPERSION

6.	When occupying terrain without altering its appearance, vehicles should be parked under natural cover whenever possible. When the cover is inadequate, vehicles should be parked so that the shape of the vehicle will blend with the surroundings. Urban camouflage sheeting should be used to enhance the camouflage.

7.	Villages, small towns and built up areas will have intricate road and path patterns. Military dispositions can be fitted into this pattern without fresh markings or disturbances if movement on the open road is minimised. Concealment is possible by siting vehicles inside buildings, blending in with the shapes of buildings, and constructing disguises with building material from the immediate surroundings. The approaches to towns and villages offer better concealment than within built up areas.

8.	Woods offer some cover from observation but IR (thermal) sensors will penetrate foliage. Dull light conditions reduce the cover afforded by strong shadows. Therefore, troops in forest areas often gain a false sense of security.

9.	In agricultural areas there are usually sufficient existing track patterns to maintain lines of communication undetected. Siting of vehicles must conform to the general checkerboard pattern. Farm complexes are often useful to conceal vehicles.

10.	Shadows. From the air, shadows cast by large objects provide dark areas that offer good concealment for vehicles. In the northern hemisphere it is best to park on the north side of an object as the shadow will not move as in the case of the east and west shadows. An effort must be made to deal with contained shadows on vehicles. Cargo space covers should be closed and material used to break the shadow area underneath the vehicle.

CAMOUFLAGE MATERIALS

11.	Use of Natural Materials. Siting and dispersion may not be adequate to completely conceal a vehicle. Usually there will be material near the vehicle harbour. If foliage is used, it should be replaced as it starts to wither. Applying mud, hessian, snow, leaves, heavy grass or sand may alter the colour and texture of the vehicle.

12.   Pattern Painting. This measure is a valuable supplement to other camouflage measures. Paint patterns are designed to disrupt shadows and the cubical shape of a vehicle from all angles of view. The pattern must be bold enough to be seen from a distance and horizontal patterns must be avoided. In Canada there are three distinctive colour patterns to be used.

      a.   summer multi-colour SCAPP;

      b.   winter patterns are the same as summer only substituting white for black; and

      c.   north of the tree line in the winter, vehicles will be solid white.

13.   Nets. The principle artificial material used to conceal vehicles is the camouflage net. The nets may be detected if they fail to blend with the background. If properly suspended and supported, nets do conceal the identity of a vehicle even though the net itself may be detected.

VEHICLE EMPLACEMENTS

14.   In open terrain the lower an object is to the ground the smaller its shadow will be. Every effort should be made to dig in vehicles to avoid detection as well as to increase protection from air attack or indirect fire. One of a kind vehicles should be given first priority.

15.   The excavation will have a slanted approach that the vehicle should back into. The emplacement should have revetment and be covered with a camouflage net gently sloped out to the sides and staked down. The vehicle tracks to the position should be brushed out or covered.

ARMOURED VEHICLES

16.   The size and shape of armoured vehicles make them difficult to conceal. When not moving they will disperse in troop hide positions to avoid detection from the air and ground.

17.   When moving, tracked vehicles generate dust which is easily detected. Low speeds will reduce the dust. Vehicle exhaust smoke will also attract attention and should be concealed when practical.

18.   Noise. Radio, engine noise and the clatter of jerrycans during replenishment can be heard at long distances. Noise levels may be reduced by:

        a.   driving in the correct gear to keep the engine revolutions down and not changing gear unnessarily;

        b.   reducing radio transmissions;

        c.   switching off auxiliary generators when the enemy is near.

        d.   Reducing unnecessary movement of men and vehicles during replenishment.

19.   AFV commanders must plan a series of alternate fire positions to move to in order to reduce the chances of detection, particularly after carrying out an engagement. Maximum use should be made of dead ground and smoke to screen the movement.

20.   Shine caused by gun barrels, periscopes, tracks etc must be covered.

21.   The contained shadow in the area of the track suspension and between the turret and hull should be camouflaged with foliage or a net. The shape of the vehicle should be broken with foliage, timber, hay or farm implements. Circular openings of cupolas are especially distinctive.

22.   Selection of routes between fire positions should expose armoured vehicles to enemy fire for the least amount of time. Buildings may be used as fire positions provided there is sufficient space to traverse the gun over required areas.

23.   When it is necessary to concentrate a combat team in one location, special security arrangements must be made to control late arrivals, echelon vehicles, mobile repair teams and visitors. A RV, with radio, should be established away from the concentration area where those joining the combat team could wait under cover until it is safe to move forward. An

alternative RV and concentration area must be designated in case it becomes necessary to move at short notice.

24.   Clear directives should be given to armoured vehicle crews as to how long they can expect to remain in a position. Thus, time and effort will not be wasted in taking elaborate camouflage precautions in a position that is only to be occupied for a short period of time.

ARTILLERY

25.   In order to counter flash spotting, sound ranging and locating radars, the following measures should be taken.

      a.   Stereotyped layouts of gun positions with regular intervals between guns should be avoided;

      b.   Large amounts of ammunition and salvage should not be kept on the gun position. Only a sufficient quantity of ammunition should be kept on the position, preferably dug in. Packaging and cartridges should be removed from the gun position. Breakdown of ammunition pallets should be done centrally under cover;

      c.   Swamp' sound ranging with intensive fire;

      d.   Employ low angle fire to avoid weapon locating radars;

      e.   Break up the regular pattern of blast marks with such expedients as lime, rubbish or ashes in front of guns or behind rockets;

      f.   Employ shoot and scoot tactics to reduce the chance of effective counter-battery fire;

      g.   Carry out adjustments prior to a large fire plan with only selected guns from several positions.

26.   Air Defence Artillery. Concealment is complicated by the need for continuous radar surveillance and radio communications. The high state of readiness does not allow overhead camouflage nets. Indeed the radar may

be damaged by power reflection from camouflage nets. The air defence systems are sited in exposed areas to achieve the best coverage possible.

27.   Air defence must rely on the following to avoid detection:

     a.   select positions that have a good natural background while avoiding skyline of the system;

     b.   use of camouflage paints with local garnishing;

     c.   concealment of all portions of the equipment except radar heads and aerial reflectors; and

     d.   conceal all cables.

