

LESSON PLAN

**PART I
COVER SHEET**

LESSON TITLE: Forestation and Vegetation (F/V) Projects

TRAINING METHOD: Lecture-Discussion

ORGANIZATIONAL PATTERN: Topical

REFERENCES: CCDI-91-1052-13, General Airbase Camouflage, Application Guide for the Camouflage, Concealment, and Deception Integration Program
Technical Report JCCD 94-1, Air Base Camouflage, Concealment, and Deception Guide

AIDS AND HANDOUTS: Attachment 1: Use of Tree Patterns for Site Camouflage
Attachment 2: Blending an Airbase into it's Surroundings
Attachment 3: Trees and Shrubs Used to Provide Screening and Reduce Shadow Problems
Attachment 4: Concrete Blocks with Grass Used to Reduce Contrast Between Paved Surfaces and Surrounding Grass Areas

LESSON OBJECTIVE: Given a lecture on the use of forestation and vegetation as one of the most effective multi-spectral countermeasures, the student, during the final exam, must correctly answer questions that demonstrate mastery of using forestation and vegetation in at least four of the samples of behavior listed below.

SAMPLES OF BEHAVIOR:

1. Determine forestation and vegetation possibilities for runway and taxiway complexes.
2. Determine forestation and vegetation possibilities for buildings and structures.
3. Identify shadow disruption techniques using forestation and vegetation.
4. Identify a forestation and vegetation technique for reducing the signature of a body of water.
5. Identify techniques for supplementing young vegetation and repairing telltale earth scarring.
6. Determine appropriate choice of vegetation to use in forestation and vegetation projects.

SUGGESTED COURSE (S) OF INSTRUCTION: CCD Trainers Course
CCD Planners Course

STRATEGY: Ideally, instructors should teach this course following RTPs K1, K3, and K5. This block of instruction is designed for members writing and coordinating on the base CCD plan. Other students may include anyone who may coordinate on plans and checklists that deal specifically with forestation and vegetation projects.

LESSON OUTLINE:

MAIN POINT 1 PURPOSE OF FORESTATION AND VEGETATION

- a. Multi-spectral Countermeasures
- b. Objectives
- c. Large-scale Patterning
- d. Leaves Affect RF

MAIN POINT 2 OVERALL AIR BASE FORESTATION AND VEGETATION

- a. Aerial Photography
- b. Vegetation
- c. Trees
- d. Runways
- e. Runway Complex
- f. Buildings And Structures
- g. Rooftops
- h. Recognizable Shapes
- i. Parking Areas
- j. Bodies Of Water

**MAIN POINT 3 OTHER FORESTATION AND VEGETATION
CONSIDERATIONS**

- a. Shadow Disruption
- b. Young Vegetation
- c. Earth Scarring

MAIN POINT 4 CONCLUSIONS FROM THE EXPERTS

- a. Relatively Inexpensive
- b. Screens, Disrupts, and Conceals
- c. Match Local Vegetation

PART II

TEACHING PLAN

INTRODUCTION

ATTENTION:

A major objective of CCD at an airbase is to increase survivability by decreasing the effectiveness of enemy tactical assets. Accomplishing CCD handicaps sensor systems as the enemy attempts to detect, recognize, and identify targets. Overall, CCD efforts reduce the accuracy of weapons delivery.

MOTIVATION:

Forestation and vegetation projects are relatively inexpensive and serve as an effective camouflage technique. An added bonus is the high return for quality of life programs.

OVERVIEW:

In this lesson we will discuss:

- Purpose of forestation and vegetation
- Air base forestation and vegetation
- Other forestation and vegetation considerations
- Conclusions of experts

**MAIN POINT 1.
PURPOSE OF
FORESTATION/
VEGETATION****a. MULTISPECTRAL
COUNTERMEASURES****b. OBJECTIVES****c. LARGE-SCALE
PATTERNING****BODY**

The purpose of forestation and vegetation, particularly trees, is to provide one of the most effective multi-spectral countermeasures available

Multi-spectral countermeasures, by definition, can delay the enemy's target acquisition process in two or more of the parts of the electromagnetic spectrums of visual, infrared (IR), and radar capabilities.

Forestation and vegetation accomplish several CCD objectives. Screening an object with vegetation reduces the size in all portions of the electromagnetic spectrum. This makes detection and recognition more difficult.

