# AIR FORCE
# QUALIFICATION TRAINING PACKAGE (AFQTP)


**FOR**

## ENGINEERING

## (3E5X1)

## MODULE 20

## AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

# TABLE OF CONTENTS

## MODULE 20

## AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

# TABLE OF CONTENTS (CONTINUED)



Career Field Education and Training Plan (CFETP) references from 1 April 02 version.

OPR: HQ AFCESA/CEOF
(SMSgt Pat Abbott)
Supersedes AFQTP 3E5X1-20, 20 Sep 02

Certified by: HQ AFCESA/CEOF
(CMSgt Myrl F. Kibbe)
Pages: 94/Distribution F

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

# AIR FORCE QUALIFICATION TRAINING PACKAGES

**FOR**

# ENGINEERING
**(3E5X1)**

## INTRODUCTION

***Before starting this AFQTP,*** refer to and read the "AFQTP Trainer/Trainee Guide."

***AFQTPs are mandatory and must be completed*** to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

***AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks***.

## MANDATORY minimum upgrade requirements:

***Core task:***
AFQTP completion
Hands-on certification

***Diamond task:***
AFQTP completion
CerTest completion (80% minimum to pass)

***Note:*** *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location*.

***Put this package to use.*** Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

HQ AFCESA/CEOF
139 Barnes Dr Suite 1
Tyndall AFB FL 32403-5319
DSN: 523-6322, Comm: (850) 283-6322
Fax: DSN 523-6488
E-mail: ceof.helpdesk@tyndall.af.mil

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

# AIRFIELD ASSESSMENT

## MODULE 20 AFQTP UNIT 2

## PERFORM INITIAL AIRFIELD ASSESSMENT (20.2.1.)

## PERFORM INITIAL AIRFIELD ASSESSMENT

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.2.1. - Perform initial airfield assessment. |
| **Training References:** | 1. Air Force Pamphlet (AFPAM) 10-219, Volume 10, *Contingency Training Guide and Task Standard.*<br>2. AFPAM 10-219, Volume 4, Chapter 2, *Damage assessment Procedures.*<br>3. Training Video # 613665, *Damage Assessment Team (DAT) Operations (Sep 99).*<br>4. Training Video # 613862, *DAT Recording and Reporting Procedures (Mar 00).*<br>5. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-1, *Damage Assessment and Explosive Ordnance Reconnaissance*. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219 Volume 10.<br>2.2. AFPAM 10-219, Volume 4, Chapter 2.<br>2.3. CDC 3E551A, Volume 2, Unit 3-1.<br>3. **Complete the following:**<br>3.1. Training Video # 613665.<br>3.2. Training Video # 613862. |
| **Equipment/Tools Required:** | 1. Data recording and reporting equipment; to include forms, clipboards, and writing instruments.<br>2. 1:400 grid map, 1:100 airfield pavement map with runway and station post indicated.<br>3. Radios and spare batteries.<br>4. Binoculars. |
| **Learning Objective:** | Be able to view an existing airfield to determine estimated airfield damage and properly call in damage to MOS team. |
| **Samples of Behavior:** | Locate airfield damage caused by bombs, UXOs, etc. Radio in estimated damage to MOS team. |
| **Note:** | |
| The trainer will need to develop an exercise scenario. | |

# PERFORM INITIAL AIRFIELD ASSESSMENT

**1. Background.**

**1.1.** During contingency situations one of the first considerations at any installation is the airfield status. Whether civil engineers are supporting beddown operations at abandoned airfields or engaged in airfield damage recovery operations, one of the first priorities is an airfield damage assessment. There are two phases of airfield damage assessment: Initial Airfield Assessment and Airfield Damage Assessment.

**1.2.** An initial airfield assessment is performed to give the Minimum Operating Strip (MOS) team a quick look at the damage on the airfield. With this information the MOS team can make decisions on where to send Damage Assessment Teams (DATs). Various personnel, not just DATs, can perform this quick assessment. The Tower, Security Forces, or any other personnel in the area can call in damage to the Survival Recovery Center (SRC).

**2.** Review the training videos # 613665, *DAT Operation*, Sep 99 and # 613862, *DAT Recording and Reporting Procedures*, Mar 00 for detailed instructions on airfield assessment. **Upon completion of the above-mentioned videos, properly perform an initial airfield assessment using the step-by-step procedures listed below.**

**3. Follow these steps to perform an initial airfield assessment:**

**Step 1: Make observations of the airfield using binoculars.**

**Step 2: Collect Data from other sources (i.e. tower personnel).**

**Step 3: Estimate damage on the various airfield surfaces: Runways, Taxiways, and Aprons.**

**Step 4: Radio in an initial assessment of the damage seen on the airfield to the MOS team.**

**NOTE:**
Remember this in an estimate and should quickly be done. This can be done as DAT's vehicles are in route to the airfield.

## REVIEW QUESTIONS
## FOR
## PERFORM INITIAL AIRFIELD ASSESSMENT

| QUESTION | ANSWER |
|---|---|
| 1. Who can perform an initial airfield assessment? | a. Only Security Police.<br>b. Only EOD.<br>c. Only Damage Assessment Team members.<br>d. Any personnel in the area can call in damage to the Survival Recovery Center. |
| 2. What are the three main areas of concern on the airfield? | a. Parking lots, Taxiways, and Tower.<br>b. Runway, Taxiways, and Aprons.<br>c. Tower, Runways, and Parking lots.<br>d. Taxiways, Tower, and Runway. |

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee is in a base recovery environment and has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will be placed at observation post to make visual observations and report the size and location of the damage as quickly and accurately as possible.

## PERFORM INITIAL AIRFIELD ASSESSMENT

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. utilize Grid and / or Airfield pavements maps? | | |
| 2. properly assess damage? | | |
| 3. properly call in damage to MOS team? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# AIRFIELD ASSESSMENT

## MODULE 20 AFQTP UNIT 2

## PERFORM AIRFIELD DAMAGE ASSESSMENT (20.2.2.)

## PERFORM AIRFIELD DAMAGE ASSESSMENT

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.2.2. - Perform airfield damage assessment. |
| **Training References:** | 1. Air Force Pamphlet (AFPAM) 10-219, Volume 10, *Contingency Training Guide and Task Standard.*<br>2. AFPAM 10-219, Volume 4, Chapter 2, *Damage Assessment Procedures.*<br>3. Training Video # 613665, *Damage Assessment Team (DAT) Operations (Sep 99).*<br>4. Training Video # 613862, *DAT Recording and Reporting Procedures (Mar 2000).*<br>5. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-1, *Damage Assessment and Explosive Ordnance Reconnaissance.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 10.<br>2.2. AFPAM 10-219, Volume 4, Chapter 2.<br>2.3. CDC 3E551A, Volume 2, Unit 3-1.<br>3. **Complete the following:**<br>3.1. Training Video # 613665.<br>3.2. Training Video # 613862. |
| **Equipment/Tools Required:** | 1. Data recording and reporting equipment; to include forms, clipboards, and writing instruments.<br>2. 1:400 grid map and 1:100 airfield pavement map with runway and station post indicated.<br>3. Radios and spare batteries.<br>4. Binoculars. |
| **Learning Objective:** | Be able to assess an existing runway surface to determine the amount, type, and accurate location of airfield damage. |
| **Samples of Behavior:** | Accurately locate airfield damage caused by bombs, UXOs, etc. Include data information regarding type, location, and number. |
| **Note:** | |
| The trainer will need to develop an exercise scenario. | |

## PERFORM AIRFIELD DAMAGE ASSESSMENT

**1. Background.**

**1.1.** The second phase of assessment is Airfield Damage Assessment. The methods of assessment and speed will depend on mission requirements. However the overall concepts of damage assessment are the same no matter what the mission. The focus of this AFQTP is where speed is essential for the Damage Assessment Teams (DATs).

**1.2.** DATs become the eyes of recovery operations and are responsible for assessing the condition of the airfield pavement surface along with locating unexploded explosive ordnances (UXOs). For this reason the, DATs are made up of engineers, Explosive Ordnance Disposal (EOD) technicians, and augmentees. Airfield repair operations cannot begin until the damage assessment and Minimum Operating Strip (MOS) selection have been completed, so remember speed is crucial.

**2.** Review the training videos # 613665, *DAT Operations*, Sep 99 and # 613862, *DAT Recording and Reporting Procedures* for detailed instructions on airfield assessment. **Upon completion of the above-mentioned videos, properly perform an airfield damage assessment using the step-by-step procedures listed below.**

**3. Follow these steps to perform airfield damage assessment:**

**Step 1: Identify Damage Assessment Team (DAT) Composition.** Team members should be identified long before the need for damage assessment occurs. It is important all team members fully understand each other's role during damage assessment operations.

**1.1. One Engineer (3E5X1).** Duties:

**1.1.1.** Determines route to be evaluated.

**1.1.2.** Determines airfield pavement damage/UXO location.

**1.1.3.** Assists EOD with explosive safety procedures, and setup of explosive actuated tools.

**1.2. Two EOD Technicians (3E8X1).** Duties:

**1.2.1.** Identifies and classifies UXOs.

**1.2.2.** Performs immediate action procedures on required UXOs.

**1.2.3.** Responsible for team movement where UXOs exist.

**1.2.4.** Trains team on proper explosive safety procedures, setup of explosive actuated tools.

**1.3. One or more Augmentees.** Assists with damage recording, driving, and radio communications.

**NOTE:**

If possible replace the augmentee position with another 3E5X1. Additionally with the limited availability of augmentees this position may have to be left vacant.

**Step 2: Determine Team Working Procedures.** If the DAT is going to complete its assessment in a timely manner, it's vital that good working procedures amongst the team are established and practiced. The 3E8X1s and the 3E5X1s will have to work together to ensure all requirements are met in the shortest time possible. The 3E8X1 will determine the safe route of travel while assessing the airfield surfaces.

**2.1.** The 3E8X1 determines the route of travel on the airfield when UXOs are present.

**2.2.** Determine communication procedures.

**2.3.** Establish between the 3E8X1s and the 3E5X1s who has priority at each point of the assessment.

**Step 3: Establish Preplanned Travel Routes.** Predetermined routes are developed based on prioritization of mission essential areas; ensuring all critical locations are assessed. Additionally preplanned routes eliminate the duplication of efforts. Being thoroughly familiar with the assigned travel routes and check points will prevent delays in the assessment process. Travel routes based on prioritized areas:

**3.1.** Take-off / Landing surfaces (Runways, Taxiways, Alternate Launch/Recovery Surfaces) are priority one.

**3.2.** Access pavements.

**3.3.** Aircraft maintenance, arm/de-arm, and refueling areas.

**3.4.** Aircraft arresting systems.

**3.5.** Navigational Aids (NAVAIDS).

**3.6.** Aircraft parking and shelter areas.

**3.7.** Other areas specified by Survival Recovery Center (SRC).

**Step 4: Setup Communication Procedures Between Team Members and Control Centers.** Good communication is essential in damage reporting and ultimately expedites airfield repair operations. Without proper communication, vital information might be lost causing delays in airfield damage recovery operations. Communication procedures must be established between the team and the SRC.

**4.1.** Ideal situation is for two radio frequencies:

**4.1.1.** Civil Engineer (CE) radio frequency (use EOD net as alternative).

**4.1.2.** EOD frequency.

**4.2.** Establish Communication priorities, what teams, and information have priority.

**4.3.** Execute clear and concise transmissions.

**4.4.** Communication-out/radio silence procedures.

**4.4.1.** Establish procedures with control centers.

**4.4.2.** Establish alternative methods that are dependable and flexible.

**4.5.** Perform periodic radio checks, detects problems with radios.

**4.6.** Report items one at a time and wait for acknowledgement of message received.

**4.7.** Call in periodic route checkpoints, this informs the SRC of your location.

**4.8.** Identify and annotate radio “dead-zones”. These are areas that radio transmissions cannot be transmitted or received.

**Step 5: Establish Pavement Reference Marking System (PRMS).** During airfield recovery operations the DAT has to be able to accurately locate damage in an expeditious manner. A PRMS is a visual reference system eliminating the need for time consuming measurements. Ultimately the PRMS increases speed and accuracy.

**5.1.** PRMS enables DAT’s to accurately locate damage/UXO’s and allows successful communication of information during airfield recovery operations.

**5.1.1.** PRMS is installed during the pre-attack preparation on all pavement surfaces serving as Take-off and Launch (TOL) surfaces and access routes in the control center checklist such as:

**5.1.1.1.** Primary Operating Surfaces.

**5.1.1.2.** Alternate Launch and Recovery Surfaces (ALARS).

**5.1.1.3.** Other surfaces capable of supporting mission aircraft (parallel taxiways, adjacent roadways, etc.).

**5.1.2.** Expedient method, using visual reference, eliminates need for time consuming measurements.

**5.1.3.** Uses combination of raised and flush markers for redundancy to enhance survivability

**5.2. PRMS Installation.**

**5.2.1.** Establish the **zero point** for the PRMS.

**5.2.1.1.** Typically placed at the threshold.

**5.2.1.2.** Once established it remains fixed (reference in one direction only).

**5.2.2.** Install **raised** (carsonite) markers.

**5.2.2.1.** Place at 50' or 100' intervals, from zero point, along length of the runway.

**5.2.2.2.** Position 25' to 50' from the pavement edges.

**Figure 1. Raised Marker**


**5.2.3.** Place **flush** station markers.

**5.2.3.1.** Mark at **50'** or **100'** intervals, from zero point.

**5.2.3.2.** Mark on centerline, pavement edges and if possible halfway between centerline and edges.

**Figure 2. Flush Marker**

**Step 6: Initial Reconnaissance as covered in 2.1 .** Provides a quick snap shot of the current situation and status of the airfield. The SRC can reprioritize the DAT routes based on initial assessment. For example, the tower reports no damage on the secondary airstrip and multiple damage on the primary strip. The priority would be to a detailed assessment on the secondary strip first to ensure it was clear because this surface could be ready to launch and recover aircraft the quickest.

**Step 7: Detailed Damage Assessment / Locating Damage/UXOs.** A detailed damage assessment is performed to accurately locate all airfield damage. This information is vital to the control center's decision-making process on the ability to launch and recover aircraft. A balance between speed and accuracy is essential. During airfield damage recovery operations the actual repair process cannot begin until the DAT has completed its assessment, so speed is crucial. However the assessment has little value if it is not accurate. The DAT must be able to locate damage on the runway within plus or minus one meter as required by the NATO Standardized Agreement 2929. Practicing and following standard procedures can easily achieve accuracy and speed. They are three basic rules that must be followed when locating damage. When encountering UXO's EOD personnel will provide the type and description of the items.