28.   Target Acquisition. Survey processes employ markers that are visible at long ranges and frequently sited on prominent features. Surveyors should use the least obvious method of indicating stations compatible with the process in use. Electronic distance measuring devices should be switched on for the minimum amount of time.

29.   Cables between sound ranging stations should follow natural lines such as tracks, hedges and woods. Radio links should be sited on reverse slopes and microphones concealed in natural cover.

30.   Weapon locating radars are best sited behind a low crest to screen them from ELINT sensors. The antenna should, when possible, have a good neutral background but must remain camouflage free.

31.   Meteorological balloons should be filled under cover and brought out in the open just prior to launch. The tracking radar should be camouflaged up to launch time.

32.   Drones and RPVs should normally only occupy hide positions near the firing position just prior to firing. Launchers should leave the fire position as soon as possible after the launch.

ENGINEERS

33.   Engineer activity is relatively easy to predict due to constraints imposed by the terrain where engineer work takes place and by the duration

of engineer tasks which often precede other arms tasks. Surveillance sensors can therefore often be tasked to search for specific types of engineer activity in relatively small areas.

34.　　　Obstacle Crossing Operations. The enemy will make every attempt to discover the location and type of crossing to be made over an obstacle in order to guide future operations and to provide a target for nuclear or heavy artillery strikes. Measures to avoid detection of obstacle crossing operations are:

> a.　　Crossing sites with good approaches and exit routes may be too obvious. Less desirable crossing sites should be selected unless a disproportionate amount of work on the approaches is required.

> b.　　Large obstacle crossing equipment such as bridging and engineer heavy equipment should be concealed in the vicinity of the crossing site and only moved forward as required.

> c.　　Once traffic has commenced across the obstacle every attempt must be made to prevent an apparent concentration of vehicles. Movement control, concealed waiting areas and camouflage are mandatory. Unnecessary engineer equipment should be removed from the crossing site. As many crossing sites as possible should be made available to avoid unnecessary concentration.

LIGHT AIRCRAFT AND HELICOPTERS

35.　　　Landing sites will primarily be observed by the enemy from the air. Concealment from ground infiltration must be borne in mind but will be a secondary consideration.

36.　　　The smooth aerodynamic surfaces of aircraft give rise to shine which must be concealed with light weight covers.

37.　　　Selecting an area in which the immediate background forms part of an overall broken pattern can reduce the reduce the distinctive shape of an

overall broken pattern can reduce the distinctive shape of an aircraft that must land I an open area. The most practical means of concealment is to move the aircraft to a concealed location.

38.   Approaches to landing points may be covered by enemy radar. Therefore, aircraft should fly at low levels behind ground or other cover during approach, take off and landing.

39.   In order to ensure access to taxiways and runways, a balance must be achieved in concealment of aircraft and the effect on the response time of the aircraft. Aircraft will still require access for servicing which further complicates the concealment problem. If servicing is done at night in the forward combat zone, there should be a light proof cover over the work area.

40.   If the aircraft must remain in the same location for maintenance purpose the use of buildings, hammocks, umbrella screens or drapes are recommended, as well as shadow nets on the ground to distort the outline of the aircraft.

CHAPTER 9
CONCEALMENT OF HIDES, HEADQUARTERS, COMMAND POSTS, OBSERVATION POSTS AND SUPPORT UNITS

HIDES

1.   A unit in a hide is particularly vulnerable to enemy air observation and attack due to its concentration in a relatively small area. Other than sentries, most personnel are resting and are less alert.

STAGES IN DEVELOPMENT OF A HIDE

2.   Planning. When time permits a reconnaissance party should be sent forward to locate a hide selected with regard to the tactical plan. The reconnaissance party should consider:

> a.   the task of the unit;
>
> b.   access routes to the hide;
>
> c.   existing concealment in the area; and
>
> d.   concealment of all round defence elements.

3.   Occupation. A track plan must be laid down prior to moving vehicles into a hide. Vehicles should be held in a buffer zone if the reconnaissance is not complete. Guards must be posted at route junctions, fully aware of the site for each vehicle. Troops on foot must follow marked paths. Seldom will vehicles be less than 30 metres apart. Three main congested areas must be dispersed: the kitchen, the maintenance area and the command post. A standard layout for a hide will speed the reconnaissance and the occupation. Within a hide, an area to conceal visitor's vehicles must also be selected.

4.   Maintenance. Camouflage discipline can be maintained through air observation and rigid enforcement of the track plan. Garbage must be concealed and blackout control observed at night.

5.   Evacuation. An evacuated area should not be left in a state of disarray as air photos of a disturbed area can reveal information on the

strength and type of unit that occupied it. The hide should be left looking completely undisturbed.

COMMAND POSTS AND HEADQUARTERS

6.   The command post is similar to a hide, with additional problems of concealment. As the command post is the nerve centre of units/formations it is a much-sought target by the enemy. Command posts are easily identified by the following characteristics:

> a.   Converging communication lines including wire and roads;
>
> b.   Concentration of vehicles;
>
> c.   Heavy traffic which causes widened turn-ins;
>
> d.   Protective wire and other barriers surrounding installations;
>
> e.   Defensive weapon emplacements around the installation.

7.   A large headquarters may remain in situ for a greater length of time. The location should therefore be continuously occupied with a minimum chance of being disclosed by changes in terrain pattern. Occupation of the only large building in an area is unwise as it will likely draw enemy fire.

8.   Command posts tied to existing roads, telephone and telegraph lines are easy to conceal. Additional communication means will include antenna with easily recognised silhouettes that must be camouflaged.

9.   Noise from communications and support equipment, in the forward combat zone, may be reduced by:

> a.   dug-in generators;
>
> b.   use of earphones instead of speakers; and
>
> c.   speakers turned down to minimum volume.

10.   Use of buildings for a headquarters is a good means of concealment provided movement to and from the building is kept to a minimum. The appearance of the building should not be altered as it may attract attention. When located in buildings that are partially destroyed, debris such as timber, plaster and scattered rugs should be used to camouflage the headquarters equipment.

11.   Route signs should be concealed from the air, if possible, to avoid detection by oblique photography. Location signs should be colour toned to match local vegetation.

12.   Signatures. Since World War II, the size and signatures of command posts and headquarters have increased dramatically. Now, more than ever, they require excellent camouflage to survive on the battlefield. There are several signatures that the enemy can use to detect and identify headquarters and command posts for destruction.