Camofleurs often use vegetation to accomplish large-scale patterning of open areas and to reduce shadows. Large-scale patterning refers to making an area such as the airfield appear to be an extension of the surrounding environment. Trees, shrubs, and vines screen structures from visual sensors. The shade effectively keeps structures cooler to reduce thermal signatures picked up by sensors.

d. LEAVES AFFECT RF

Leaves absorb some of the radio frequency (RF) energy transmitted. The particular characteristics of the leaves and vegetation cause the RF energy to scatter in many directions. The RF scatter greatly reduces energy returned to the radar receiver and weakens the radar signature.

MAIN POINT 2.
GENERAL PLAN

Now that you understand the purpose of effective forestation and vegetation projects, let us discuss some general guidelines to implement these projects on installations. The overall air base CCD plan must provide a general plan of vegetation and land use that is similar to the area surrounding the base.

a. AERIAL
PHOTOGRAPHY

Aerial photographs taken in the planning stage indicate patterns of fields or areas of forest in the vicinity. Plans are based on patterns and implemented to blend the airbase into its background.

b. VEGETATION

Screening an object with vegetation reduces the object's apparent size in all three relevant portions of the spectrum, making its detection and recognition more difficult.

1) LARGE SCALE
PATTERNING

Other uses for vegetation include accomplishing large scale patterning of open areas and reducing shadows.

2) CLUTTER IS GOOD

As mentioned earlier, leaves absorb some transmitted RF energy and scatter energy. The radar receiver absorbs less energy. In addition, more clutter is seen by the enemy's radar system. This clutter is caused by an increase in what radar interpreters call the "back scattering coefficient" of the environment. As clutter increases, clear object definition decreases. The effect is a lot of clutter on the screen and no clear definition of any thing particular.

INSTRUCTORS NOTE: Use Attachment 1, in Part IV, to illustrate how plantings should conform to the base surroundings.

c. TREES

If the airbase is located in a region that is heavily or even moderately forested, a huge clear area is a definite cue to the location of the base.

1) EXTEND
WOODLANDS

Use trees to extend local woodlands onto the site. Be sure to choose species that are common to the region. Choose fast-growing species whenever possible. Plan planting areas so they are similar in size and shape to the surrounding forest patterns.

2) AVOID ROWS OF TREES

Trees should not be planted in rows nor should they outline the perimeter of a facility or area. Flight safety restrictions will bar trees from certain areas of the base.

INSTRUCTORS NOTE: Use Attachments 2 and 3, in Part IV, to illustrate how the effects of fields surrounding the installation can be simulated on base by planting large geometric patterns.

3) SIMULATE FARMLAND

If farmland surrounds the airbase, simulate the effect of fields on the base by planting large geometric areas with grasses or ground covers to look like the local surroundings.

4) OPERATIONAL SAFETY AND SECURITY

Plant vegetation and trees in particular, with operational, safety, and security issues in mind.

5) FLIGHT SAFETY AND SECURITY

Flight safety restrictions necessarily limit the types of vegetation planted along and near runways. A concern voiced by security personnel is trees planted along the perimeter of the installation as posing a security risk. Trimming the lower tree branches so none are within six feet of the ground may lessen these concerns.

d. RUNWAYS

Runways are conspicuous because they are long linear features located in large flat open areas. Uses grasses and low shrubs to break up the large open areas of the runway and taxi complex. The primary goal is to make the area less conspicuous by blending it into the local environment.

1) FORM LARGE
GRASSY AREAS

In regions where large grassy areas are common, grass plots of various sizes and orientations can be formed in the runway and taxi area. Use small bushes or short hedges to create plot boundaries.

2) ADJACENT PLOTS

Adjacent grass plots should be cut at different times and in perpendicular directions to emphasize their differences. If possible, adjacent plots should be planted with different grasses.

3) CONSTANT
MAINTENANCE
REQUIRED

Chemical sprays and fertilizers can be used to enhance the patterns. Constant maintenance is needed during the growing season, such as a schedule to coordinate the plot mowing once the plots have been laid out.

e. RUNWAY COMPLEX

If the site is carved out of a forest, the large, treeless runway complex will be particularly apparent. Consider planting ground covers or low shrubbery that adds more texture than grass would add.