**7.1. Zero Point Rule**. **Once** established, it's **fixed!** Only reference from one direction.

**7.2. Centerline Rule**. All distances are measured along the existing runway centerline, from zero point, to center of damage/UXOs.

**7.3. Right/Left Rule**. All damage/UXOs are located left or right of existing runway centerline to the center of damage/UXOs.

**NOTE:**
All measurements use English units **(feet).**

**7.4.** Coordinate Systems (Single Point, Double Point, Crash Grid).

**7.4.1. Single point coordinates** are used to locate single items or small groups.

**7.4.1.1.** Examples of single point coordinates damage/UXO:

| | | |
|---|---|---|
| Crater | (C) | **C 1240 R45 D30** |
| Spall | (S) | **S 2700 L15 D50 N30** |
| UXO | (X) | **X 4360 R 0 (FAB 250)** |
| Bomblet | (B) | **B 6730 L33 D80 N15** |
| Camouflet | (C) | **C 8055 R75 D25 (Camouflet)** |
| Hole of Entry (HOE) | (X) | **X 9610 R90 D2** |

**7.4.1.2.** Using the Single Point Coordinate System. (Figure 3)

**7.4.1.2.1.** Determine and record type of damage.

**7.4.1.2.2.** Estimate and record distance down pavement, from zero point (Centerline Rule).

**7.4.1.2.3.** Determine direction and distance from existing center (Right/Left Rule).

**7.4.1.2.3.1.** Record **L** or **R**.

**7.4.1.2.3.2.** Record distance.

**7.4.1.2.4.** Estimate apparent diameter of crater/field/HOE.

**7.4.1.2.4.1.** Record **D.**

**7.4.1.2.4.2.** Record measurement.

**7.4.1.2.5.** Count/estimate number of spalls/bomblets.

**7.4.1.2.5.1.** Record **N.**

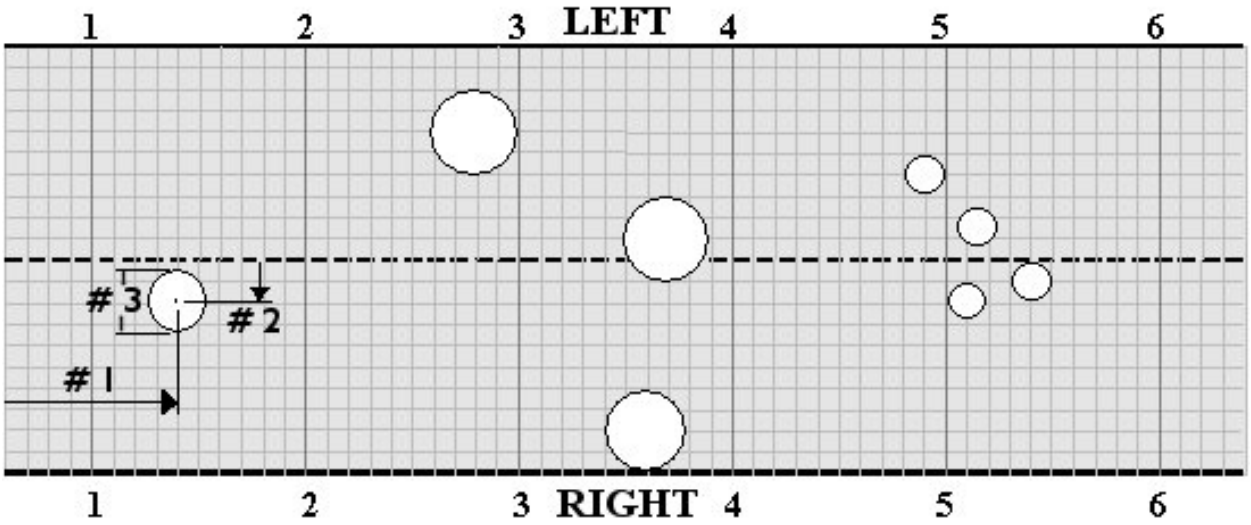
**7.4.1.2.5.2.** Record number of spalls/bomblets.

**7.4.1.2.6.** Write description of item, if necessary.

**7.4.1.2.6.1.** UXO info (Color code, nose fuse, tail fuse, shape, size, etc.).

**7.4.1.2.6.2.** Utility damage, camouflet, water in crater, damage to NAVAIDS, etc.

**Figure 3. Single Point Example Coordinates C 140 R20 D30**




**Step 1.** Determine the distance of crater from the zero point. (140 feet)

**Step 2.** Determine distance left or right of existing runway centerline. (20 feet, right)

**Step 3.** Determine the apparent diameter of the crater. (30 feet in diameter).

**Step 4.** Enter data in your log, and report damage to the control center.

**7.4.2.** **<u>Double point coordinates</u>** identifies the outer boundaries of large areas of damage or large UXOs fields. (Used *primarily* for *bomblet/spall* fields.)

**7.4.2.1.** Examples of double point coordinate type of damage:

| | | |
|---|---|---|
| Bomblet | (B) | **B330 L33 W0 F1200 R40 W100 N60 (PFM1)** |
| Spall | (S) | **S6820 R40 W10 F5980 L50 W120 N100** |

**NOTE:**
In cases of extreme damage, double point coordinates could be used for craters.

**7.4.2.2.** Using the Double Point Coordinate System. (Figure 4)

**7.4.2.2.1.** Determine and record type of damage.

**7.4.2.2.2.** Estimate and record distance down pavement, from zero point, to center of field's leading edge (Centerline Rule*)*.

**7.4.2.2.3.** Determine direction and estimate distance to center of field's leading edge, from existing centerline (Right/Left Rule).

**7.4.2.2.3.1.** Record **L** or **R.**

**7.4.2.2.3.2.** Record distance.

**7.4.2.2.4.** Estimate width of field's leading edge.

**7.4.2.2.4.1.** Record **W.**

**7.4.2.2.4.2.** Record width.

**7.4.2.2.5.** Field identifier (F).

**7.4.2.2.5.1.** Record **F.**

**7.4.2.2.5.2.** Signifies that additional coordinates are following.

**7.4.2.2.6.** Estimate and record distance down pavement, from zero point, to center of field's trailing edge (Centerline Rule*).*

**7.4.2.2.6.1.** Record **L** or **R.**

**7.4.2.2.6.2.** Record distance.

**7.4.2.2.7.** Estimate width of field's trailing edge.

**7.4.2.2.7.1.** Record **W.**

**7.4.2.2.7.2.** Record width.

**7.4.2.2.8.** Count number of spalls/bomblets.

**7.4.2.2.8.1.** Record **N.**

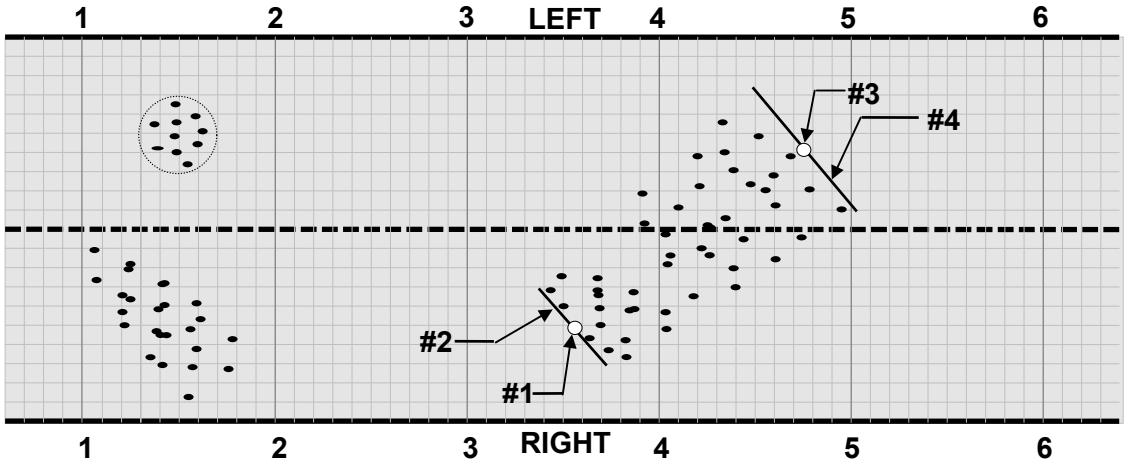
**7.4.2.2.8.2.** Record number of spalls/bomblets.

**7.4.2.2.9.** Write description of item, if necessary.

**7.4.2.2.9.1.** Utility damage, camouflet, water in crater, damage to NAVAIDS, etc.

**7.4.2.2.9.2.** UXO information (color code, nose fuse, tail fuse, shape, size, etc).

**Figure 4. Double Point Coordinates S355 R50 W50 F475 L40 W75 N45**




**Step 1.** Locate distance of center point of the leading edge of the field from zero point. (355 feet approximately)

**Step 2.** Determine the distance left or right from existing runway centerline of center of leading edge of the field. (50 feet, right)

**Step 3.** Determine the approximate width of the leading edge of field. (50 feet)

**Step 4.** Locate distance of center point of the trailing edge of the field from zero point (475 feet, approximately.)

**Step 5.** Determine the distance left or right from existing runway centerline of center of trailing edge of the field. (40 feet, left)

**Step 6.** Determine the approximate width of the trailing edge the field. (75 feet)

**Step 7.** Determine the approximate number of spalls in the field. (45 spalls)

**Step 8.** Enter data into your log, and report damage to the control center.

**7.4.3. Crash Grid Coordinate System** is used to locate damage/UXOs in areas not supported by PRMS and precise location is not as critical. Also, can be used for TOL surfaces where PRMS is not installed. The grid coordinate system is based on the Base Comprehensive Plan (BCP), Tab O-3, Crash Grid Map.

**7.4.3.1.** Always read grids *right* and *up.*

**7.4.3.2.** Numbers increase from *left* to *right.*

**7.4.3.3.** Letters flow in alphabetical order from *bottom* to *top.*

**7.4.3.4.** Each grid encompasses 1000' x 1000' area.

**7.4.3.5.** Subdivisions can be simplified to smaller grids of 100' x 100' using a grid overlay.

**7.4.3.6. Using the Grid Coordinate System.**

**7.4.3.6.1.** Locate point on grid map.

**7.4.3.6.2.** Read numbers *righ*t to grid containing the damage/UXO (1, 2, 3, etc).

**7.4.3.6.3.** Reference lower left hand corner of grid location.

**7.4.3.6.4.** Overlay or measure, using scale, grid (.1, .2, ….,.9).

**7.4.3.6.5.** Record grid coordinate.

**7.4.3.7.** Read letters *up* to grid containing the damage (A, B, C, etc).

**7.4.3.7.1.** Reference lower left hand corner of grid location.

**7.4.3.7.2.** Overlay or measure *up*, using scale.

**7.4.3.7.3.** Record grid coordinate, (.1, .2, ….,.9).

**7.4.3.8.** Write description of item, if necessary. Include following notable information:

**7.4.3.8.1.** Utility damage, camouflet, water in crater, damage to NAVAIDS, etc.

**7.4.3.8.2.** UXO information (color code, nose fuse, tail fuse, shape, size, etc.)

**7.4.3.8.3.** Determine if aircraft can taxi past damage to access/egress.

**Step 8: Ensure Damage Assessment is relayed to the Control Centers.** The DAT should be relaying damage information to the SRC during the assessment process. Immediately upon completion of the damage assessment route the team should bring a hard copy of the damage found to the SRC ensuring all inputs were properly transmitted.

## REVIEW QUESTIONS
## FOR
## PERFORM AIRFIELD DAMAGE ASSESSMENT

| QUESTIONS | ANSWERS |
|---|---|
| 1. What is the Airfield Damage Assessment Team (DAT) composition? | a. 3 - EOD technicians, 2-3E5X1s, 1 or more-Augmentee(s).<br>b. 2 - EOD technicians, 1-3E5X1s, 1 or more-augmentee(s).<br>c. 1 - EOD technicians, 1-3E5X1s, 2-augmentee.<br>d. 1 - Site Developer. |
| 2. When expressing crater location what measurement is used? | a. The leading edge of the crater.<br>b. The trailing edge of the crater.<br>c. The center of the crater.<br>d. The left edge of the crater. |
| 3. What does the letter “S” identify when locating airfield damage? | a. Suppression in the airfield surface.<br>b. Spall.<br>c. Site Developer.<br>d. Second input. |
| 4. How are grid coordinates read? | a. Left and down.<br>b. Right and up.<br>c. Right and down.<br>d. Left and up. |
| 5. How are large bomblet fields located? | a. Very carefully.<br>b. Using the double point coordinate system.<br>c. Using Initial reconnaissance.<br>d. Using the single point system. |

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee is in a base recovery environment and has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee is on a airfield damage team and report damage/bomb to the control center.

## PERFORM AIRFIELD DAMAGE ASSESSMENT

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. identify all airfield damage and UXOs? | | |
| 2. accurately locate:<br>2.1. craters?<br>2.2. spall fields?<br>2.3. bomblet fields?<br>2.4. UXOs? | | |
| 3. properly format the coordinates of:<br>3.1. craters?<br>3.2. spall fields?<br>3.3. bomblet fields.<br>3.4. UXOs? | | |
| 4. properly identify damage using grid coordinates? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

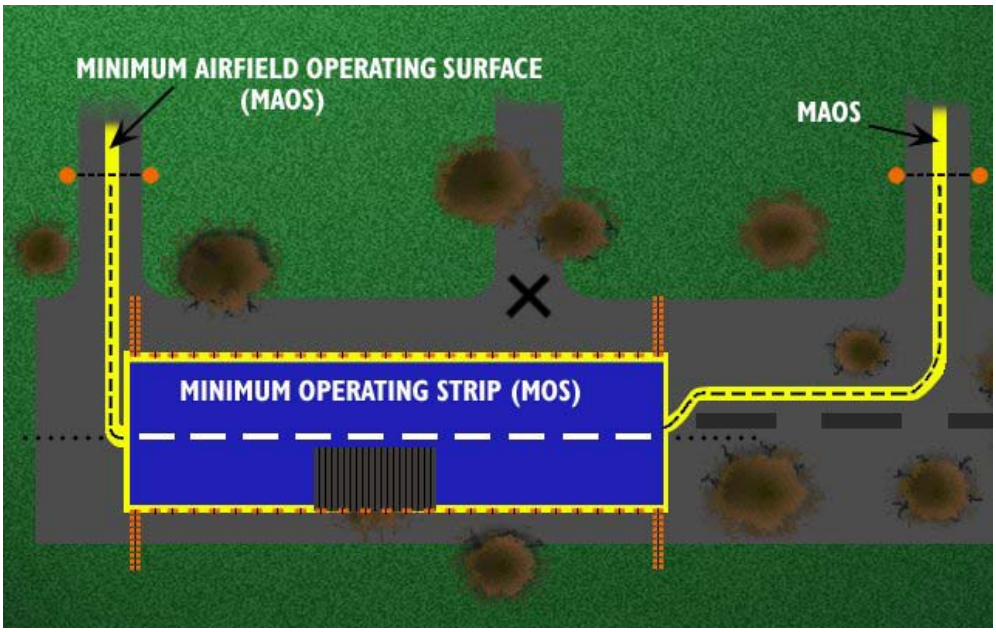
# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 3

## PERFORM EXPLOSIVE ORDNANCE RECONNAISSANCE (EOR) (20.3.)

**PORTIONS OF THIS TASK ARE COVERED IN TASK 20.2.2. ALSO, EOR IS A PART OF PRIME BEEF HOME STATION TRAINING CATEGORY I AND II TRAINING REQUIREMENTS IN ACCORDANCE WITH AIR FORCE INSTRUCTION 10-219, PRIME BASE ENGINEER EMERGENCY FORCE (BEEF) PROGRAM.**

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.




# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 6

## PERFORM MINIMUM OPERATING STRIP (MOS) SELECTION PROCEDURES AND CONSIDERATIONS (20.6.)

## PERFORM MOS SELECTION PROCEDURES AND CONSIDERATIONS

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.6. - Perform MOS selection procedures and considerations. |
| **Training References:** | 1. CD-ROM Air Force Qualification Training Package (AFQTP) *Minimum Operating Strip Selection,* Version 1.0, May 98.<br>2. Technical Order (TO) 35E2-6-1, *Minimum Airfield Operating Surface Marking System.*<br>3. Air Force Instruction (AFI) 32-1042, *Standards for Marking Airfields.*<br>4. Air Force Pamphlet (AFPAM) 10-219, Volume 4, *Rapid Runway Repair Operation*, Chapter 3, *MOS Selection Procedures.*<br>5. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-2: *MOS Selection.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E551 AFSC**.<br>2. **Review the following references:**<br>2.1. TO 35E2-6-1.<br>2.2. AFI 32-1042.<br>2.3. AFPAM 10-219, Chapter 3.<br>3. **Complete the following:**<br>3.1. CDC 3E551A, Volume 2, Unit 3-2.<br>3.2. CD-ROM AFQTP *Minimum Operating Strip Selection*, Version 1.0, May 98. |
| **Equipment/Tools Required:** | 1. 1:1200 (1":100') airfield pavement map with pavement reference markings indicated.<br>2. Engineering scales.<br>3. Runway templates.<br>4. Writing implements, radios, and spare batteries. |
| **Learning Objective:** | Given a contingency scenario select three MOS selections. |
| **Samples of Behavior:** | Plot airfield damage and make appropriate MOS selections based on mission criteria given in contingency scenario. |
| **Note:** | |
| Trainer needs to provide a contingency scenario. | |

## PERFORM MOS SELECTION PROCEDURES AND CONSIDERATIONS

**1. Background.** During airfield damage recovery operations it is imperative an accurate reflection of the airfield status is provided; indicating the current situation. This information must be depicted in the SRC as soon as possible. The Damage Assessment Teams (DATs) inputs are used to produce an accurate map indicating exact locations of damage and UXOs. This crucial map gives the decision-makers a tool to evaluate airfield operational status and choose a Minimum Operating Strip (MOS) if the need arises. In addition to MOS selection this map is used to plan haul routes, estimate repair times, and avoid dangerous UXO locations. Speed is essential during the plotting phase; however, accuracy cannot be sacrificed.

**2.** Complete the CD-ROM AFQTP *Minimum Operating Strip Selection*, Version 1.0, May 98, for detailed instructions on selection procedures and considerations for minimum operating strip. **Upon completion of the above-mentioned CD-ROM AFQTP, properly perform MOS selection procedures and considerations using the step-by-step procedures listed below.**

> **NOTE:**
> The review questions for this material are in the above-mentioned CD-ROM.

**3. Follow these steps to perform MOS selection procedures and considerations:**

**Step 1: MOS selection is accomplished in four phases:**

**1.1.** Alert status preparation--gathering the team equipment and basic information for use during MOS selection.

**1.2.** Plotting the damage and searching for candidate MOSs and access/egress routes.

**1.3.** Evaluating candidate MOSs.

**1.4.** Recommending a MOS to the commander.

**Step 2: Refer to AFPAM 10-219, Volume 4, Chapter 3, paragraph 3-9 for the procedures and considerations you must use in selecting a MOS.**

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee is in a base recovery environment and has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee needs to select a MOS based on data from the field and provide his/her recommendations to the Wing Commander.

## PERFORM MOS SELECTION PROCEDURES AND CONSIDERATIONS

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. assemble background information needed for MOS selection? | | |
| 2. determine required length for MOS? | | |
| 3. acknowledge the Wing Commander has the responsibility for selecting the final MOS dimensions? | | |
| 4. make selection considerations on location of runway damage, UXO's, aircraft operational limitations, and available resources? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 7

## PLOT AIRFIELD DAMAGE (20.7.)

## PLOT AIRFIELD DAMAGE

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.7. - Plot airfield damage. |
| **Training References:** | 1. Air Force Pamphlet (AFPAM) 10-219, Volume 10, *Contingency Training Guide and Task Standard*.<br>2. AFPAM 10-219, Volume 4, *Rapid Runway Repair Operation*, Chapter 3, *MOS Selection Procedures*.<br>3. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-1, *Damage Assessment and Explosive Ordnance Reconnaissance.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 10.<br>2.2. AFPAM 10-219, Volume 4, Chapter 3.<br>3. **Complete CDC 3E551A, Volume 2, Unit 3, Section 3-1.** |
| **Equipment/Tools Required:** | 1. Airfield pavement map (1:1200 (1": 100')) with pavement reference makings indicated.<br>2. Scales.<br>3. Runway templates.<br>4. Writing implements.<br>5. Radios. |
| **Learning Objective:** | Given a training scenario be able to accurately plot airfield damage and UXOs. |
| **Samples of Behavior:** | Plot airfield damage and UXOs. |
| **Note:** | |
| The trainer will need to develop an exercise scenario. | |

# PLOT AIRFIELD DAMAGE

**1. Background.** During airfield damage recovery operations it is imperative an accurate reflection of the airfield status be provided; indicating the current situation. This information must be depicted in the SRC as soon as possible. The Damage Assessment Team (DAT) inputs are used to produce an accurate map indicating exact locations of damage and UXOs. This crucial map gives the decision-makers a tool to evaluate airfield operational status and choose a Minimum Operating Strip (MOS) if the need arises. Accurate plotting is the first stage in locating a MOS in airfield recovery operations. In addition to MOS selection, the airfield damage map is used to plan haul routes, estimate repair time, and avoid dangerous UXO locations. Speed is essential during the plotting phase; however, accuracy cannot be sacrificed.

**1.1.** When plotting, it is vital the plotter fully understand the coordinate systems. Concerning the single point coordinate system, the first portion of the coordinate is the type of damage, followed by the distance down the runway from the zero point. After the distance down the runway, either a right (R) or left (L) distance from the existing centerline is provided. The last part of the coordinate is the diameter (D). The plotted diameter is twice the assessed size. The doubling of the crater diameter equals the approximate repair size. To prevent any confusion when plotting crater sizes be sure to label your templates with the correct diameter (doubled) in advance. The double point system is a bit more complicated but can be mastered with practice. Again the first part of the coordinate is the type of damage followed by the distance down the runway from the zero point. After the distance down the runway a right (R) or left (L) distance from the existing centerline is provided. This right (R) or left (L) distance from the existing centerline is measured to the center of the field's leading edge. Next there will be a width of the leading edge of the field followed by a field identifier (F) indicating a double point coordinate. After the field identifier will be the distance from the zero point to the trailing edge of the field; either a right (R) or left (L) distance from the existing centerline; width of the trailing edge. The last part of the double coordinate will be a number (N) of items in the field.

**1.2.** Symbols used in plotting the type of damage to an airfield:

| | | |
|---|---|---|
| Crater | = (C) | **C 1240 R 45 D 30** |
| Spall | = (S) | **S 2700 L 15 D 50 N 30** |
| UXO | = (X) | **X 4360 R 0 (FAB 250)** |
| Bomblet | = (B) | **B 6730 L 33 D 80 N 15** |
| Hole of Entry | = (X) | **X 9610 R 90 D 2 (Hole of Entry)** |

**2. Follow these steps to plot airfield damage:**

**Step 1: Initial preparation**. Gather materials:

**1.1.** 1:1200 (1"=100') airfield map with pavement reference markings indicated.

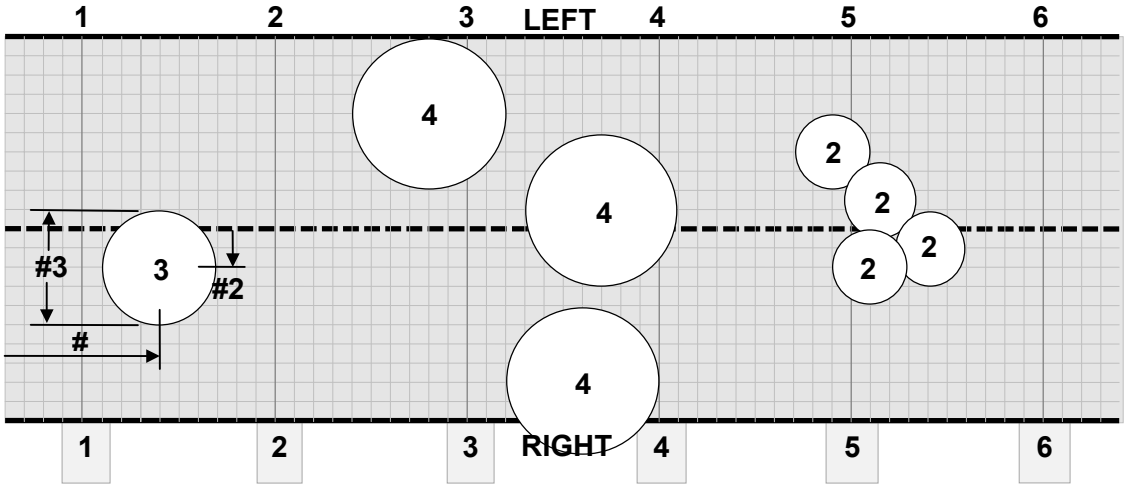
**1.2.** Engineer scale.

**1.3.** Circle templates. Double the crater diameters (22' crater is plotted at 44' — repair size using the .44 circle).

**Step 2: Receive inputs from airfield damage assessment team (DAT).** Plot the airfield damage as inputs are received from the DAT. This increases the speed of the airfield recovery process.

**Step 3: Plot airfield damage.**

**3.1.** DAT Single Point Coordinate Input – C140 R20 D30.



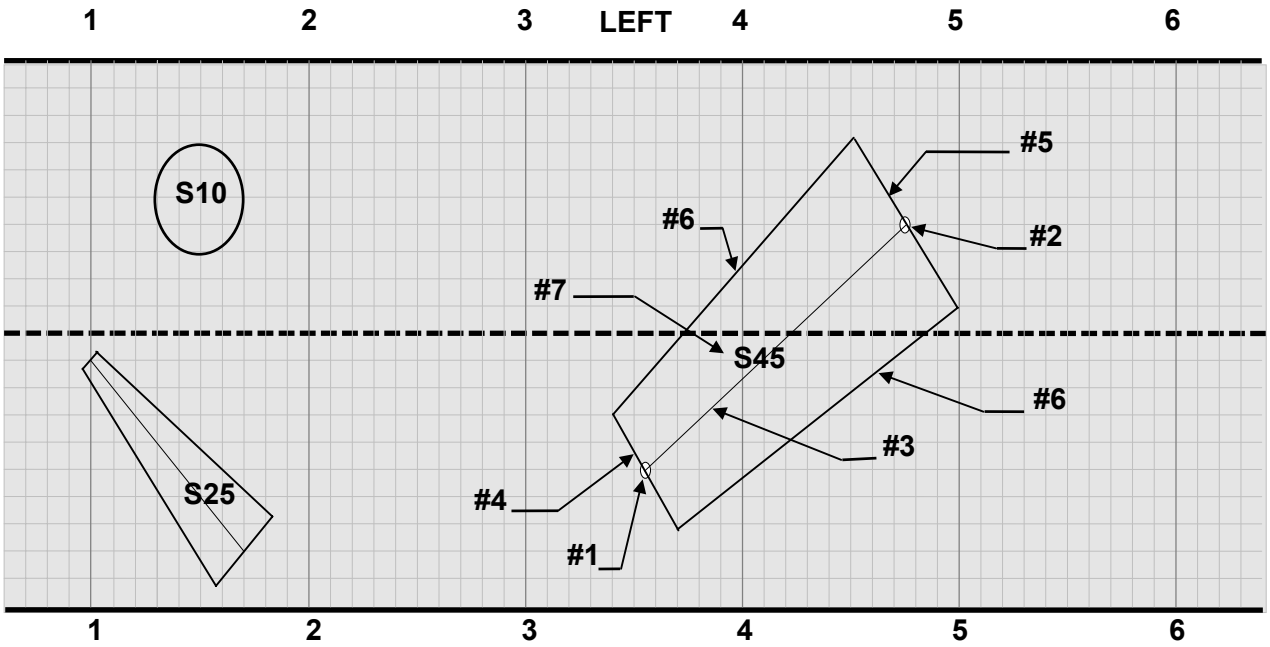

**3.1.1.** Locate the distance from the zero point. (140 feet)

**3.1.2.** Locate the distance left or right of the existing runway centerline; this becomes the center of the plotted crater. (20 feet, right)

**3.1.3.** Determine the repair diameter of the crater, and plot the crater. *Double the apparent diameter*. (60 feet in diameter)

**3.1.4.** Label the crater with the apparent diameter digit. (3 represents 30 feet.), UXOs are labeled with an "X".

**3.2.** DAT Double Point Coordinate Input – S355 R50 W50 F475 L40 W75 N45.




**3.2.1.** Locate center point of the field's leading edge from the zero point and the distance left or right of the existing runway centerline. (355 feet down, 50 feet right)

**3.2.2.** Locate center point of the field's trailing edge from the zero point and the distance left or right of the existing runway centerline. (475 feet down, 40 feet left)

**3.2.3.** Connect the leading edge and trailing edge center points.

**3.2.4.** Draw the leading edge width perpendicular to the line drawn in 3.2.3.

**3.2.5.** Draw the trailing edge width perpendicular to the line drawn in 3.2.3.

**3.2.6.** Connect the end points of the lines drawn in 3.2.4. and 3.2.5.

**3.2.7.** Label the field either "S" or "B" designating it as a spall or bomblet field and add the number of spalls or bomblets.