> a.   Lines of Communications. Headquarters and command posts are usually located near converging lines of communications, such as road or rail junctions, and they often require new access and egress routes.
>
>> (1)   Vehicle traffic. Concentrations of vehicles and heavy traffic, with characteristic wear and track marks, can indicate a headquarters' location. Also consider air traffic when evaluating detection signatures. Park vehicles and aircraft at a significant distance from headquarters or command post.
>>
>> (2)   Antennae. Antennae, with their associated electronic emissions, and an abundance of wire lines, are also common to most headquarters.
>>
>> (3)   Security emplacements. Security measures, such as barbed wire, barriers, security and dismount points, and other types of emplacements, can also provide an indication of headquarters operations. Barbed or concertina wire should follow natural terrain lines and be concealed as much as possible.

b.   Equipment. Power generators and other heat sources develop signatures that are targeted by enemy surveillance. Place heat-producing equipment and other thermal sources in defilade, within structures or under natural cover.

13.   Camouflage. Camouflage, when used with dispersion and standardisation, will improve OPSEC and increase survivability by minimising the observable size and signatures of command posts. Command post camouflage, as with that of an assembly area, requires reconnaissance, planning, discipline, and maintenance. Carefully controlled traffic plans will also decrease the possibility of disturbing natural cover and of creating new, observable paths.

14.   Sites. Command posts and lower level tactical headquarters, while likely to be moved at least every 24 hours, are still occupied for a longer period than assembly areas. Placement is therefore crucial. Consider the following: When placing a headquarters or command post consider the needs of supporting an extended occupation while minimising changes to natural terrain patterns. Take advantage of existing lines of communications (roads, trails, streams, and so forth). Avoid sites requiring new roads or paths, but if this is unavoidable, make maximum use of natural concealment and existing terrain. The fewer new lines required, the better the command post blends, leaving natural features relatively unchanged. Do not locate a headquarters directly at a road junction. Road junctions are obvious targets for enemy sensor systems. If possible, locate a command post in an existing civilian structure as it conceals military activity; . However, if you place a command post in a building, choose a building in an area where a sufficient number of other buildings can mask its location. This siting must not contravene the laws of armed conflict.

15.   Radiotelephone Procedures. By strictly complying with proper radiotelephone procedures, you will decrease the opportunities for the enemy to detect you. Consider the following: Place your antennae in a remote location such as in an antenna farm or in and around trees or other natural screens. Move your antennae as often as possible. Use directional antennae whenever possible. If you must use non-directional antennas, employ proper terrain-masking techniques to defeat enemy radio direction-finding efforts. Maximise the use of existing telephone lines. Note that newly laid wire is a readily observable signature that can reveal a headquarters location. Communications wire and cable should follow natural terrain lines and be concealed as much as possible.

16.   Camouflage Discipline. After occupation of the site and erection of camouflage to supplement available natural concealment, maintain camouflage discipline. Establish and use designated footpaths to, from, and within the area. Security and dismount points as well as other individual emplacements should be well camouflaged, and the paths to command post should be inconspicuous. Enforce proper procedures for trash and spoil disposal. Rigidly enforce light and noise discipline.

OBSERVATION POSTS (OP)

17.   The best viewpoint is often the most obvious choice as a site for an artillery OP and therefore subject to enemy fire. The site selection for an OP should provide:

a.   best observation possible as the primary consideration,

b.   cover and concealment for the OP, and

c.   concealed routes to and from the OP.

18.   Crests of hills should be avoided in order to prevent skyline of the observer. It may be more appropriate to select a position on the forward slope of a hill when observation is not restricted.

SUPPORT UNITS

19.   Support units will vary in size from large concentrations of materials and installations in rear areas to small piles of supplies and installations in the forward areas. Huge amounts of equipment are brought forward to be unloaded quickly. Built-up areas and woods usually provide the best concealment.

20.   Stores should be stacked in irregular patterns. In areas where overhead cover is lacking camouflage nets and large overhead screens may have to be erected to give covered storage and working space.

21.   To avoid shadows when the sun is low, shallow drapes and sloping screens should not exceed an angle with the ground of more than 15

degrees. Vertical walls with fully garnished flat top should cast shadows that are concealed by other terrain features.

22.   Adequate concealment for support units can normally be obtained by careful siting. Inadequate concealment of support units may lead to the manoeuvre plan being compromised even if no manoeuvre elements are identified.

23.   Supplies may be stacked in cultivated fields, laid out along cultivation lines and covered with camouflage nets to resemble standing stubble. Stores may also be stacked in plowed fields aligned with the furrows and covered with earth coloured hessian. Suitable roadside ditches and hedges may be used to stack stores that will be in shadow for most of the day.

24.   Walls that are intact or partially damaged may be used to conceal stores as long as the wall thickness is not noticeably increased. Stores may also act as a false floor in damaged structures.

25.   Installations may be disguised by a variety of means. Two-dimensional patterning may be applied to roofs, walls and the ground. These measures could include:

> a.   disruptive paint patterns to break up the outline of a structure;
>
> b.   scarification of open land around a large installation to give the appearance of a field;
>
> c.   grass seeding to conceal any new construction;
>
> d.   control irrigation and fertilisation to produced patterned areas;
>
> e.   employ toxic agents to kill vegetation and produce patterned areas;
>
> f.   controlled grass cutting of varying heights;
>
> g.   spreading materials such as mulching, wet brush, and black cinders; and

      h.   controlled burning can simulate runways or orchards.

26.   Three dimensional patterning may be necessary to successfully camouflage large installations:

      a.   False structures that act as screens or decoys may be constructed to be mobile or static. Three-dimensional construction is used to make existing installations or fortifications resemble entirely different structures. Examples are farmhouses built over pillboxes and debris erected over tank cars to resemble a rubbish heap.

      b.   Track and False Trees. The transplant of trees in clumps will create dark masses or break-up the outline and shadows of new buildings. False trees can be used to supplement overhead cover, break up regular shadows or to help disguise cleared areas such as landing strips or runways. A false tree usually consists of rigid skeleton on which material is arranged to imitate foliage such as burlap, garnished twine nets, steel wool, tin cans (spray painted) and palm fronds.

      c.   Quick growing vines may be planted to grow over and hide concrete emplacements and climb sloped wire and overhead nets.

      d.   False terrain features of crumbled paper, sagebrush, tumbleweed or other bush materials may be wired to the ground to simulate crops. Cut hay or straw may be mounded to simulate a dike or revetment. Shallow ditches with the sides painted black may represent drainage ditches or other excavations.

      e.   Grading is often necessary to provide adequate blast protection for small structures. It should be accomplished without interfering with the regular slopes and geometric shape of the surrounding terrain.

      f.   Camouflage. Take maximum advantage of natural cover and concealment. Configure logistics layouts to conform to the local ground pattern. Creativity can play a large

role in doing this. For example, in plowed fields, stacking supplies parallel to the furrows and covering them with earth-coloured tarps can provide effective concealment from aerial observation. The following guidelines will enhance concealment of these operations:

(1)   Avoid establishing regular (square or rectangular) perimeter shapes for the area.