1) EVERGREENS

If evergreen trees are common, low evergreen shrubs help the complex blend with the surrounding trees. The large open area will be less apparent.

2) MATCH LOCAL
VEGETATION

To match the surrounding area, plant randomly shaped patches of low bushes and shrubs near the runway. In geographic regions where vegetation is sparse and scrubby, the vegetation should be sparse and scrubby also.

3) HIGHLIGHT VERSUS
CAMOUFLAGE

If chosen to use grass where surrounding vegetation is low brush, highlight rather than camouflage the area. Consider using ground covers, which differ from grass in color, reflectance, and texture. They also require very little maintenance.

f. BUILDINGS AND
STRUCTURES

Trees, bushes, and climbing vines can deny attacking aircrews visual acquisition of structures and disrupt thermal and radar signatures.

1) ONLY SCREEN ONE
OR TWO SIDES OF
BUILDING

Given a structure's size, shape, orientation, and the assumed avenues of attack, screening one or two of its sides may be sufficient. Trees and bushes planted along or near a building can reduce its apparent size, thereby making it more difficult to detect and recognize.

2) VINES

Vines also will disrupt its multi-spectral signature. To break up the regular pattern of a building's shadow, plant vegetation within the shadow, but away from the building.

3) DON'T OUTLINE
BUILDINGS

Consider the geographic location of the building and function. Then use trees to screen large buildings, if possible. A building, regardless of size, should not be outlined by trees. However, a row on one side can significantly alter its visual signature.

4) PREVENT LOW-LEVEL
OBSERVATION

A tree need not be taller than a structure to provide camouflage or screening. A tree must only be tall enough to prevent direct observation from a low angle. In many cases, merely breaking up of a sidewall will work.

5) YEAR-ROUND
SCREENING

Evergreen trees provide very effective year-round screening, but are not common to all climates. A mix of evergreen and deciduous trees is also effective.

6) AVOID REGULAR
PATTERNS

As with pattern painting, similar or adjacent buildings should not receive identical styles of plantings. Incoming enemy aircrews should not be able to perceive any regularity in the use of vegetation. A regular pattern can suggest the presence of poorly camouflaged targets.

7) EXAMPLE OF
REGULARITY

For example, planting a row of evergreen trees on the west side of each munitions bunker could highlight them more than it screens them.

g. ROOFTOPS

Grow grass on the roofs of structures to help to blend them into a surrounding grass background. The grass on the roof will appear very similar in color and brightness to the surrounding grass, although it may have a different thermal signature.

1) FLAT ROOFS

On flat roofs, the grass may be easily planted.

2) SLOPED ROOFS

On roofs with a slight slant, pack planting soil into quilt-type mats to prevent erosion.

h. RECOGNIZABLE
SHAPES

Some facilities and structures on an airbase are so easily identifiable. Here are some tips for these types of structures.

1) HANGARS AND
SHELTERS

The unique, highly recognizable shape of an aircraft shelter makes it an excellent candidate for vegetative screening. Plant trees around the shelter and its hard stand.

2) HARD STANDS AND RAMPS

Position the trees carefully so aircraft exhaust does not damage them.

Another consideration is, how about if the base come under attack. Plant trees far enough away from hard stands and ramps so they cannot fall and block aircraft movement.

3) SHELTERS

Vines can be grown directly on the shelter to provide additional screening. Extend their coverage to surround the shelter and cover open areas of ground. Overlap is important so the vines do not highlight the presence of the shelter.

4) BUNKERS/POL TANKS

Bunkers and POL tanks are other easily recognizable structures. Trees and bushes planted at the base of their steep, noticeable slopes, screen their sides very effectively.

5) BERMS AND SLOPES

If such a structure has been bermed with earth, plant shorter trees and bushes on the slope. By planting like this, we create an almost level canopy of foliage. Plant the vegetation in random clusters and extend it to the surrounding areas.

INSTRUCTORS NOTE: Show Attachment 4, in Part IV, to provide students an example of using concrete blocks with grass used to reduce the contrast between paved surfaces and surrounding grass areas.

i. PARKING AREAS

Concrete blocks with holes through which grass can grow can reduce the visual and thermal signatures of parking areas.