**Step 4: Verify plot against the DAT information.**

**4.1.** Once all the airfield damage is plotted, the information should be verified against the hard copies of the DAT reports as soon as possible.

**4.2.** Remember, **NEVER** compromise accuracy for speed.

## REVIEW QUESTIONS
## FOR
## PLOT AIRFIELD DAMAGE

| QUESTION | ANSWER |
|---|---|
| 1. How are crater sizes plotted? | a. To the apparent diameter.<br>b. Half of the apparent diameter.<br>c. Double the apparent diameter.<br>d. Double the apparent radius. |
| 2. When plotting the coordinate X450 R60, what does the number 450 indicate? | a. Distance down the runway from the threshold.<br>b. Distance from the departure end<br>c. Distance left or right from the centerline.<br>d. Distance from the zero point reference. |
| 3. When plotting the coordinate S 850 R35 W50 F1900 L15 W75 N250, what does N250 indicate? | a. Damage input number 250.<br>b. 250 spalls.<br>c. Runway designation.<br>d. 250 bomblets. |

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee is in a base recovery environment and has access to the items listed in the Equipment/Tools Required block. Build an exercise scenario where the trainee will be plotting airfield damages receiving from the DAT.

## PLOT AIRFIELD DAMAGE

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. understand the circle template scale? | | |
| 2. accurately plot the damage on the airfield map for:<br>2.1. craters?<br>2.2. bomblet fields?<br>2.3. spall fields?<br>2.4. UXOs? | | |
| 3. properly identify the damage on the map for:<br>3.1. craters?<br>3.2. bomblet fields?<br>3.3. spall fields?<br>3.4. UXOs? | | |
| 4. draw the damage to the proper scale? | | |
| 5. double all craters from their apparent size? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 8

## PERFORM CRATER PROFILE MEASUREMENT (CPM) OPERATIONS (20.8.)

## PERFORM CRATER PROFILE MEASUREMENT (CPM) OPERATIONS

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.8. - Perform CPM operations. |
| **Training References:** | 1. Air Force Pamphlet (AFPAM) 10-219, Volume 4, *Rapid Runway Repair Operation*, Chapter 4, *Repair Quality Criteria.*<br>2. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 5-2, *Crater Profile Measurement.*<br>3. CD-ROM Air Force Qualification Training Package (AFQTP) *Crater Profile Measurement*, Version 1.0, May 98.<br>4. Technical Order (TO) 35E2-5-1, *Crushed-Stone Crater Repair and Line-Of-Sight Profile Measurement for Rapid Runway Repair.*<br>5. Local procedures. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 4, Chapter 4.<br>2.2. TO 35E2-5-1.<br>2.3. Local procedures.<br>3. **Complete the following:**<br>3.1. CDC 3E551A, Volume 2, Unit 5-2.<br>3.2. CD-ROM AFQTP *Crater Profile Measurement*, Version 1.0, May 98. |
| **Equipment/Tools Required:** | 1. Pair of "T" stanchions.<br>2. Adjustable sight rod.<br>3. Pavement marking material (Chalk or Paint). |
| **Learning Objective:** | Given equipment, the trainee should be able to perform CPM operations. |
| **Samples of Behavior:** | The trainee should have the knowledge to perform CPM operations. |
| **Notes:** | |
| 1. Teamwork with the Airfield Damage Repair Team (formerly known, as Rapid Runway Repair (RRR) Team) is very critical to the success of achieving the most expedient crater repair operation.<br>2. A balance of speed and accuracy should be maintained during this entire process. | |

## PERFORM CPM OPERATIONS

**1. Background.**

**1.1.** With today's fast paced contingency rate, it is crucial civil engineers maintain the capability to repair damaged airfield pavement in an expedient manner. The first step in repairing pavement damage is identifying the amount of pavement to be repaired. This is accomplished by using a method called Crater Profile Measurement (CPM). CPM is an expedient level survey using line of sight to identify damaged areas above or below the surrounding pavement. CPM is used to determine the amount of upheaval before crater repairs begin and to perform quality control checks during and after crater repairs.

**1.2.** When identifying the extent of upheaval, simply place two stanchions of equal height parallel to the centerline on the undamaged pavement surrounding the crater. This will form an imaginary line-of-sight above the crater. A rod, with a target set at the same height as the stanchions, will identify upheaval (or sagging) areas of pavement. The target will rise or fall below the line of sight when the rod is placed on damaged pavement and will remain at a consistent height as the stanchions when placed on undamaged pavement.

**2. Complete the CD-ROM AFQTP *Crater Profile Measurement*, Version 1.0, May 98, for detailed instructions on CPM procedures.** After completing the CD-ROM AFQTP see your Unit Education and Training Manager to take the **mandatory** CerTest # 8081, Crater Profile Measurement. Trainee must score at least 80% to meet the minimum completion requirement for diamond tasks.

**NOTE:**
The review questions for this material are in the above-mentioned CD-ROM.

**3. If equipment is available, follow these steps to perform hands-on certification training:**

**Step 1: Locate TO 35E2-5-1, *Crushed-Stone Crater Repair and Line-Of-Sight Profile Measurement for Rapid Runway Repair.***

**Step 2: Perform CPM operations in accordance with TO 35E2-5-1, Chapter 4, paragraph 4-7.**

**PERFORM CPM OPERATIONS**

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. properly identify/work the crater in the correct quadrant sequence? | | |
| 2. position stanchions correctly? | | |
| 3. mark pavement to allow for a margin of error? | | |
| 4. follow the correct steps in marking the upheaval? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 10

## LAYOUT MINIMUM AIRFIELD OPERATING STRIP MARKING SYSTEM (MAOSMS) (20.10.)

## LAYOUT MINIMUM AIRFIELD OPERATING STRIP MARKING SYSTEM (MAOSMS)

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.10. - Layout MAOSMS. |
| **Training References:** | 1. Air Force Pamphlet (AFPAM) 10-219, Volume 4, *Rapid Runway Repair Operation*, Chapter 6, *Airfield Marking Procedures.*<br>2. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 5-1: *MOS Layout.*<br>3. CD-ROM Air Force Qualification Training Package (AFQTP) *Contingency Airfield Marking Procedures*, Version 1.0, May 99.<br>4. Air Force Instruction (AFI) 32-1042, *Standards for Marking Airfields.*<br>5. Technical Order (TO) 35E2-6-1, *Minimum Airfield Operating Surface Marking System.*<br>6. TO 36E35-7-1, *AFI 20 Set Point Striping Set Operations and Maintenance Manual.*<br>7. Engineer Technical Letter (ETL) 94-01, *Standard Airfield Pavement Marking Schemes.* Changes to ETL 94-01.<br>8. Air Force Handbook 10-222, Volume 16, *Guide For Use Of The Minimum Airfield Operating Surface Marking System.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 4, Chapter 6.<br>2.2. AFI 32-1042.<br>2.3. TOs 35E2-6-1 and 36E35-7-1.<br>2.4. AFH 10-222, Volume 16.<br>3. **Complete the following:**<br>3.1. CDC 3E551A, Volume 2, Unit 5, Section 5-1.<br>3.2. CD-ROM AFQTP *Contingency Airfield Marking Procedures*, Version 1.0, May 99. |
| **Equipment/Tools Required:** | Airfield Marking Kit or local substitute. |
| **Learning Objective:** | Enable the student to explain the contingency airfield marking procedures. |
| **Samples of Behavior:** | The trainee will be able to perform and explain contingency airfield marking. |
| **Notes:** | |
| | |

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## LAYOUT MAOSMS

**1.Background.** After a MOS has been selected, the first step for the MAOSMS team to mark the intended MOS location on the exiting runway pavement so it is visible to the work crews. MOS boundary markings are important in many repair operations, including crater repair, paint-striping, Electric Airfield Lighting System (EALS), arresting barriers, and distance to go markers.

**2. Complete the CD-ROM AFQTPs *Contingency Airfield Marking Procedures*, Version 1.0, May 99, for detailed instructions on MAOSMS layout.** After completing the CD-ROM AFQTP see your Unit Education and Training Manager to take the following **mandatory** CerTest tests. **Trainee must score at least 80% to meet the minimum completion requirement for diamond tasks.**

| CerTest # | Title |
|---|---|
| 8091 | Contingency Airfield Marking 1 |
| 8092 | Contingency Airfield Marking 2 |
| 8093 | Contingency Airfield Marking 3 |
| 8094 | Contingency Airfield Marking 4 |
| 8095 | Contingency Airfield Marking 5 |
| 8096 | Contingency Airfield Marking 6 |
| 8097 | Contingency Airfield Marking 7 |
| 8098 | Contingency Airfield Marking 8 |

**NOTE:**
The review questions for this material are in the above-mentioned CD-ROM.

**3. If equipment is available, follow these steps to perform hands-on certification training:**

**Step 1: Locate TO 35E2-6-1, *Minimum Airfield Operating Strip Marking System.***

**Step 2: Layout a Minimum Airfield Operating Strip Marking System in accordance with TO 35E2-6-1, Chapter 4, paragraphs 4-2 and 4-3 and Chapter 5, Paragraph 5-2.**

## LAYOUT MAOSMS

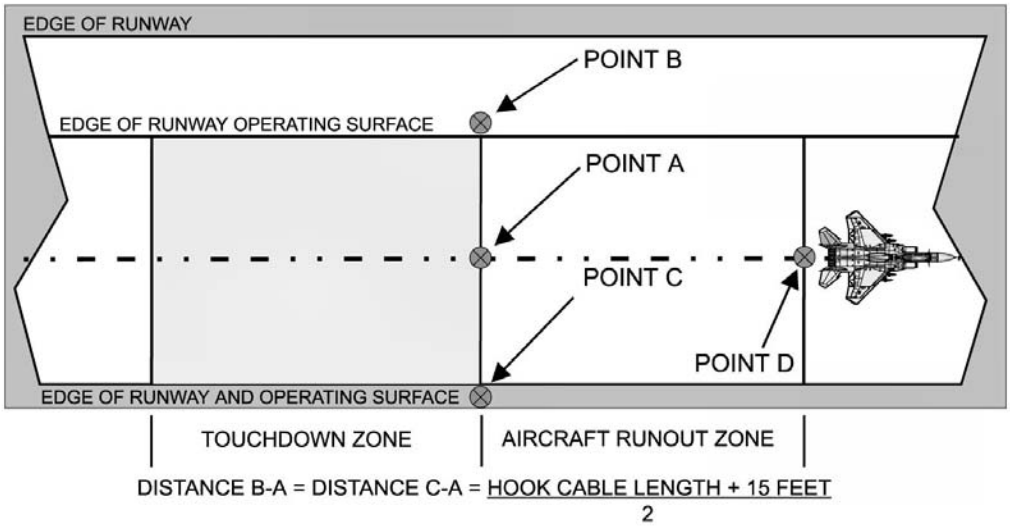
## PERFORMANCE CHECKLIST

**INSTRUCTIONS:**

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. align center line and edge markers? | | |
| 2. ensure [_____] safety at all times?<br>2.1 vehicle<br>2.2 lifting | | |
| 3. ensure [_____] markers were located and spaced correctly?<br>3.1 edge<br>3.2 arresting barrier<br>3.3 distance-to-go<br>3.4 threshold | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.




# MOBILE AIRCRAFT ARRESTING SYSTEM (MAAS) PROCEDURES

## MODULE 20 AFQTP UNIT 11

## ALIGN MAAS (20.11.1.)

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## ALIGN MOBILE AIRCRAFT ARRESTING SYSTEM

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.11.1. – Align Mobile Aircraft Arresting System (MAAS). |
| **Training References:** | 1. Technical Order (TO) 35E8-2-11-1, *Mobile Aircraft Arresting System Configuration Set*.<br>2. TO 35E8-2-11-2, *Lightweight Fairlead Beam Configuration Set.*<br>3. TO 35E8-2-10-1, Arresting System, Aircraft, Mobile.<br>4. Air Force Handbook (AFH) 10-222, Volume 8, *Guide to Mobile Aircraft Arresting System Installation*.<br>5. Air Force Pamphlet (AFPAM) 10-219, Volume 4, Chapter 6, *Airfield Marking Procedures.*<br>6. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-2, *MOS Selection.*<br>7. CD-ROM Air Force Qualification Package (AFQTP) *Mobile Aircraft Arresting System*, Version 2.0, Oct '02. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 4, Chapter 6.<br>2.2. TOs 35E8-2-11-1, 35E8-2-11-2, and 35E8-2-10-1.<br>2.3. AFH 10-222, Volume 8.<br>3. **Complete CDC 3E551A, Volume 2, Unit 3-2.**<br>4. **Highly recommend the completion of the CD-ROM AFQTP *Mobile Aircraft Arresting System*, Version 2.0, Oct 02.** |
| **Equipment/Tools Required:** | 1. 200' tape.<br>2. Theodilite or total station.<br>3. Philadelphia rod or range pole.<br>4. Spray paint or keel.<br>5. Stakes and flagging.<br>6. Gloves, hearing, and eye protection. |
| **Learning Objective:** | To explain the development of arresting systems, as well as the pre-installation considerations such as man power requirements and site selection/preparation. |
| **Samples of Behavior:** | Be able to properly describe MAAS alignment and positioning procedures. |
| **Notes:** | |
| | |

# ALIGN MAAS

## 1. Background.

**1.1.** In today's fast paced contingency world, civil engineers are frequently deployed in support of aircraft missions all over the world. The likelihood of a permanent installed arresting systems being at the deploy locations is very slim. One of the primary tasks is the installation of a MAAS unit with fairlead beam. It is vital for successful MAAS operations the fairlead beam is properly positioned and aligned with the MAAS trailer and the runway surface. A fairlead beam is an apparatus installed at the runway edge so the MAAS unit can be back further from the runway thus providing sufficient wing tip clearance for heavy aircraft.

**1.2.** There are three types of fairlead beams: the Light Weight Fairlead Beam (LWFB), the two-roller sheave standard beam, and the three-roller sheave standard beam. The LWFB is anchored using cruciform stakes; referred to as KM stake lines. The two and three roller beams are anchored with a deadman anchoring system. The deadman anchoring system uses a series of chained weights buried into the ground.