(2)   Select locations where concealed access and egress routes are already established and easily controlled.

(3)   If new access roads are needed, use roads that have existing overhead concealment.

(4)   Conceal access over short, open areas with overhead nets.

(5)   Rigidly control movement into and out of the supply area.

(6)   Mix and disperse supply point stocks to the maximum extent possible, not only to avoid a pattern of stockpile shapes but to avoid easy destruction of one entire commodity.

(7)   Irregularly space stocks (both in length and depth) to avoid recognisable patterns. Stack supplies as low as possible to avoid shadows. If resources allow, dig supplies in.

(8)   Cover stocks with nets and other materials that blend with the local ground pattern.

(9)   Flattops (large, horizontal camouflage nets) are effective for concealing supply-point activities when resources allow their construction and supply points are not too large.

g.   Traffic Control. Access and traffic-control plans should provide for minimal changes to the natural terrain as a

result of movement into, within, and out of the area. Provide for concealment and control of vehicles waiting to draw supplies. Rigidly practice and enforce camouflage discipline. Debris control may be especially troublesome and will require constant attention.

h.   Water-Point Considerations. Camouflage of water points requires the following additional considerations:

(1)   Spillage. Minimise water spillage. Provide adequate drainage to prevent standing pools of water that can reflect light and attract attention.

(2)   Equipment. Use adequate natural and artificial concealment for operating personnel, storage tanks, and specialised pumping and purification equipment. Conceal water point equipment to eliminate shine from water. Conceal shine by placing canvas covers on tanks, using nets, and placing foliage on or around water tanks. Use the same methods to distort the characteristic shape of these tanks.

(3)   Scheduling. Enhance camouflage discipline at water points by setting and strictly enforcing a supply schedule for units. The lack or violation of such a schedule will produce a concentration of waiting vehicles, which is difficult to conceal.

MEDICAL FACILITIES

27.   NATO Standardisation Agreement (STANAG) 2931 covers procedures for using the Geneva emblem and for camouflaging land medical facilities. This STANAG requires signatories to display the Geneva emblem (red cross) on medical facilities to help identify and protect the sick and wounded. STANAG 2931 defines medical facilities as medical units, medical vehicles, and medical aircraft on the ground. All signatories, however, are allowed to display the Geneva emblem according to their national regulations and procedures.

28.   A tactical commander may order the camouflage of medical facilities, to include the Geneva emblem, when he judges that the failure to camouflage will endanger or compromise tactical operations. Such an order is considered temporary and must be rescinded as soon as the tactical situation permits. The camouflage of large, fixed medical facilities is not envisaged under the guidelines of STANAG 2931.

FIXED INSTALLATIONS.

29.   Concept. Fixed installations, such as airfields and other lines-of-communication facilities, provide scarce, nearly implacable, functional support to ground manoeuvre forces. The primary threat to these facilities is from fighter-bombers and attack helicopters both of which approach targets at low altitudes and high speeds. This method of attack creates unique target acquisition problems for the pilot due to the short time the pilot has to locate, identify, and lock onto a target (Figures 5 and 6). Proper camouflage can easily magnify the pilots' difficulties. The location and configuration of most fixed installations are well known. Camouflage against sophisticated threat sensor systems, except in special cases, is not cost effective. Furthermore, the cost of completely camouflaging many facilities is prohibitive. Camouflage efforts, therefore, should focus on the multispectral defeat of the attacking aircraft's target acquisition process. Camouflage efforts should take advantage of local terrain features and the poor field of vision and short time available to attacking aircraft pilots.
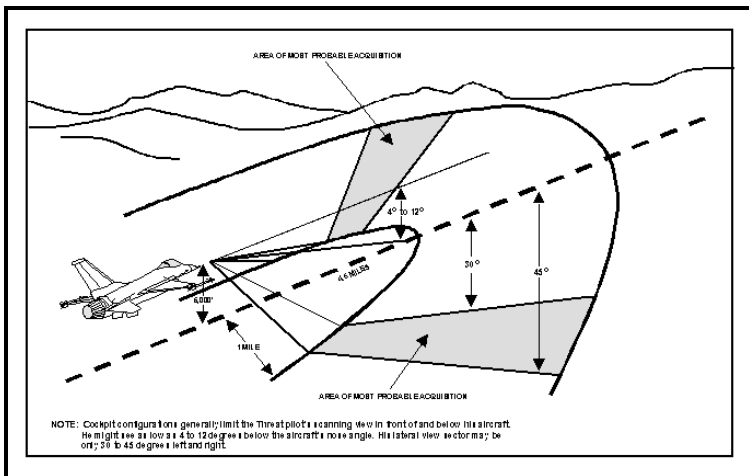
Figure 5: High Performance Aircraft Visibility