1) CONCRETE
PLANTERS

If planting trees is not feasible in and around the parking area, put them in large concrete planters. Use these planters to outline parking space rows, but scatter them about. Benefits include a camouflaged parking lot, beautification, and shade. If you need to rearrange them, a forklift fits under the base to lift and move them.

2) NOTHING WASTED

If a base under BRAC closes, a donation of trees can be given to the host nation as thanks for allowing residence there.

j. BODIES OF WATER

Vegetation can reduce a very noticeable signature associated with lakes and ponds.

1) SHORELINE PATTERN

Clusters of trees will screen the water from the view of approaching enemy pilots. Plant the trees along the shore facing the assumed direction of approach. Then, scatter a few more trees randomly to break any lakeshore pattern.

2) FLOATING WATER PLANTS

For example, if its assumed the enemy will approach from the east, plant trees on the east shore. Floating water plants are another great measure to reduce the apparent size of the water.

**MAIN POINT 3.
OTHER
CONSIDERATIONS**

When planning forestation and vegetation projects, consider other areas. Let us expand our discussion of shadow disruption, supplementing young vegetation, and telltale earth scarring.

a. SHADOW DISRUPTION

A shadow of a target often reveals its presence to an incoming pilot before he detects the target itself. The visible shadow can also make the target more apparent in the thermal regions by creating a cool side, which contrasts with the warm unshaded side.

1) DISTORT AND MASK SHADOWS

Plants in a structure's shadow can distort and mask the shadow, as well as, visually shield the structure. Disrupting their distinctive shadows can enhance the camouflage of bunkers, POL tanks, and aircraft shelters. As always, use clumps of vegetation rather than planting in rows.

2) MAKE TALL TOWERS LESS CONSPICUOUS

Pilots often notice tall, slender towers after seeing their long, slender shadows on the ground. To make shadows less conspicuous, plant native trees and shrubs radially outward from the base of the tower.

3) DISTORT LONG SHADOWS

Use the vegetation to distort the longest shadows. Disruption can make the tower look shorter and harder to detect or use as a reference point.

b. YOUNG VEGETATION

Trees may not provide enough concealment for several years, but that is not a valid reason not to plant them. They will grow into their role. In the meantime, they provide some immediate screening and do add to the complexity of the background.

1) MAKE TREES APPEAR TALLER

If tall trees are required for a given application, mature trees are not the only answer. Create a tall screen by planting younger, shorter trees in a revetment wall container filled with dirt. You can plant younger trees on small earth berms as well.

2) SUPPLEMENT
IMMATURE
VEGETATION

If necessary, supplement immature vegetation by using large area coverage with camouflage nets. Eventually the area will no longer need the nets.

c. EARTH SCARRING

You cannot plant vegetation of any kind, particularly trees, without some earth scarring. Keep scarring to a minimum especially for large areas of plantings.

1) RESEEDING AND
'HYDROSEEDING'

Re-seed bare earth with grass or the original ground cover, so the area soon will look undisturbed. Some construction companies and highway firms use "hydro-seeding" to cover large ground scars with a green-colored mixture of seed, fertilizer, and mulch.

2) REPLANT SOD

Another cheap and effective option is saving the sod removed from the area and replanting it in bare areas.

**MAIN POINT 4.
CONCLUSIONS FROM
THE EXPERTS**

There are a few conclusions made from past uses of forestation and vegetation. Some from field experts, others from technical resources. Experts, such as botanists and horticulturists strongly recommend increasing vegetation and forestation on the air base to meet CCD objectives.

a. RELATIVELY
INEXPENSIVE

Vegetation is relatively inexpensive. A permanent CCD method contributes to the overall camouflage of an airbase by blending it with the surrounding area.

b. SCREENS, DISRUPTS,
AND CONCEALS

You can also use vegetation to screen structures, and disrupt telltale shadows. Not only does it disrupt and conceal visual signatures, but it is also very effective in reducing radar, laser, and thermal signatures.

c. MATCH LOCAL
VEGETATION

You must use vegetation common to the local region. Consult local nurserymen to aid in choosing appropriate trees, shrubs, and ground covers. Given the permanent Multi-spectral camouflage provided, Some maintenance will be required. However, it is a minor consideration.