## 2. Site Selection.

**2.1.** The site selected should be relatively level and meet installation slope requirements. This minimizes or eliminates the need for grading the selected site. Locate the site approximately 1500 to 1800' from the runway threshold. As a minimum the distance from the runway has to accommodate a full tape run out (1200') and the length of the plane (nose to tail hook).

### 2.1.1. Barrier Location.

**2.1.1.1.** 1500' – 1800' from runway threshold.

**2.1.1.2.** 150' – 200' clear of taxiways.

**2.1.1.3.** Ensure site conforms to soil requirements.

**2.1.1.4.** Ensure site conforms to slope requirements.

**2.1.1.5.** Check natural drainage of area.

### 2.1.2. Soil Requirements.

**2.1.2.1.** Basic MAAS installation requires a minimum CBR value of 7.

**2.1.2.2.** The LWFB can be installed with a minimum CBR value of 7.

**2.1.2.3.** LWFB should not be installed in the same location as a previous installation unless the soil is recompacted to a minimum CBR value of 15.

**2.1.2.4.** KM anchoring system can be utilized with minimum CBR of 7.

**2.1.2.5.** Deadman anchoring system is required for CBR < 7.

### 2.1.3. Soil Conditions.

**2.1.3.1.** Can be determined using airfield soil specification data.

**2.1.3.2.** Can be determined by referring to Airfield Pavement Evaluation data.

**2.1.3.3.** Can be field verified using a Dynamic Cone Pentrometer (DCP).

### 2.1.4. Slope Requirements.

**2.1.4.1.** Runway slope is typically 1% - 1 ½%.

**2.1.4.2.** 0% - 8% uniform slope is required over the length of free exposed tape.

**2.1.4.3.** Exceeding slope of 8% can cause tape track problems.

**2.1.4.4.** Tape should project 1' – 4' above the runway centerline.

**2.1.4.5.** LWFB should be at least equal height to paved surface when positioned at runway edge.

**2.1.4.6.** Single slope runways.

**2.1.4.7.** MAAS can be inclined from a negative to positive slope up to 3%.

**3. Positioning and Alignment.** The two alignment methods used are taping and instrument. Due to the scope and length of steps required for positioning and alignment it is highly suggested to utilize the proper Technical Orders when performing this step.

**4. It is highly recommended that the trainee complete the CD-ROM AFQTP *Mobile Aircraft Arresting System*, Version 2.0, Oct '02 for information on the placement of the MAAS.** After completing this paper based AFQTP see your Unit Education and Training Manager to take the **mandatory** CerTest # 8142, Align Mobile Aircraft Arresting System. Trainee must score at least 80% to meet the minimum completion requirement for diamond tasks.

**5. If equipment is available, follow these steps to perform hands-on certification training:**

**Step 1: Locate Air Force Handbook 10-222, Volume 8;** *Guide to Mobile Aircraft Arresting System Installation.*

**Step 2: Align MAAS in accordance with AFH 10-222, Volume 8, page 28; *Sitting the Equipment*.**

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## ALIGN MAAS

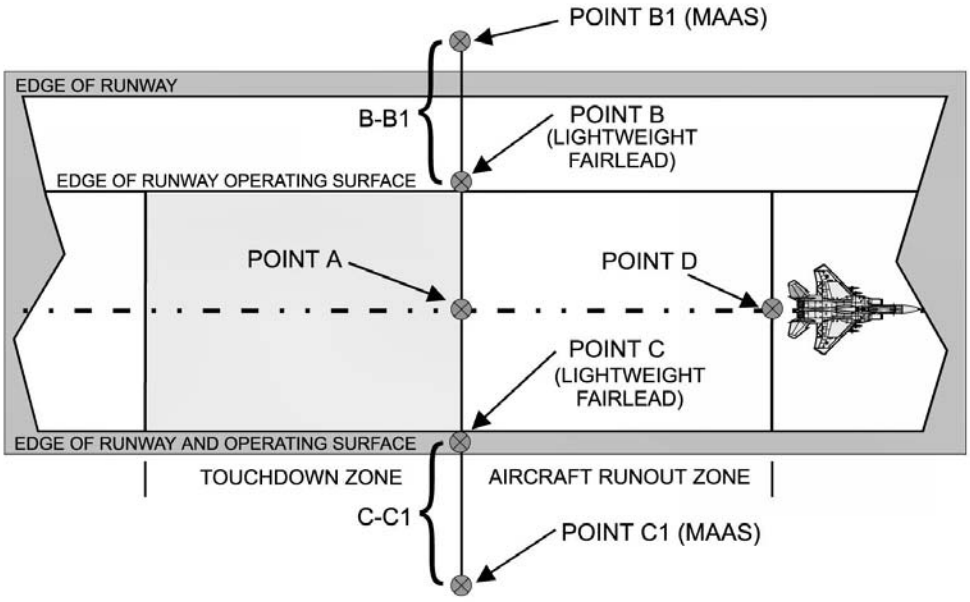
## PERFORMANCE CHECKLIST

**INSTRUCTIONS:**

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. determine MAAS location? | | |
| 2. use proper methods for instrument layout? | | |
| 3. use proper methods for tape layout? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.




$$\text{DISTANCE B-A} = \text{DISTANCE C-A} = \frac{\text{HOOK CABLE LENGTH + 15 FEET}}{2}$$

DISTANCE B-B1 = DISTANCE C-C1 = 100 TO 200 FEET

# MOBILE AIRCRAFT ARRESTING SYSTEM (MAAS) PROCEDURES

## MODULE 20 AFQTP UNIT 11

## ALIGN MAAS WITH LIGHTWEIGHT FAIRLEAD BEAMS (20.11.2.)

## ALIGN MAAS WITH LIGHTWEIGHT FAIRLEAD BEAMS

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.11.2. - Align Mobile Aircraft Arresting System (MAAS) with lightweight fairlead beams. |
| **Training References:** | 1. Technical Order (TO) 35E8-2-11-1, *Mobile Aircraft Arresting System Configuration Set*.<br>2. TO 35E8-2-11-2, *Lightweight Fairlead Beam Configuration Set.*<br>3. TO 35E8-2-10-1, Arresting System, Aircraft, Mobile.<br>4. Air Force Handbook (AFH) 10-222, Volume 8, *Guide to Mobile Aircraft Arresting System Installation*.<br>5. Air Force Pamphlet (AFPAM) 10-219, Volume 4, Chapter 6, *Airfield Marking Procedures.*<br>6. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-2, *MOS Selection.*<br>7. CD-ROM Air Force Qualification Package (AFQTP) *Minimum Operating Strip Selection*, Version 1.0, May 98.<br>8. CD-ROM AFQTP *Lightweight Fairlead Beam*, Version 1.0, Oct 99.<br>9. Air Force Instruction (AFI) 32-1043, *Managing Aircraft Arresting Systems, paragraph 3.3.3.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 4, Chapter 6.<br>2.2. TOs 35E8-2-11-1, 35E8-2-11-2, and 35E8-2-10-1.<br>2.3. AFH 10-222, Volume 8.<br>2.4. AFI 32-1043, paragraph 3.3.3.<br>3. **Complete CDC 3E551A, Volume 2, Unit 3-2.**<br>4. **Highly recommend the completion of the CD-ROM AFQTP *Lightweight Fairlead Beam*, Version 1.0, Oct 99.** |
| **Equipment/Tools Required:** | 1. 200’ tape.<br>2. Theodilite or total station.<br>3. Philadelphia rod or range pole.<br>4. Spray paint or keel.<br>5. Stakes and flagging.<br>6. Gloves, hearing, and eye protection. |
| **Learning Objective:** | Should be able to accurately position and align a MAAS. |
| **Samples of Behavior:** | Properly describe MAAS alignment and positioning procedures. |
| **Note:** | |
| | |

## ALIGN MAAS WITH LIGHTWEIGHT FAIRLEAD BEAMS (LWFB)

**1. Background.** The LWFB Configuration Set is designed to the capabilities of the Mobile Aircraft Arresting System. The LWFB Configuration Set presents a significantly decreased arresting gear profile at edge of the runway, thus reducing potential hazards to incoming and outgoing aircraft. Like the MAAS, the Configuration Set can be warehouse stored and deployed as needed. The system can easily be located at a runway site.

**2. Positioning and Alignment.** Although there are two alignment methods, taping and instrument, this AFQTP concentrates on instrument method. Before getting into the alignment, an understanding of some general positioning formulas and terms are needed.

**2.1. Fairlead Beam Positioning.**

**2.1.1.** Calculate distance from runway centerline to lead off sheave of fairlead beam.

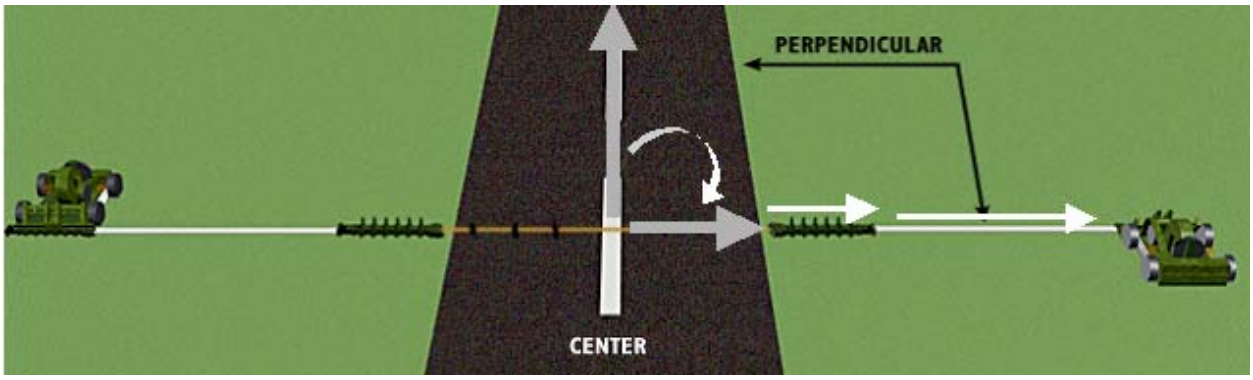
**2.1.2. The formula used to determine the location of the fairlead beam lead off sheave is:** Cable Length + 15' divided by 2. The 15' in the formula takes into account the distance of the two tape connectors.

**2.2. MAAS Trailer Positioning.**

**2.2.1.** Setback Distance – distance from lead off sheave of fairlead beam to MAAS trailer exit sheave. This distance depends on the aircraft tip clearance. Usually the barrier team chief in conjuction with the airfield operations chief determines this distance.

**2.2.2.** Split Distance – distance from lead on sheave of fairlead beam to MAAS trailer exit sheave. Usually the barrier team chief in conjunction with the airfield operations chief determines this distance.

**2.3. Alignment Procedures.**




**2.3.1.** Determine MAAS location from runway threshold/departure. Measure pre-determined distance (1500'-1800').

**2.3.2.** Mark & setup instrument over point on runway centerline.

**2.3.2.1.** Align instrument with runway centerline.

**2.3.2.2.** Plunge scope to ensure alignment with centerline.

**2.3.2.3.** Zero instrument.

**2.3.3.** Turn 90° angle.

**2.3.4.** Locate LWFB *lead off sheave* reference stake.

**2.3.4.1.** Measure pre-determined distance from paved surface of runway edge (cable length +15' divided by 2).

**2.3.4.2.** Site and set reference stake.

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

**2.3.5.** Locate LWFB *lead on sheave* (farthest from threshold) reference stake.

**2.3.5.1.** Measure 15' from lead off sheave reference stake (length of the beam).

**2.3.5.2.** Site and set reference stake.

**2.3.6.** Locate MAAS trailer runway edge sheave reference stake.

**2.3.6.1.** Measure split distance (30' min. up to 300' max.) as determined by Barrier Crew Chief.

**2.3.6.2.** Site and set reference stake.

**2.3.7.** Plunge scope.

**2.3.8.** Locate LWFB & MAAS trailer reference stakes. (Use same procedures as above.)

**2.3.9.** Position & stake LWFB.

**2.3.9.1.** Use instrument to site front & back alignment pins.

**2.3.9.2.** Stake 4 corners of LWFB to secure its position.

**2.3.10.** Position & stake MAAS trailer.

**2.3.10.1.** Align trailer exit sheave with reference stake. Use instrument to ensure alignment of MAAS exit sheave with beam.

**2.3.10.2.** Site on center of rollers where tape exits trailer or use range pole.

**3. It is highly recommended that the trainee complete the CD-ROM AFQTP *Lightweight Fairlead Beam*, Version 1.0, Oct 99, for instructions on the placement of the MAAS.** After completing this paper based AFQTP see your Unit Education and Training Manager to take the **mandatory** CerTest # 8142, Align Mobile Aircraft Arresting System. Trainee must score at least 80% to meet the minimum completion requirement for diamond tasks.

**4. If equipment is available, follow these steps to perform hands-on certification training:**

**Step 1: Locate Air Force Handbook 10-222, Volume 8;** *Guide to Mobile Aircraft Arresting System Installation.*

**Step 2: Align MAAS in accordance with AFH 10-222, Volume 8, page 28; *Sitting the Equipment*.**

## ALIGN MAAS WITH LIGHTWEIGHT FAIRLEAD BEAMS

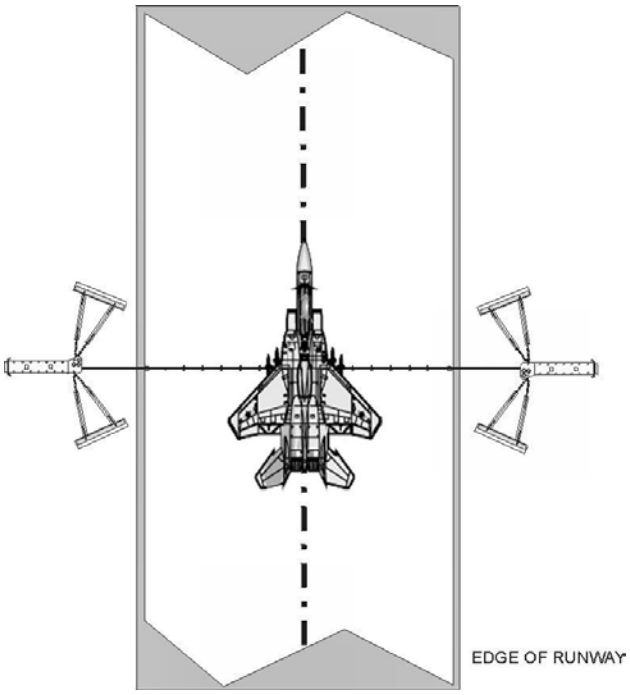
## PERFORMANCE CHECKLIST

**INSTRUCTIONS:**

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. site the MAAS properly? | | |
| 2. use the proper procedures for MAAS positioning with fairlead beams? | | |
| 3. locate proper point on centerline of runway? | | |
| 4. use the proper offsets laid out for the two and three sheave fairlead beams? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.