RELEASE POINT

800 - 900 KPH

30 - 100 M

IP   TARGET

2 - 3 KM

TERRAIN - FOLLOWING ATTACK PROFILE

30 - 100 M

800 - 1,000 KPH   300 - 1,500 M

10% - 30%

IP   PULL - UP POINT   TARGET

4 - 8 KM

STRAIGHT - APPROACH, POP - UP ATTACK PROFILE

10° - 30°

TARGET

1,200 - 1,800 M

2 - 8 KM

600 - 900 KPH   10° - 30°

100 M

0 - 125 M

18OO DEGREE APPROACH, POP - UP ATTACK PROFILE
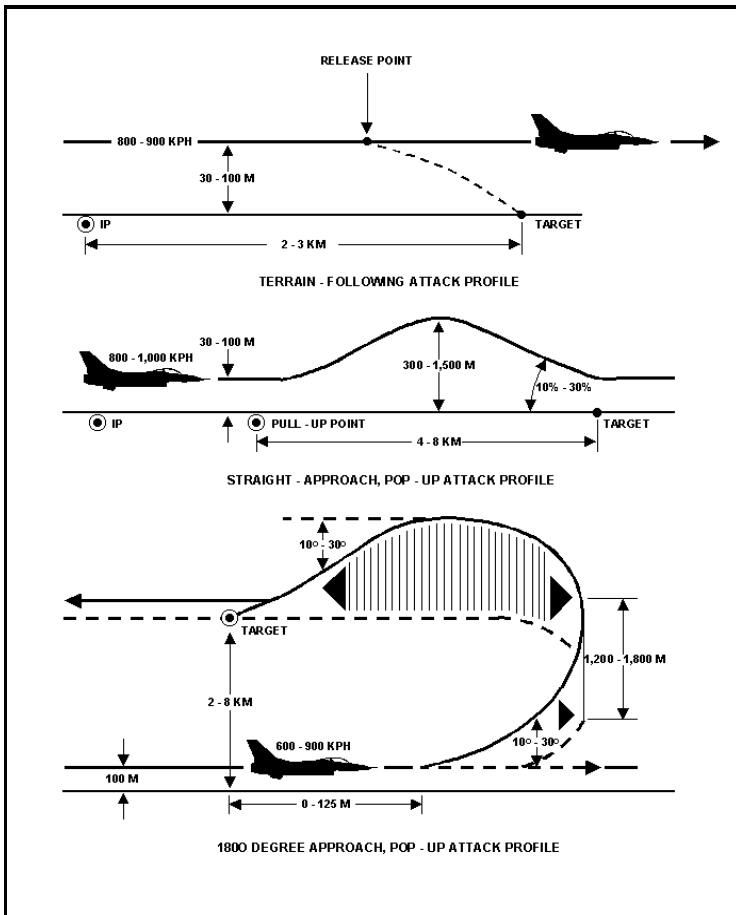
Figure 6: Typical Aerial Attack Profiles Against Fixed Facilities

30.   Camouflage Plans. There is no single solution for enhancing fixed-installation survivability using camouflage technology. The characteristics of most facilities are unique, requiring distinctly different camouflage techniques. Accordingly, every fixed-installation commander should develop a unique camouflage plan based on a thorough study of the factors affecting an enemy aircraft's ability to distinguish key targets.

a.   Objective. The objective of the camouflage plan is to produce the desired level of survivability within the limits of available resources. The design procedure must systematically determine what is conspicuous about a given site, why it is conspicuous, and how to best camouflage it. The ultimate goal is to decrease the effectiveness of enemy firepower by making installation location and identification as well as critical target acquisition more difficult to accomplish. Minimum camouflage efforts may include the concealment of orientation cues or reference points that assist the attacker in finding the installation. The next level of effort may involve the camouflage treatment of large or conspicuous features (airfield runways or the geometric shapes of weapon storage sites) that allow the attacker to orient himself relative to the facility. Other critical targets within the installation may often be quite conspicuous, hence requiring additional concealment camouflage to conceal them. Decoys (reference points or critical targets) may be sufficient to confuse and defeat the attacker's target-acquisition process.

b.   Planning Approach. Use the following eight-step approach to develop a camouflage plan that meets the installation's needs.

(1)   Identify the threat. Initially, identify the chief enemy sensors, aircraft, weapon systems, and the most likely directions of attack.

(2)   Establish goals. Establish specific camouflage goals for the installation. Base these goals on the threat assessment, the impact the goals will have on operations, and the cost effectiveness of achieving the goals. This step is iterative, requiring reconsideration throughout the planning process.

(3)   Identify critical facilities. Identify the most critical facilities on the installation. Include facilities that are critical from an operational standpoint as well as those that may provide

reference points for an attack on the more
lucrative targets.

(4)   Evaluate facilities. Once you have identified the
critical facilities, focus your efforts on
identifying what facility features make them
conspicuous to attacking aircraft. This
assessment must consider multispectral (visual,
thermal, NIR, and radar) signatures. The
recognition factors (Chapter 3) are an excellent
framework within which to conduct this
assessment. Include a review of area maps, site
plans, and photographs, as well as an aerial
survey of the installation, its surroundings, and
probable attack avenues of approach.

(5)   Quantify signatures. Relatively quantify the
multispectral signatures emitted by installation
facilities. Base signature quantity on actual
surveys of critical facilities, using the array of
possible threat sensors. The goal is to develop a
priority for signatures to be reduced and to
determine the level of reductions of these
signatures.

(6)   Select materials and techniques. Based on the
previous steps, select the suitable materials and
techniques that best reduce the facilities'
signatures, while meeting the plan's camouflage
goals. Table 3 contains a list of generic counter
surveillance technologies that apply to fixed
installations. As there is no camouflage kit
available for fixed facilities, select techniques
and materials based on what fulfils each
installation's needs.

(7)   Organise the plan. At this point, develop a total
installation camouflage plan. Since all facilities
can be characterised by two dominant features
(traffic surfaces and aboveground structures),
group specific camouflage measures accordingly.
Consider both temporary (removable) and

permanent measures. Table 4 groups camouflage measures according to these categories. Whichever measures used, avoid repetitive solutions that may be recognised as a pattern. The previous identification of installation camouflage goals, critical facilities, signature-reduction priorities, and available camouflage measures should provide the framework for the completion of this step.

(8)   Implement the plan. The last step is implementation. If possible, deploy permanent measures during normal maintenance schedules. For example, substitute special thermal coatings for normal paints; store temporary (removable) materials inconspicuously; conduct deployment training for these materials, but on a schedule that will deny enemy intelligence teams the opportunity to identify the measures or develop methods to defeat the camouflage.

c.   Limitations. While all the measures and techniques described above are designed to enhance fixed-installation survivability, they have practical limitations. For example, attacking pilots will still be able to use natural cues (mountains and rivers) and some man-made cues (such as towers and expressways). The physical size of the installation will also be a limiting factor, especially if there are too many critical facilities or cues completely concealed. Despite these limitations, carefully developed and implemented camouflage plans can significantly increase fixed-installation survivability against airborne threats.