CONCLUSION**SUMMARY:**

In this lesson we discussed:

1. Purpose of forestation and vegetation
2. Air base forestation and vegetation
3. Other forestation and vegetation considerations
4. Conclusions of experts

REMOTIVATION:

For a relatively small investment of labor and money, forestation and vegetation projects give you the greatest return in terms of CCD potential. Other benefits include energy dollars saved and an overall increase in quality of life.

CLOSURE:

This concludes this lesson.

TRANSITION:

(Develop locally to transition to the next topic.)

PART III

EVALUATION

STUDENT PERFORMANCE STANDARDS

TEST ITEMS

1. LESSON OBJECTIVE: Know an important application of trees and shrubs in CCD.

QUESTION: (MULTIPLE CHOICE)

Which of the following statements is not true?

- a. The purpose of forestation and vegetation, particularly trees, is to provide one of the most effective Multi-spectral countermeasures available
- b. Multi-spectral countermeasures, by definition, can delay the enemy's target acquisition process in two or more of the parts of the electromagnetic spectrums of visual, infrared (IR), and radar capabilities.
- c. Screening an object with vegetation reduces the size in all portions of the electromagnetic spectrum. This makes detection and recognition more difficult.
- d. Trees, shrubs, and vines do not screen structures from visual sensors.

KEY: d. Trees, shrubs, and vines do not screen structures from visual sensors.

REFERENCE: Main Point 1

2. LESSON OBJECTIVE: Determine forestation and vegetation possibilities for runway and taxiway complexes.

QUESTION: (True or False)

To match the surroundings, plant randomly shaped patches of low bushes or shrubs in the runway and taxiway complex area. The primary goal here is to make the area less conspicuous through blending.

- a. True
- b. False

KEY: a. True

REFERENCE: Main Point 2

3. LESSON OBJECTIVE: Determine forestation and vegetation possibilities for buildings and structures.

QUESTION: Which of the following can help deny enemy aircrews visual acquisition of air base structures, as well as disrupting their thermal and radar signatures?

- a. Vines.
- b. Trees, bushes and shrubs.
- c. Grasses and ground covers.
- d. All of the above.

KEY: d. All of the above.

REFERENCE: Main Point 2.

4. LESSON OBJECTIVE: Identify a forestation and vegetation technique for reducing the signature of a body of water.

QUESTION: (Multiple Choice)

Which of the following actions would effectively reduce the signature of a body of water?

- a. Plant trees along the shore facing the assumed direction of approach.
- b. You can use floating water plants to reduce the apparent size of the water.
- c. Place large stumps in the water along the trailing edge of the enemy's approach direction.
- d. Both answers (a) and (b) are correct.

KEY: d. Both answers (a) and (b) are correct.

REFERENCE: Main Point 2.

5. LESSON OBJECTIVE: Identify shadow disruption techniques using forestation and vegetation.

QUESTION: Which of the following is FALSE?

- a. Use clumps of vegetation rather than rows to break up the outline.
- b. Planting trees and bushes within the shadow of the target can distort and mask the shadow.
- c. Planting trees in a tower's shadow can cause the tower to appear shorter than it actually is.
- d. Vegetation planted in a structure's shadow is unnecessary because the shadow will hide the vegetation.

Key: d. Vegetation planted in a structure's shadow is unnecessary because the shadow will hide the vegetation.

REFERENCE: Main Point 3.

6. LESSON OBJECTIVE: Know the importance of using forestation and vegetation.

QUESTION: (True or False)

Experts, such as botanists and horticulturists strongly recommend increasing vegetation and forestation on the air base to meet CCD objectives.

- a. True
- b. False

Key: a. True

REFERENCE: Main Point 4.