# MOBILE AIRCRAFT ARRESTING SYSTEM (MAAS) PROCEDURES

## MODULE 20 AFQTP UNIT 11

## ALIGN MAAS WITH STANDARD BEAMS WITH DEADMAN ANCHORING SYSTEM (20.11.3.)

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## ALIGN MAAS WITH STANDARD BEAMS WITH DEADMAN ANCHORING SYSTEM

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.11.3. - Align Mobile Aircraft Arresting System (MAAS) with standard beams with deadman anchoring system. |
| **Training References:** | 1. Technical Order (TO) 35E8-2-11-1, *Mobile Aircraft Arresting System Configuration Set*.<br>2. TO 35E8-2-11-2, *Lightweight Fairlead Beam Configuration Set.*<br>3. TO 35E8-2-10-1, Arresting System, Aircraft, Mobile.<br>4. Air Force Handbook (AFH) 10-222, Volume 8, *Guide to Mobile Aircraft Arresting System Installation.*<br>5. Air Force Pamphlet (AFPAM) 10-219, Volume 4, Chapter 6, *Airfield Marking Procedures.*<br>6. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 3-2, *MOS Selection.*<br>7. CD-ROM Air Force Qualification Package (AFQTP) *Mobile Aircraft Arresting System*, Version 2.0, Oct '02. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFPAM 10-219, Volume 4, Chapter 6.<br>2.2. TOs 35E8-2-11-1, 35E8-2-11-2, and 35E8-2-10-1.<br>2.3. AFH 10-222, Volume 8.<br>3. **Complete CDC 3E551A, Volume 2, Unit 3-2.**<br>4. **Highly recommend the completion of the CD-ROM AFQTP *Mobile Aircraft Arresting System*, Version 2.0, Oct 02.** |
| **Equipment/Tools Required:** | 1. 200' tape.<br>2. Theodilite or total station.<br>3. Philadelphia rod or range pole.<br>4. Spray paint or keel.<br>5. Stakes and flagging.<br>6. Gloves, hearing and eye protection. |
| **Learning Objective:** | Know when and how to layout MAAS with standard beams with deadman anchoring system. |
| **Samples of Behavior:** | Demonstrate and explain how to layout MAAS with standard beams with deadman anchoring system. |
| **Note:** | |
| | |

## ALIGN MAAS WITH STANDARD BEAMS WITH DEADMAN ANCHORING SYSTEM

**1. Background.** Installation of the Mobile Aircraft Arresting System (MAAS) with standard beams with deadman anchoring system is installed when the engineer, 3E5X1, identifies the soil to have a very low bearing pressure (CBR less than 7).

**2. Positioning and Alignment.** Although there are two alignment methods, taping and instrument, this AFQTP concentrates on instrument method. Before getting into the alignment, an understanding of some general positioning formulas and terms are needed.

**2.1. Alignment Procedures for Fairlead Beam & MAAS Trailer.** The procedures are similar to those associated with aligning the LWFB except the beams have to be offset for proper operations. The other difference is the need to locate the trenches for the anchoring systems.

**2.1.1.** Determine MAAS location from runway threshold/departure.

**2.1.1.1.** Mark point with paint/keel.

**2.1.1.2.** Set tack on runway centerline. (Remove tack later for safe aircraft operations.)

**2.1.2.** Setup instrument on runway centerline.

**2.1.2.1.** Set up and level instrument over tack,

**2.1.2.2.** Align with runway centerline.

**2.1.2.3.** Plunge scope to ensure alignment with centerline.

**2.1.2.4.** Zero instrument.

**2.1.3.** Measure and set offset stack.

**2.1.3.1.** 40 $^{5}/_{8}$" offset for Two Sheave Fairlead.

**2.1.3.2.** 17 $^{1}/_{2}$" offset for Three Sheave Fairlead.

**2.1.3.3.** Ensure offset is in proper direction.

**2.1.4.** Rotate instrument 90° to right.

**2.1.5.** Locate *lead off sheave* of fairlead beam (closest to threshold):

**2.1.5.1.** Measure pre-determined distance from paved surface of runway edge (cable length+15'/2).

**2.1.5.2.** Site and set reference stake.

**2.1.6.** Locate fairlead beam *lead on sheave* (farthest from threshold):

**2.1.6.1.** Measure 15' (length of the beam).

**2.1.6.2.** Site and set reference stake.

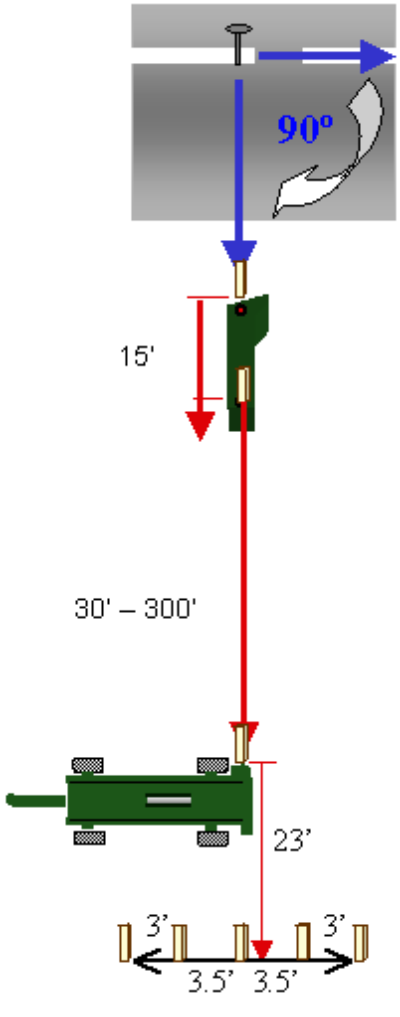
**2.1.7.** Locate MAAS trailer runway edge sheave reference stake. Measure *Split Distance* (30' min. up to 300'max.) as determined by Barrier Crew Chief.

**2.1.8.** Locate MAAS trailer deadman trench.

**2.1.8.1.** Measure 23'.

**2.1.8.2.** Site and set reference stake (locates center of trench).

**2.1.8.3.** Locate chain trench reference stakes. Measure 6.5' both sides of stake (parallel to runway).




**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

**2.1.9.** Position and stake fairlead beam:

**2.1.9.1.** Use instrument to site front & back alignment pins.

**2.1.9.2.** Stake 4 corners of LWFB to secure its position.

**2.1.10.** Position and stake MAAS trailer:

**2.1.10.1.** Use instrument to line alignment pin.

**2.1.10.2.** Set range pole on alignment pin to aid in aligning trailer.

**2.1.11.** Move and setup instrument over *offset* tack:

**2.1.11.1.** Set up and level instrument over tack.

**2.1.11.2.** Align with runway centerline.

**2.1.12.** Rotate instrument 90° to left.

**2.1.13.** Locate, position, and stake fairlead beam and MAAS trailer. Repeat this step for the other side.

**2.2. Locating Deadman Anchors for Fairlead Beam.**

**2.2.1.** Set up instrument over *lead off sheave* alignment pin:

**2.2.1.1.** Level instrument.

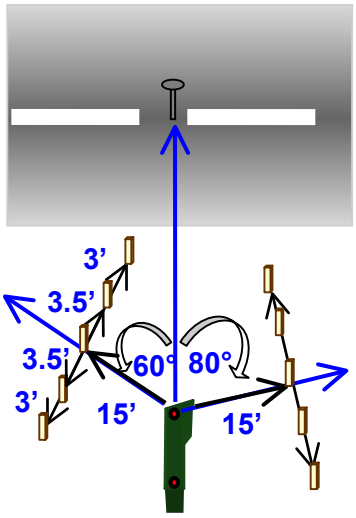
**2.2.1.2.** Site back on tack.

**2.2.1.3.** Zero instrument.

**2.2.2.** Rotate instrument 60° to left:

**2.2.2.1.** Measure 15’ from outer edge of fairlead beam.

**2.2.2.2.** Site and set stake (identifies center of deadman trench).




**2.2.3.** Measure and set stakes 3 ½’ each side of stake, perpendicular (⊥) to line of sight (locates chain trenches).

**2.2.4.** Measure and set stakes 3’ each side from chain trench stake (locates outer edges of deadman trench).

**2.2.5.** Site back on runway centerline tack (0°).

**2.2.6.** Rotate instrument 80° to right:

**2.2.6.1.** Measure 15’ from outer edge of fairlead beam.

**2.2.6.2.** Site and set stake (Identifies center of deadman trench).

**2.2.7.** Measure and set stakes 3 ½’ each side of stake, ⊥ to line of instrument (locates chain trenches).

**2.2.8.** Measure and set stakes 3’ each side from chain trench stake (locates outer edges of deadman trench).

**3. It is highly recommended that the trainee complete the CD-ROM AFQTP *Mobile Aircraft Arresting System*, Version 2.0, Oct 02, for instructions on the placement of the MAAS.** After completing this paper based AFQTP see your Unit Education and Training Manager to take the **mandatory** CerTest # 8142, Align Mobile Aircraft Arresting System. Trainee must score at least 80% to meet the minimum completion requirement for diamond tasks.

**4. If equipment is available, follow these steps to perform hands-on certification training:**

**Step 1: Locate Air Force Handbook 10-222, Volume 8; *Guide to Mobile Aircraft Arresting System Installation.***

**Step 2: Align MAAS with standard beams with deadman anchoring system in accordance with AFH 10-222, Volume 8, page 121; *MAAS on A Low Bearing Pressure Soil (CBR Less Than 7)*.**

**ALIGN MAAS WITH STANDARD BEAMS WITH DEADMAN ANCHORING SYSTEM**

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. understand the principles of installing the deadman anchoring system? | | |
| 2. know when this system should be installed? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# COMBAT AIR BASE PLANNING AND PURPOSE

## MODULE 20 AFQTP UNIT 13

## IDENTIFY BARE BASE ASSETS (20.13.3.)

# IDENTIFY BARE BASE ASSETS

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.13.3. - Identify bare base assets. |
| **Training References:** | 1. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 1, *Contingency Bare Base Planning.*<br>2. Air Force Pamphlet (AFPAM) 10-219,Volume 2, *Preattack and Predisaster Preparations.*<br>3. AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide.*<br>4. Air Force Handbook (AFH) 10-222, Volume 1, *Guide to Bare Base Development.*<br>5. AFH 10-222, Volume 2, *Guide to Bare Base Assets.*<br>6. AFH 10-222, Volume 3, *Guide to Civil Engineer Force Protection*.<br>7. CD-ROM Air Force Qualification Training Package (AFQTP), *Bare Base Planning and Layout*, Version 1.0, Mar 99. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFH 10-222, Volumes 1, 2,and 3.<br>2.2. AFPAM 10-219, Volumes 2 and 5.<br>3. **Complete the following:**<br>3.1. CDC 3E551A Engineering Journeyman, Volume 2, Unit 1.<br>3.2. CD-ROM AFQTP Bare Base Planning and Layout, Version 1.0, Mar 99. |
| **Equipment/Tools Required:** | AFH 10-222 Vol 2, Guide to Bare Base Development. |
| **Learning Objective:** | Be able to describe various factors influencing layout of bare base functions and assets. |
| **Samples of Behavior:** | Identify and explain the air base planning process and principles. |
| **Note:** | |
| The trainer will need to develop an exercise scenario. | |

## IDENTIFY BARE BASE ASSETS

**1. Background.** A bare base is a site with a useable runway, taxiway, parking areas and a source of water that can be made potable. It must be capable of supporting assigned aircraft and provide other mission essential resources such as logistical support and a service infrastructure composed of people, facilities, and equipment. This bare base concept requires mobile facilities, utilities and support equipment that can be rapidly deployed and installed to transform virtually overnight undeveloped real state into an operational air base. Fortunately these kinds of assets have undergone more than three decades of research and development.

**2.** Complete the CD-ROM AFQTP *Bare Base Planning and Layout*, Version 1.0, May 99, for detailed instructions on identifying bare base assets. **Upon completion of the above-mentioned CD-ROM AFQTP, properly identify bare base assets using procedure listed below.**

**NOTE:**
The review questions for this material are in the above-mentioned CD-ROM.

**3. Follow these steps to perform this task:**

**Step 1: Trainee is provided with scenario.**

**Step 2: Identify Bare Base Assets.** Refer to AFH 10-222, Volume 2.

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will have to identify bare base assets required for a deployment.

## IDENTIFY BARE BASE ASSETS

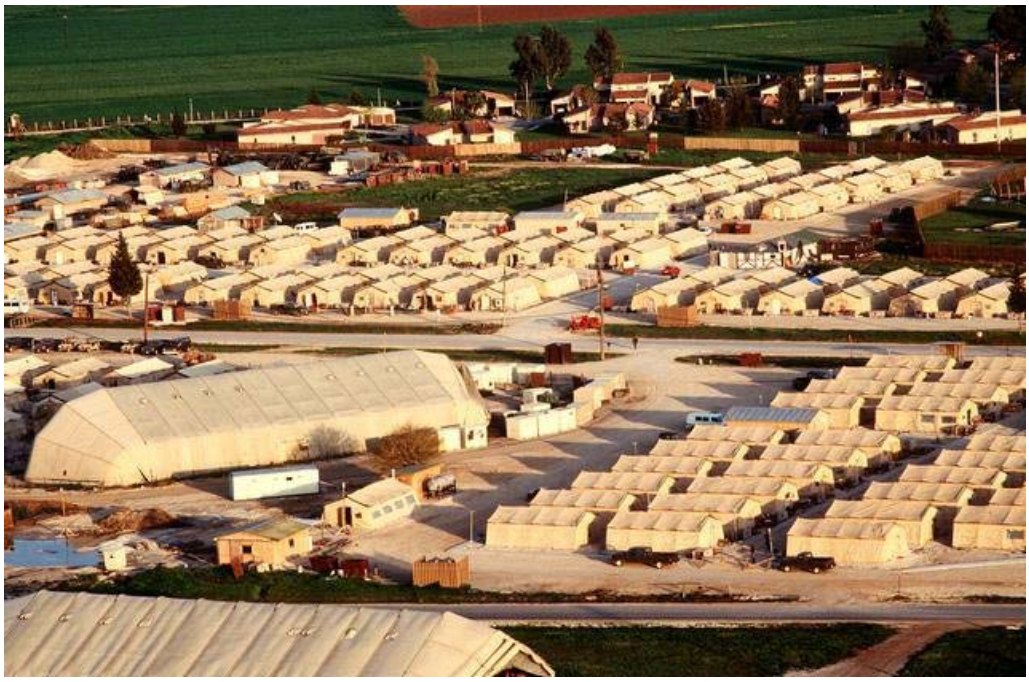
## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. understand the planning process to help identify bare base assets? | | |
| 2. identify bare base assets? | | |
| 3. understand the principles and procedures of identifying bare base assets? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.