Camouflage objective	Optical System	Thermal System	Electronic system
Hide	Earth cover Earth embankments Vegetation Nets	Earth cover Earth embankments Vegetation Nets	Chaff Corner reflectors Earth cover Earth embankments Vegetation

Camouflage objective	Optical System	Thermal System	Electronic system
	Camouflage sheeting Screens Smoke	Camouflage sheeting Screens Smoke	Nets Radar Absorbing Material (RAM)
Blend	Paint Foam Lights Vegetation Nets and sheeting Texture mats	Thermal paints Foam Air Conditioning Vegetation Nets and sheeting Texture mats Water Insulation	Vegetation Nets RAM Reshaping to eliminate diederon Texture mats
Disguise	Reshaping Paint	Reshaping Paint	Corner reflectors
Decoy	Lights Pneumatic or rigid structures Smoke	Flares Air conditioning Smoke	Corner reflectors Signal Generators
Distract	Pyrotechnic Smudge post Balloons Strobe lights Tracer Simulators Smoke	Rocket Flares Balloons Smoke	Chaff

Table 3: Generic Counter Surveillance Technologies

Feature	Removable Solutions	Permanent Solutions
Traffic Surfaces	Paint Water Liquid Foam Nets, Sheeting and Carpets	Paint and Coatings Reforestation Paving Blocks with vegetation hole Irregular patterns

Land Force Counter Surveillance

Feature	Removable Solutions	Permanent Solutions
	Corner Reflectors Decoys Smoke and Obscurants	
Above Ground Structures	Paint and coatings Water Nets, and Sheeting Corner Reflectors Decoys Smoke and Obscurants Lights	Paint and coatings Reforestation Earthworks Reshaping Insulation New Construction Guidelines

Table 4: Installation Camouflage Measures

CHAPTER 10
EXTREME ENVIRONMENTS

SNOW

1.   In winter, the whiteness of the countryside emphasises any item that does not blend in naturally with its surroundings. Every movement leaves clearly defined tracks. The texture of white materials used for camouflage must be considered.

2.   Individual concealment will depend on the type of terrain. Recommended clothing combinations are:

> a.   heavy forested areas consisting of coniferous trees or deciduous trees with thick underbrush, all dark clothing is best;

> b.   for low brush with light scrub a combination of white trousers and dark jacket is preferable;

> c.   open snow covered areas with dark woods in the background white trousers and dark jacket are the most suitable; and

> d.   All white clothing is best in open snow covered terrain. Weapons and similar accoutrements must be similarly camouflaged using personal winter camouflage screens or discarded winter appliqué patches.

3.   Concealment of equipment may be achieved by the application of white paint. Large equipment should be covered with the snow camouflage nets with special care not be disturb the natural snow cover.

4.   Concealment of field defences is most difficult when snow depth is inadequate to dig down. The following measures should be taken:

> a.   site field defences under overhead cover when possible;

> b.   side and ends of fortifications should have pronounced slopes to prevent formation of shadows;

c.   ground level should not be exposed if possible; and

d.   fresh snow should be brushed smooth with twigs to remove bumps.

5.   Tracks will be difficult to conceal, as sharp edges of the snow ruts will cast shadows. Smoothing out of ruts may be accomplished by dragging tree boughs. Use of deceptive tracks will be most effective.

6.   Light discipline will be particularly difficult in the long winter nights. Tasks should be completed without the use of lights, as the reflection in snow will be observed from great distances, particularly on clear nights.

7.   Vapour clouds will be formed from anything that produces heat such as vehicle exhausts, weapons firing, and heat from a man's breath. Fogs may be minimised by moving vehicles to rear areas and breathing through balaclavas or scarves.

DESERT

8.   The primary characteristic of desert areas is the absence of vegetation that may provide overhead cover. The colour of desert terrain varies from pink to blue, depending on the minerals in the soil. No colour or combination of colours will match all deserts. These conditions have led to the development of a neutral, monotone tan as the best desert camouflage paint colour.

9.   Imagination and ingenuity are required to overcome the difficulties of concealment in the desert. Problems associated with camouflage are:

a.   Vehicle dust caused from movement is easily observed. The choice of ground, reduction of speed and restriction of movement to night hours only may be necessary.

b.   Background colours include shades of gray, brown and yellow. Disruptive painting of vehicles, dying of camouflage nets and clothing may be necessary.

c.   Shadows will be sharply outlined due to the lack of vegetation. Camouflage nets must be hung with a gradual

slope towards the ground to eliminate shadow. Heavy use of decoys will be required due to the difficulty in the concealment.

10.   Topography. Although desert terrain may appear featureless, it is not completely flat. In many respects desert terrain resembles unplowed fields; barren, rocky areas; grasslands; and steppes. The challenges and effective techniques presented by these different terrains are similar.

11.   Shadows. In any terrain, the lower the object, the smaller the shadow. The smaller the shadow, the easier it is to conceal the object from aerial observation. Shadows cast by folds of the ground are effective as camouflage when supplemented by artificial materials. The proper draping of camouflage nets will further reduce shadows. The best solution in desert terrain is to dig in and use overhead concealment or cover.

12.   Siting. Proper siting and shadow disruption remain effective techniques. Place objects in gullies, washes, wadies, and ravines to reduce their shadows and silhouettes, as well as to take advantage of terrain masking. More dispersion is necessary in desert terrain than in wooded areas. Move objects as the position of the sun changes in order to keep equipment in the shadows.

13.   Camouflage and Movement Discipline. Camouflage and movement disciplines are especially important in the desert. Vehicle movement produces dust, diesel plumes, and track marks, all of which are easy to detect in a desert environment. When movement is necessary, move along the shortest route and, if possible, on the hardest ground. As shine is a particularly acute problem, remove all reflective surfaces or cover them with burlap. Use matte camouflage paint or expedient paints (grease mixed with sand) to dull the gloss of a vehicle's finish. Shade optical devices (such as binoculars and gun sights) when using them.

14.   Noise and Light Discipline. Noise and light discipline are particularly important in desert terrain, since sound and light can be detected at great distances on clear desert nights. The techniques for reducing these signatures remain the same as for other environments. Keep in mind that thermal sensors, while not as effective during the day, have an ideal operating environment during cold desert nights. A technique to confuse enemy acoustical surveillance efforts is to start all vehicle and equipment engines simultaneously.