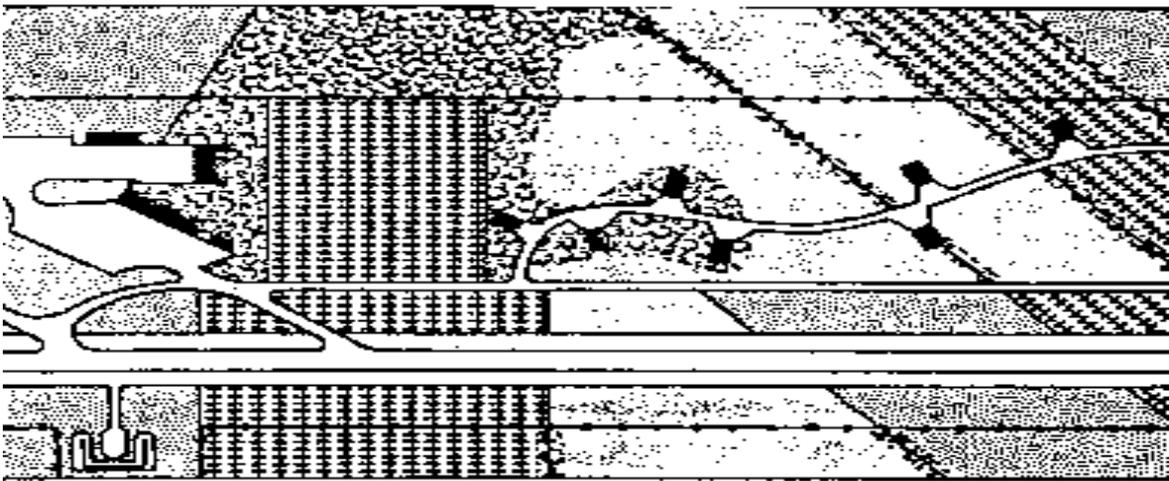
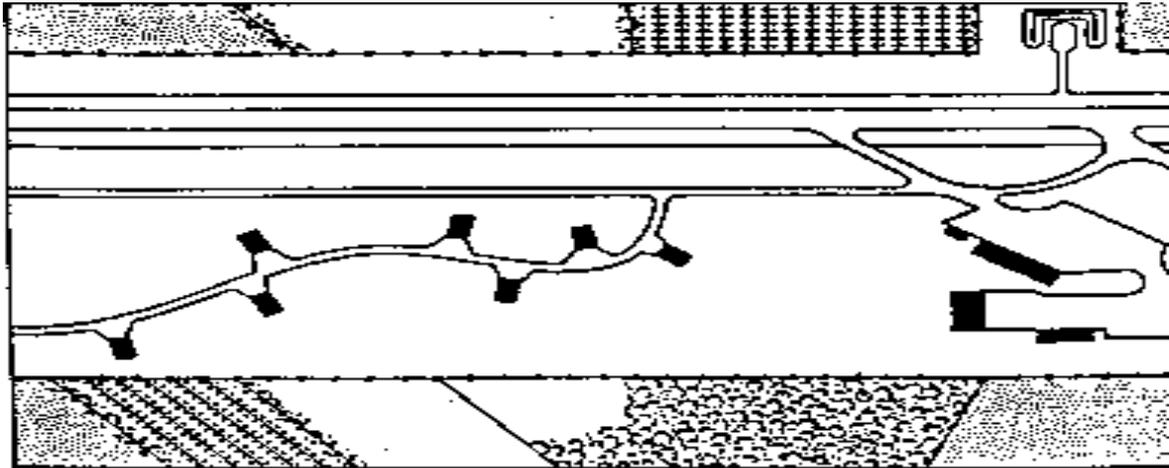
PART IV