# EXPEDIENT BEDDOWN METHODS

## MODULE 20 AFQTP UNIT 14

## APPLY BARE BASE PLANNING CRITERIA (20.14.1.)

# APPLY BARE BASE PLANNING CRITERIA

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.14.1. - Apply bare base planning criteria. |
| **Training References:** | 1. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 1, *Contingency Bare Base Planning.*<br>2. Air Force Pamphlet (AFPAM) 10-219,Volume 2, *Preattack and Predisaster Preparations.*<br>3. AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide.*<br>4. Air Force Handbook (AFH) 10-222, Volume 1, *Guide to Bare Base Development.*<br>5. AFH 10-222, Volume 2, *Guide to Bare Base Assets.*<br>6. AFH 10-222, Volume 3, *Guide to Civil Engineer Force Protection*.<br>7. CD-ROM Air Force Qualification Training Package (AFQTP), *Bare Base Planning and Layout*, Version 1.0, Mar 99. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E551 AFSC**.<br>2. **Review the following references:**<br>2.1. AFH 10-222, Volumes 1, 2,and 3.<br>2.2. AFPAM 10-219, Volumes 2 and 5.<br>3. **Complete the following:**<br>3.1. CDC 3E551A Engineering Journeyman, Volume 2, Unit 1.<br>3.2. CD-ROM AFQTP Bare Base Planning and Layout, Version 1.0, Mar 99. |
| **Equipment/Tools Required:** | AFH 10-222 Vol 2, Guide to Bare Base Development. |
| **Learning Objective:** | Given a scenario, trainee will be able to apply bare base planning criteria. |
| **Samples of Behavior:** | The trainee will determine requirements and procedures by applying the bare base planning criteria. |
| **Notes:** | |
| Trainer must supply a scenario that outlines the following:<br>Mission to be performed.<br>Anticipated threat conditions.<br>Overall situation.<br>Number and types of aircraft to beddown.<br>Base population for deployed location. | |

## APPLY BARE BASE PLANNING CRITERIA

**1. Background.** The planning process assists us in determining the facility and utility requirements of the base, identifies required assets, and evaluates the installation's ability to support the operational mission. The process itself is fairly mechanical. However, you will require assistance from other journeymen in Civil Engineer. Remember you are part of a team tasked to develop the overall plan for the installation. Your team consists of you, Civil Engineer officers, and other journeymen in your squadron. The initial step in the process consists of analyzing three key items; the mission or missions to be performed, anticipated threat conditions, and the overall situation. You will be briefed as to the number and types of aircraft to beddown, and the expected base population for your deployed location. This and other information is required to develop your plan.

**2.** Complete the CD-ROM AFQTP *Bare Base Planning and Layout*, Version 1.0, May 99, for detailed instructions on applying bare base criteria. **Upon completion of the above-mentioned CD-ROM AFQTP, properly apply bare base criteria using the step-by-step procedures listed below.**

> **NOTE:**
> The review questions for this material are in the above-mentioned CD-ROM.

**3. Follow these steps to perform this task:**

**Step 1: Trainee is provided with scenario that outlines the following:**

- **1.1.** Mission to be performed.
- **1.2.** Anticipated threat conditions.
- **1.3.** Overall situation.
- **1.4.** Number and types of aircraft to beddown.
- **1.5.** Base population for deployed location.
- **1.6.** Any other information provided in scenario.

**Step 2: Analyze data.**

**Step 3: Apply bare base planning criteria.**

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will have to apply bare base criteria requirements for an upcoming deployment.

## APPLY BARE BASE PLANNING CRITERIA

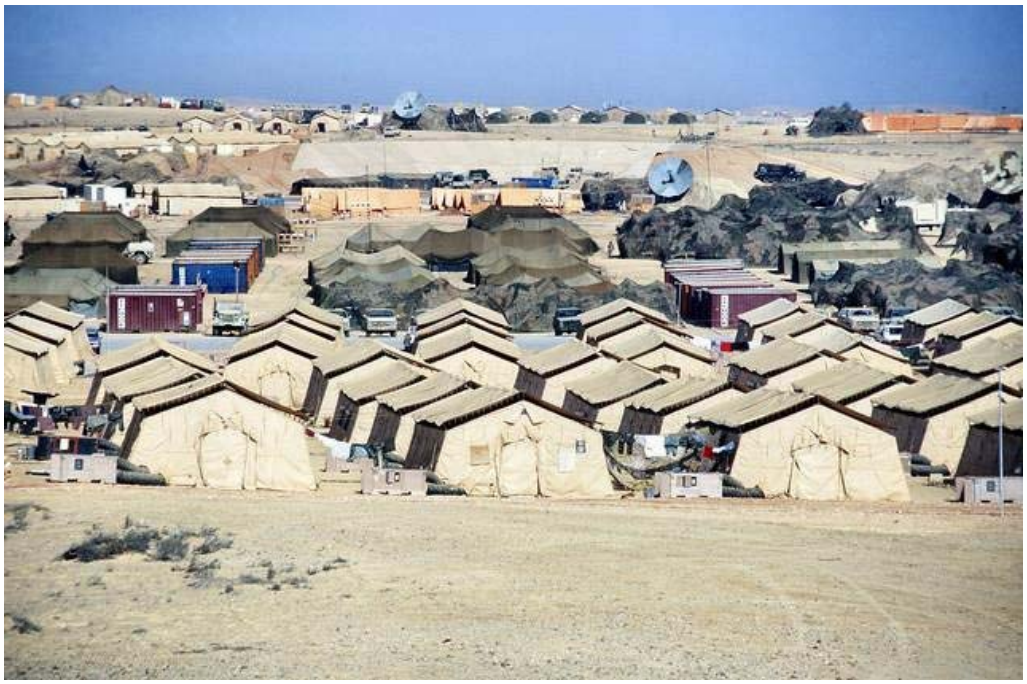
## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. demonstrate their knowledge in applying the bare base planning criteria? | | |
| 2. apply the 10 planning principles? | | |
| 3. identify construction standards that apply to contingency operations? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.



# EXPEDIENT BEDDOWN METHODS

## MODULE 20 AFQTP UNIT 14

## PERFORM SITE SELECTION (20.14.2.)

## PERFORM SITE SELECTION

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.14.2. - Perform site selection. |
| **Training References:** | 1. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 1, *Contingency Bare Base Planning.*<br>2. Air Force Pamphlet (AFPAM) 10-219,Volume 2, *Preattack and Predisaster Preparations.*<br>3. AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide.*<br>4. Air Force Handbook (AFH) 10-222, Volume 1, *Guide to Bare Base Development.*<br>5. AFH 10-222, Volume 2, *Guide to Bare Base Assets.*<br>6. AFH 10-222, Volume 3, *Guide to Civil Engineer Force Protection*.<br>7. CD-ROM Air Force Qualification Training Package (AFQTP), *Bare Base Planning and Layout*, Version 1.0, Mar 99. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E551 AFSC**.<br>2. **Review the following references:**<br>2.1. AFH 10-222, Volumes 1, 2,and 3.<br>2.2. AFPAM 10-219, Volumes 2 and 5.<br>3. **Complete the following:**<br>3.1. CDC 3E551A Engineering Journeyman, Volume 2, Unit 1.<br>3.2. CD-ROM AFQTP Bare Base Planning and Layout, Version 1.0, Mar 99. |
| **Equipment/Tools Required:** | 1. Exercise scenario.<br>2. Site plan. |
| **Learning Objective:** | Given scenario, trainee will be able to perform a site selection. |
| **Samples of Behavior:** | The trainee will perform a site selection. |
| **Note:** | |
| The trainer will need to develop an exercise scenario. | |

## PERFORM SITE SELECTION

**1. Background.** Sitting of facilities is influenced by the topography and climatic conditions such as sun and wind; the principle of group related facilities to improve efficiency; and dispersing facilities to limit damage from enemy attack.

**2.** Complete the CD-ROM AFQTP *Bare Base Planning and Layout*, Version 1.0, May 99, for detailed instructions on applying bare base criteria. **Upon completion of the above-mentioned CD-ROM AFQTP, perform site selection using the step-by-step procedures listed below.**

**NOTE:**
The review questions for this material are in the above-mentioned CD-ROM.

**3. Follow these steps to perform this task:**

**Step 1: Trainee is provided with scenario.**

**Step 2: Analyze data.**

**Step 3: Perform site selection.**

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will have to develop site drawings for a base.

## PERFORM SITE SELECTION

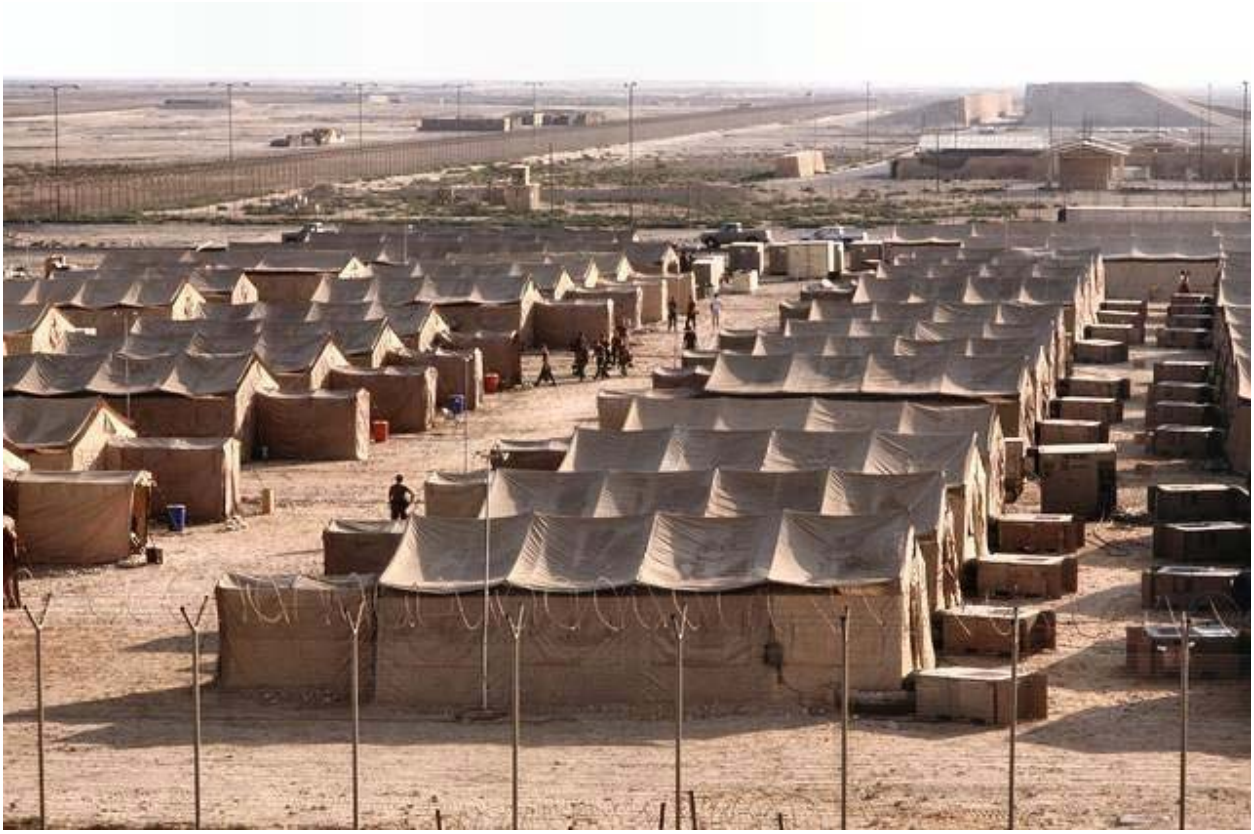
## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE….? | YES | NO |
|---|---|---|
| 1. understand the planning process for site selection? | | |
| 2. consider topography and climatic conditions? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.



# EXPEDIENT BEDDOWN METHODS

## MODULE 20 AFQTP UNIT 14

## ESTABLISH NON-DISPERSAL LAYOUT (20.14.3.)

## ESTABLISH NON-DISPERSED LAYOUT

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.14.3. - Establish non-dispersal layout. |
| **Training References:** | 1. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 1, *Contingency Bare Base Planning.*<br>2. Air Force Pamphlet (AFPAM) 10-219,Volume 2, *Preattack and Predisaster Preparations.*<br>3. AFPAM 10-219, Volume 5, *Bare Base Conceptual Planning Guide.*<br>4. Air Force Handbook (AFH) 10-222, Volume 1, *Guide to Bare Base Development.*<br>5. AFH 10-222, Volume 2, *Guide to Bare Base Assets.*<br>6. AFH 10-222, Volume 3, *Guide to Civil Engineer Force Protection*.<br>7. CD-ROM Air Force Qualification Training Package (AFQTP), *Bare Base Planning and Layout*, Version 1.0, Mar 99. |
| **Prerequisites:** | 1. **Possess as a minimum a 3E551 AFSC**.<br>2. **Review the following references:**<br>2.1. AFH 10-222, Volumes 1, 2,and 3.<br>2.2. AFPAM 10-219, Volumes 2 and 5.<br>3. **Complete the following:**<br>3.1. CDC 3E551A Engineering Journeyman, Volume 2, Unit 1.<br>3.2. CD-ROM AFQTP Bare Base Planning and Layout, Version 1.0, Mar 99. |
| **Equipment/Tools Required:** | 1. Site plan.<br>2. Facility priority list (contained in Contingency Response Plan).<br>3. 3.List of critical assets for facility.<br>4. AFH 10-222 Volume 1, *Guide to Bare Base Development*. |
| **Learning Objective:** | Given scenario, trainee will be able to develop a non-dispersed layout. |
| **Samples of Behavior:** | The trainee will be able to develop a non-dispersed layout for a contingency scenario. |
| **Notes:** | |
| The trainer will need to develop an exercise scenario. | |

## ESTABLISH NON-DISPERSED LAYOUT

**1. Background.** This method of base layout uses closely spaced, linear groups of facilities. Utility plants are centrally located to improve efficiency of operations. This layout is used in low-threat areas only, because it's extremely vulnerable to air attack. A non-dispersed base is faster and easier to layout and requires less land area and utilities. Non-dispersed layout is used when protection against conventional bombing is not required. This layout provides advantages of economy and convenience.