JUNGLE

15.   Concealment is relatively straight forward in jungle due to the following conditions:

        a.   dense vegetation provides good overhead cover;

        b.   ground observation is seldom beyond 25 metres;

        c.   there is intense contrast between the bright reflections in tropical sunlight and deep shadows; and

        d.   mist, fog, low cloud, heat, haze and rain restrict air to ground observation.

16.   The sophisticated sensors of Northwest Europe will not likely be encountered in the jungle. Rather enemy forces will likely detect evidence of human presence with the human senses such as:

        a.   boot marks or tracks,

        b.   leaves unnaturally turned,

        c.   bruised or bleeding roots,

        d.   freshly cut saplings muddied over at ground level,

        e.   warm ashes on an old fire,

        f.   dry patches on the ground after rain,

        g.   unnatural litter,

        h.   disturbed insect life and broken spider webs across a track,

        i.   smell of stove fuel, cigarette smoke, scented soap and human sweat, and

        j.   noise of machetes cutting foliage.

MOUNTAINOUS OPERATIONS

17.   Concealment is more difficult in mountainous terrain due to the following factors:

      a.   Depending the altitude, terrain and vegetation may alter radically. Natural cover will be limited at high altitudes.

      b.   Movement is generally restricted to valley bottoms or ridgelines. This reduces the size of area which an enemy must keep under surveillance.

      c.   An enemy will take every opportunity to establish observation posts on high ground where good fields of view are available.

18.   To avoid detection during movement the following measures are necessary:

      a.   move bodies of troops at well spaced intervals;

      b.   avoid crest lines;

      c.   make maximum use of shadows caused by high features; and.

      d.   make maximum use of dead ground.

19. Natural cover should be improved for concealment of individuals and field defences. Digging of field defences will often not be possible due to the nature of ground. Troops in position should be as still as possible to avoid detection.

OPERATIONS IN BUILT-UP AREAS

20.   Urbanisation is reducing the amount of open, natural terrain throughout the world. Therefore, modern military units must be able to apply effective urban camouflage. Many of the camouflage techniques used in natural terrain are effective in urban areas. The urban environment, however, presents unique camouflage opportunities. Built-up areas provide excellent cover for personnel and equipment. The cover provided by

buildings will conceal visual and thermal images from enemy surveillance devices.

21.   Movement on rooftops and roads should be minimised. If possible, movement should be from building to building.

22.   Concealment outside of buildings is possible by employing the following measures:

        a.   avoid major routes within the built up area;

        b.   move at night when practical;

        c.   make use of large building shadows;

        d.   employ camouflage materials which simulates the shape and colour of buildings; and

        e.   site in the approaches to a city where there is more natural concealment than a downtown core.

23.   Planning. Planning for operations in urban areas presents unique challenges. Tactical maps do not show man-made features in enough detail to support tactical operations. Although these maps show details of adjacent terrain, you must supplement them with aerial photographs and local city maps. Local government and military organisations are key sources of information that can support tactical (and camouflage) operations. Key examples of the type of information they may provide are:

        a.   diagrams of underground facilities,

        b.   large-scale city maps,

        c.   civil defence or air raid shelter locations.

24.   Site Selection. The physical characteristics of urban areas enhance camouflage efforts. It is difficult for enemy surveillance to detect emplacements in urban terrain, hence an excellent location for concealing Command Posts, reserves, combat service support complexes, or combat forces. As the physical structure of dense urban areas reduces the effectiveness of most modern sensors, visual camouflage is the most important consideration.

a.   Terrain Patterns. The regular pattern of terrain, the diverse colours and contrast, and the large, enclosed structures offer enhanced concealment opportunities. Established, hardened road surfaces effectively mask vehicle tracks. Underground structures (sewers, subways, and so forth) are excellent means of concealing movement and high-value targets. Depending on the nature of the operation, numerous civilian personnel and vehicles may be present, confounding the enemy's ability to distinguish between military targets and civilian population.

b.   Man-made Structures. Man-made structures provide symmetrical shapes that, when augmented by artificial means, provide ready-made camouflage. The camouflage of fighting positions will be especially important, given the reduced identification and engagement ranges (100 meters or less) typical of urban fighting. Limit or conceal movement and shine. These signatures provide the best opportunity for threat surveillance to be successful in urban terrain. Careful placement of equipment and fighting positions remains important, not only to provide visual camouflage, but to avoid detection by contrast (thermal sensors detecting personnel and equipment silhouetted against colder buildings or other large, flat surfaces).

25.   Establishing Fighting Positions. The fundamental rule is to maintain the natural look of the area as much as possible. Buildings with large, thick walls and few narrow windows provide the best concealment. When selecting a position inside a building, avoid the lighted areas near windows. Soldiers should always stand in shadows when observing or firing their weapons through windows. Select positions with covered and concealed access and egress routes.

26.   Placing Vehicles. If possible, hide vehicles in large structures. Use local materials to help blend vehicles with the environment. Paint vehicles and equipment a solid, dull, dark colour. If this is not possible, use expedient paints to subdue the lighter, sand-coloured portions of standard camouflage paint patterns. Use shadows when placing vehicles outdoors. When moving, screen vehicles with smoke or take advantage of conditions of limited visibility.

ANNEX A
COUNTER SURVEILLANCE STANDING
OPERATING PROCEDURES

1.   Purpose. SOPs are critical to success on the battlefield. All commanders must train using the camouflage guidelines in their SOPs and ensure their soldiers are familiar with them. The objective of these SOPs is to reduce the time required to perform routine tasks. Achieve these ends by defining responsibilities, identifying expected tasks, and providing supervisors with an aide-mémoire when planning or inspecting. SOPs, coupled with good battle drills, provide units with guidance on how to execute anticipated battlefield tasks. Camouflage is a task that should be routine for all units. A comprehensive camouflage SOP that is followed will enhance the unit's ability to survive and assist soldiers to continuously employ proper camouflage measures.

2.   Content. The unit and formation SOPs must:

      a.   review the fundamentals of camouflage and establish rules of camouflage discipline for the unit;

      b.   provide an aide-mémoire inspection checklist for supervisors (included below);

      c.   provide a chart of sensor systems with possible countermeasures;

      d.   establish camouflage discipline rules to provide uniformity among all sub-units;

      e.   the SOP also addresses different standard camouflage postures.