RELATED MATERIALS

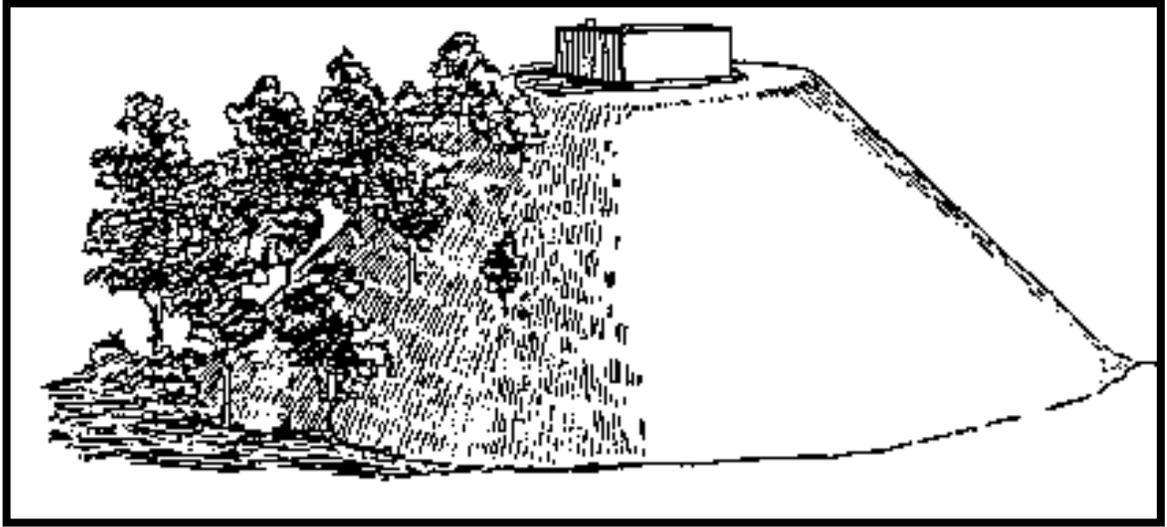
- ATTACHMENT 1:** Use of Tree Patterns for Site Camouflage
- ATTACHMENT 2:** Blending an Airbase into it's Surroundings
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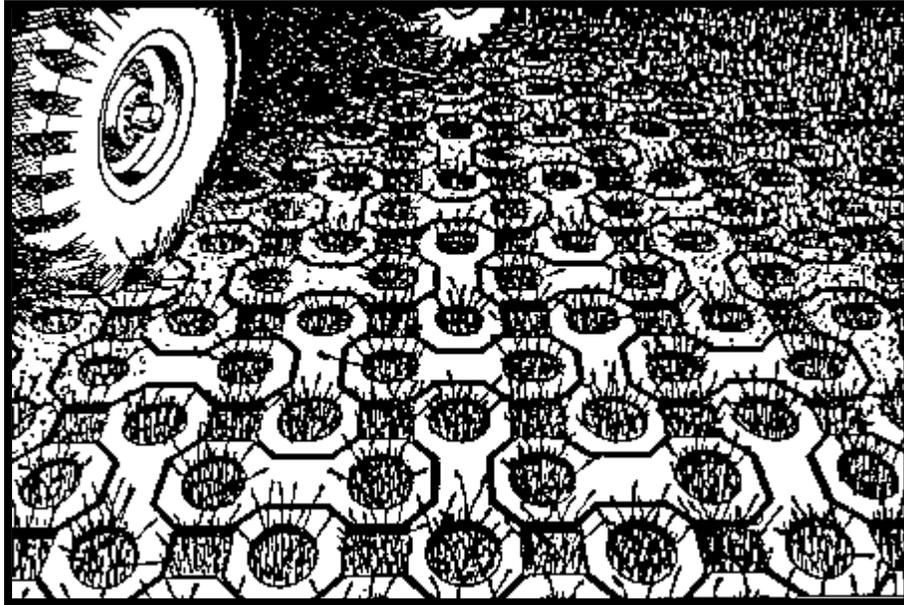
ATTACHMENT 1. USE OF TREE PATTERNS FOR SITE CAMOUFLAGE



ATTACHMENT 2. BLENDING AN AIRBASE INTO IT'S SURROUNDINGS



ATTACHMENT 3. TREES AND SHRUBS USED TO PROVIDE SCREENING AND REDUCE SHADOW PROBLEMS



ATTACHMENT 4. CONCRETE BLOCKS WITH GRASS USED TO REDUCE CONTRAST BETWEEN PAVED SURFACES AND SURROUNDING GRASS AREAS.

TRAINING PACKAGE COMMENT REPORT

RTP # _____

RTP DATE: _____

For an *immediate response* to your questions concerning subject matter in this Readiness Training Package (RTP), contact the Office of Primary Responsibility (OPR) TSgt Ron Childs of the Contingency Training Section at DSN 523-6458 between 0700-1600 (CT), Monday through Friday. Otherwise, write, fax, or E-mail the OPR to make comments, suggestions, or point out technical errors in the areas of: references, body information, performance standards, test questions, and attachments.

NOTE: Do not use the Suggestion Program to submit corrections for printing or typographical errors.

Comments: _____

HQ AFCESA/CEX FAX #: DSN 523-6383

E-mail address: childsr@afcesa.af.mil

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**HQ AFCESA/CEXR
ATTN: TSGT CHILDS
139 BARNES DRIVE SUITE 1
TYNDALL AFB FL 32403-5319**