3.   Commander's Responsibilities.

      a.   Uniforms. The commander must ensure each soldier has the required quantities of serviceable combat uniform and that these uniforms are properly maintained to protect their near infrared-screening properties.

      b.   Camouflage Materials. Based his unit requirements, forecast, request, and store adequate quantities of

expendable camouflage supplies (such as paint, makeup, and repair kits).

c.   Commanders should also ensure authorised quantities of camouflage net, patches and support systems are on hand and continually maintained in a clean and serviceable condition.

4.   Fratricide. The commander should consider ways for friendly units to identify each other on the battlefield, as well as allied units, and incorporate these methods into the unit's field SOPs. Fratricide compels commanders to consider the effect camouflage, concealment and deception operations will have on the necessity of being recognised by friendly troops

CAMOUFLAGE INSPECTION CHECKLIST

5.   Commander's emphasis:

    a.   frequent inspections for camouflage deficiencies,

    b.   conduct of follow-up inspections of deficiencies,

    c.   integration of camouflage into all training exercises,

    d.   maintenance of an adequate camouflage SOP.

    e.   Adherence to SOPs.

6.   Discipline:

    a.   Unit:

       (1)   Observes noise discipline at all times.

       (2)   Observes light discipline (no smoking, no fires and lights) at all times.

       (3)   Conceals all highly visible equipment.

       (4)   Covers all shiny surfaces.

          (5)   Keeps exposed activity to a minimum.

          (6)   Properly uses cut vegetation.

          (7)   Properly uses and conceals dismount points.

    b.   Soldiers:

          (1)   Wear the correct uniform

          (2)   Control litter and spoil.

7.   Techniques. The unit properly

    a.   Places and disperses vehicles and equipment.

    b.   Disperses CP.

    c.   Uses nets, patches and support systems.

    d.   Uses shadows.

    e.   Minimises movement.

    f.   Hides operations and equipment.

    g.   Blends operations and equipment with backgrounds.

    h.   Uses pattern-painting techniques.

    i.   Uses decoys.

    j.   Integrates smoke.

    k.   Practices individual camouflage.

          (1)   Helmets

          (2)   Face paint.

          (3)   Weapons.

(4)   Other equipment.

l.   Uses camouflage on fighting positions.

(1)   Silhouette with background.

(2)   Spoil control. Regular or geometric shapes and layouts.

(3)   Overhead concealment.

(4)   Dust control.

m.   Camouflages vehicles.

(1)   Track marks.

(2)   Shine on vehicles and equipment.

(3)   Shadows.

(4)   Nets, patches and support system.

(5)   Pattern paint.

n.   Camouflages artillery positions.

(1)   Dispersion.

(2)   Concealment (including supply routes).

(3)   Litter and spoil control.

(4)   Nets, patches and support system.

(5)   Ammunition storage and concealment.

o.   Camouflages bivouac areas.

(1)   Planning facilitates mission, access and egress, and concealment.

(2)   Guideposts are marked at route junctions.

(3)   Turns are not widened by improper use.

(4)   Dismount, feeding, rest and maintenance areas are dispersed

(5)   CP is dispersed.

(6)   Camouflage is maintained.

        (a)   Camouflage is frequently inspected.

        (b)   Litter and garbage are controlled.

        (c)   Blackout procedures are observed.

(7)   Evacuation procedures are observed.

        (a)   Area is properly policed.

        (b)   Tracks are properly covered or eliminated.

        (c)   Congestion is prevented.

        (d)   Spoil is properly concealed.

p.   Camouflages the CP.

(1)   Communications lines do not converge.

(2)   Vehicles are dispersed.

(3)   Turns are not widened by improper use.

(4)   Protective obstacles follow terrain features.

(5)   Defensive weapons are concealed.

(6)   Existing poles are used for communications lines.

(7)   CP is dug in (when in open areas).

(8)   Nets, patches and support system are maintained.

(9)   LZ is located away from CP and provides a covered air route

(10)   Civilian buildings are properly used.

      (a)   Access and egress are controlled.

      (b)   Blackout procedures are observed.

      (c)   Obvious locations are avoided.

q.   Camouflages supply points.

(1)   Operations are dispersed.

(2)   Access and egress are concealed.

(3)   Track plan is used.

(4)   Concealed loading areas are provided.

(5)   Schedule is developed and used for units being serviced.

r.   Camouflages water points.

(1)   Access and egress roads are concealed.

(2)   Track plan is used.

(3)   Spillage is controlled.

(4)   Shine and reflections are controlled.

(5)   Schedule is developed and used for units being serviced.

s.   Concealment of movement.

        (1)   Terrain masking is used to hide movement from ground and air surveillance.

ANNEX B
DEFINITIONS

ACTIVE

In surveillance, an adjective applied to actions or equipment which emit energy capable of being detected (AAP-6)

CAMOUFLAGE

The use of natural or artificial material on personnel, objects or tactical positions with the aim of confusing, misleading or evading the enemy (AAP-6)

CONCEALMENT

The protection from observation or surveillance (AAP-6)

COUNTER SURVEILLANCE

All measures, active or passive, taken to counteract hostile surveillance (AAP-6)

DECEPTION

Those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests (AAP-6)

DECOY

An imitation in any sense of a person, object or phenomenon which is intended to deceive enemy surveillance devices or mislead enemy evaluation (AAP-6)

DETECTION

The discovery by any means of the presence of a person, object or phenomenon of potential military significance (AAP-6)

DISRUPTIVE PATTERN

In surveillance, an arrangement of suitably coloured irregular shapes which, when applied to the surface of an object, is intended to enhance its camouflage (AAP-6)

NEAR INFRARED

The part of the electromagnetic spectrum nearest to visible light. Wavelength 0.7 to 2.5 microns

MID INFRARED

The part of the electromagnetic spectrum associated with radiated heat. Wavelength 3 to 5 microns

FAR INFRARED

The part of the electromagnetic spectrum associated with radiated heat. Wavelength 8 to 12 microns

PASSIVE

In surveillance, an adjective applied to actions or equipment which emit no energy capable of being detected (AAP-6)

SCREEN

In surveillance, camouflage and concealment, any natural or artificial material, opaque to surveillance sensor(s), interposed between the sensor(s), and the object to be camouflaged or concealed

SURVEILLANCE

The systematic observation of aerospace, surface or subsurface areas, places, persons or things, by visual, aural, electronic, photographic, or other means (AAP-6)