**2.** Complete the CD-ROM AFQTP *Bare Base Planning and Layout*, Version 1.0, May 99, for detailed instructions on applying bare base criteria. **Upon completion of the above-mentioned CD-ROM AFQTP, establish a non-dispersed layout using the step-by-step procedures listed below.**

> **NOTE:**
> The review questions for this material are in the above-mentioned CD-ROM.

**3. Follow these steps to perform this task:**

**Step 1: Trainee is provided with scenario.**

**Step 2: Analyze data.**

**Step 3: Establish non-dispersed layout.**

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will have to establish a non-dispersal layout of a base.

## ESTABLISH NON-DISPERSED LAYOUT

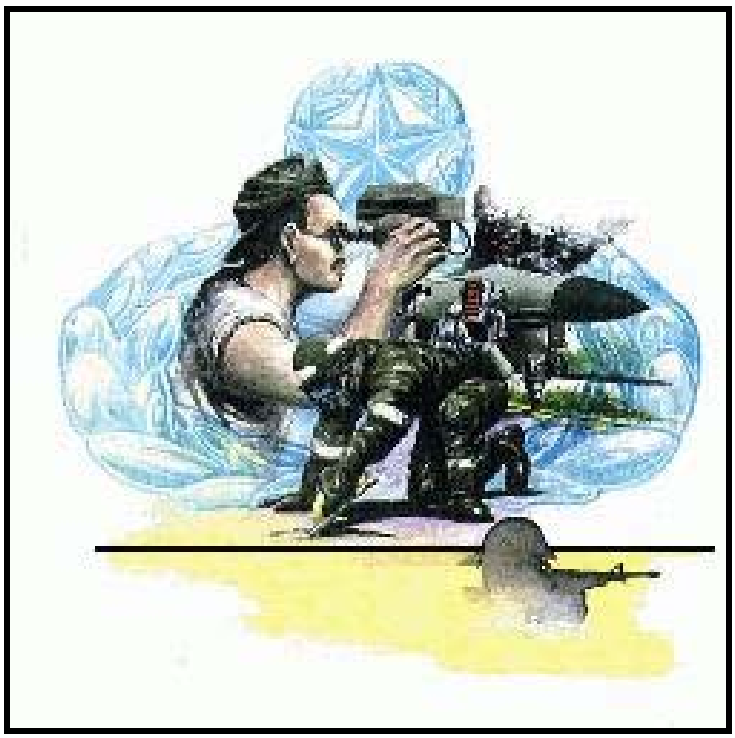
## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. apply functional grouping? | | |
| 2. make sure the proposed area was adequate? | | |
| 3. understand the principles and procedures for establishing a non-dispersed layout? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.



# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## OPTIONAL

## MODULE 20 AFQTP UNIT 17

## DETERMINE FIELD CALIFORNIA BEARING RATIO (CBR) USING DYNAMIC CONE PENETROMETER (DCP) (20.17.)

# DETERMINE FIELD CALIFORNIA BEARING RATION (CBR) USING DYNAMIC CONE PENETROMETER (DCP)

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.17. - Determine field California Bearing Ratio (CBR) using Dynamic Cone Penetrometer (DCP). |
| **Training References:** | 1. Career Development Course (CDC) 3E551B Engineering Journeyman, Volume 4, Unit 3, Section 639. (ver. Nov 03)<br>2. Air Force Joint Manual (AFJMAN) 32-1034, *Material Testing.*<br>3. AFJMAN 32-8013, Appendix J, *Planning and Design of Roads, Airfields, and Heliports in the Theater of Operations—Road Design.*<br>4. Manufacture's Manual |
| **Prerequisites:** | 1. **Possess as a minimum a 3E531 AFSC**.<br>2. **Review the following references:**<br>2.1. AFJMAN 32-1034.<br>2.2. AFJMAN 32-8013.<br>2.3. Manufacture's Manual.<br>3. **Complete CDC 3E551B Engineering Journeyman, Volume 4, Unit 3, Section 639.** |
| **Equipment/Tools Required:** | 1. Data recording and reporting equipment; to include forms, graph paper, clipboards, straight edge and writing instruments.<br>2. Dynamic Cone Penetrometer Kit. |
| **Learning Objective:** | Given training equipment and an area free of obstructions, determine the CBR of a soil structure using the DCP. |
| **Samples of Behavior:** | 1. The trainee will be able to perform the DCP test.<br>2. The trainee will be able to manually plot DCP test data. |
| **Note:** | |
| Trainer needs to provide a safe training area free of underground obstructions. | |

# DETERMINE FIELD CALIFORNIA BEARING RATION (CBR) USING DYNAMIC CONE PENETROMETER (DCP)

**1. Background.** The Dynamic Cone Penetrometer (DCP) is an easily transported, hand-operated device used to measure the California Bearing Ratio (CBR) and thickness of layers of soil. CBR is a value between 0 and 100, which relates the soil's resistance to penetration or it's strength. 0 represents almost no resistance and 100 being the maximum. The higher the value is the stronger the soil, which means it can support larger building, aircraft, or vehicle loads. You may be tasked during a contingency operation to perform a DCP test to evaluate a potential assault strip (landing area) for a C-17 or an area a MAAS will be installed. This testing devise can also be used to check compaction work done by a contractor or even crater repair work accomplished by Airfield Damage Repair (formally known as Rapid Runway Repair (RRR)).

**2. Follow these steps to perform this task:**

**Step 1: SOIL CLASSIFICATION.**

**1.1. Soil Categories:**

**1.1.1.** Coarse Grained: At least half of the material is larger than a number 200 sieve.

**1.1.1.1.** Differentiated by grain size.

**1.1.2.** Fine Grained: More than half of the material is smaller than a number 200 sieve.

**1.1.2.1.** Differentiated by grain size.

**1.1.3.** Peat: Highly organic material.

**1.1.3.1.** Identified by large amounts of organic material.

**1.2. Soil Groups:**

**1.2.1.** Coarse Grained:

**1.2.1.1.** ***Gravel(G)*** – Over half of material is *retained* on #4 sieve.

**1.2.1.2.** ***Sand (S)*** – Over half of material will *pass* through #4 sieve.

**1.2.2.** Fine Grained: Classified by plasticity & compressibility.

**1.2.2.1.** *Silt (M).*

**1.2.2.2.** *Clay (C).*

| **1.3. Soil Characteristics** | **Symbol** |
|---|---|
| **1.3.1.** Well Graded | (W) |
| **1.3.2.** Poorly Graded | (P) |
| **1.3.3.** High Compressibility | (H) |
| **1.3.4.** Low Compressibility | (L) |
| **1.3.5.** Organic {Peat} | (Pt) |
| **1.3.6.** Organic {Silts and Clays} | (O) |
| **1.3.7.** Liquid Limits under 50 | (L) |
| **1.3.8.** Liquid Limits over 50 | (H) |
| **1.3.9.** High Compressibility | (H) |
| **1.3.10.** Low Compressibility | (L) |

**Step 2: DCP**

**2.1. California Bearing Ratio (CBR) Test:**

**2.1.1.** Determined by an arbitrary penetration procedure to obtain a modulus of shearing resistance of subgrade or base course soil to penetration.

**2.1.2.** Designated as a ratio in percent from 0-100.

**2.2. DCP: Purpose**

**2.2.1.** Purpose: Identifies soil layer thickness and strength which helps in supporting the following operations:

**2.2.1.1.** Airfield Evaluations.

**2.2.1.2.** Determines Mobile Aircraft Arresting System (MAAS) fairlead beam configuration & location.

**2.2.1.3.** Aids in expedient Trim Pad setup.

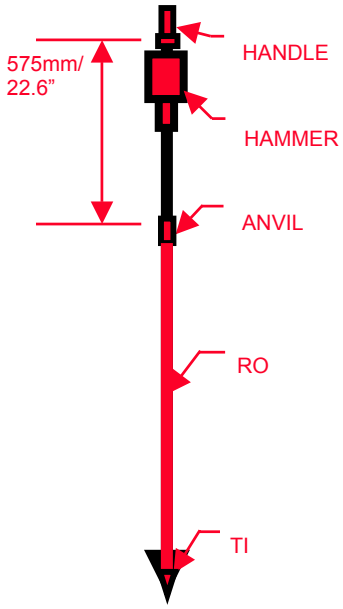
**2.2.1.3.1.** Used for aircraft engine run-ups after engine maintenance/replacement.

**2.3. DCP: Equipment Specifications**

**2.3.1.** Hammer:

**2.3.1.1.** *Single-Mass (8 kg / 17.6 lbs)*. Most tests are conducted with single mass hammer method.

**2.3.1.2.** *Dual-Mass (4.6 kg / 10.1 lbs).*




**2.3.2.** Tips: (15mm / .79” diameter)

**2.3.2.1.** *Disposable:*

**2.3.2.1.1.** Used in compacted soil.

**2.3.2.1.2.** Easy removal from soil.

**2.3.2.2.** *Hard Point.*

**2.3.3.** Vertical Scale:

**2.3.3.1.** Graduated in millimeters and inches.

**2.4. DCP: Operations**

**2.4.1.** Procedures:

**2.4.1.1.** Hold DCP vertically.

**2.4.1.2.** Use hammer to tap device until base of cone is flush with surface. *Base* - widest part of tip (cone).

**2.4.1.3.** Record distance from bottom of hammer to soil’s surface.

**2.4.1.3.1.** Measure to nearest millimeter (.04”) with vertical scale.

**2.4.1.3.2.** Establishes a baseline reading.

**2.4.1.4.** Raise hammer until light contact is made with handle. Causes device to raise.

**2.4.1.5.** Allow hammer to drop freely. Do not exert downward force.

**2.4.1.6.** Ensure rod remains plumb.

**2.4.1.6.1.** Perform new test if rod deviates more than 6” from plumb.

**2.4.1.6.2.** Large aggregate may cause DCP penetration to slant.

**2.4.1.6.3.** Do not apply force to keep device plumb. This will cause damage to rod and connections.

**2.4.1.7.** Count # of blows between measurements.

**2.4.1.7.1.** Allow device to penetrate 25mm or 1” between measurements.

**2.4.1.7.2.** Operator & recorder keep track of # blows.

**2.4.1.8.** Record depth measurement to nearest 5mm (0.2”) and # of blows.

**2.4.1.9.** Conduct test to full depth of rod.

**2.4.1.9.1.** Aircraft affect soils to depths of 36” or more.

**2.4.1.9.2.** MAAS stakes are driven to a depth of 36” or more.

**2.5. DCP: Tests**

**2.5.1.** Locations:

**2.5.1.1.** Test areas which appear to be weakest first.

**2.5.1.1.1.** Weakest condition controls the evaluation.

**2.5.1.1.2.** Keep weak location tests closely spaced.

**2.5.1.2.** Testing areas which appear to be firm & uniform.

**2.5.1.2.1.** Widely spaced.

**2.5.1.2.2.** Require fewer tests.

**2.5.1.3.** No less than 3 tests should be made in areas with similar soil conditions.

**2.5.1.3.1.** Measure to nearest millimeter (.04”) with vertical scale

**2.5.1.3.2.** Establishes a baseline reading.

**2.5.2.** Special Considerations for Clay Soils:

**2.5.2.1.** Tests in highly plastic clays are generally accurate to depth of approx. 12”.

**2.5.2.2.** Deeper layers of clay may give a false indication of a high CBR value. Auguring out 12” of penetration eliminates friction and allows for more accurate measurements.

**2.5.3.** Special Considerations for Sandy Soils:

**2.5.3.1.** Dry sands give low CBR value for few inches of top layer.

**2.5.3.1.1.** May show increasing strength with depth.

**2.5.3.1.2.** Confining action of aircraft tires will increase strength of sand.

**2.5.3.2.** Avoid sands and gravels with percolating water. Auguring out 12” of penetration eliminates friction and allows for more accurate measurements.

**2.5.4.** Special Considerations for Impenetrable Materials: (See Figure 2-1.)

**2.5.4.1.** Stop tests if after 10 blows the cone does not penetrate significantly.

**2.5.4.1.1.** Areas with large amounts of aggregate >2” is not suitable for DCP.

**2.5.4.1.2.** Attempt new test in close proximity.

**2.5.4.2.** If stabilized base cannot be penetrated. Core to its depth and resume with DCP operations.

**NOTE:**
When coring through material assign CBR to specified layer according to material type.

**Figure 2-1. Impenetrable Materials**

| SUGGESTED CBR VALUES FOR IMPENETRABLE MATERIALS | |
|---|---|
| GRADED CRUSHED AGGREGATE | 100 |
| MACADAM | 100 |
| BITUMINOUS BINDER | 100 |
| LIMEROCK | 80 |
| STABILIZED AGGREGATE | 80 |
| SOIL CEMENT | 80 |
| SAND/SHELL OR SHELL | 80 |
| SAND ASPHALT | 80 |

## 2.6. DCP: Recording & Plotting Field Data Manually

**2.6.1.** Recording: (See Figure 2-2.)

**2.6.1.1.** Hammer Factor:

**2.6.1.1.1.** 8 kg = 1

**2.6.1.1.2.** 4.6 kg = 2

**2.6.1.2.** # of Blows.

**2.6.1.3.** Accumulative Depth. Allow device to penetrate 25mm or 1" between measurements.

**2.6.2.** Plotting: (See Figure 2-3.)

**2.6.2.1.** Plot using graph paper.

**2.6.2.1.1.** *Horizontal Scale* – determined by Accumulative Depth. (Example – **1220 mm**). Scale horizontally (10, 20, 30, etc).

**2.6.2.1.2.** *Vertical Scale* – determined by total # blows. (Example – **84**). Scale vertically (100, 200, 300, etc).

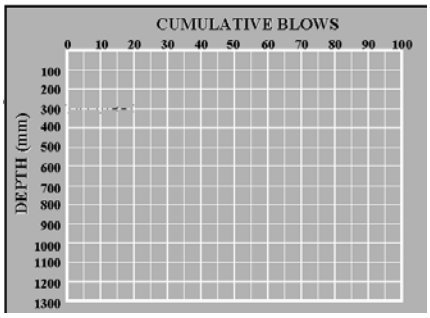
**Figure 2-2. DCP Recording**

Location:
Test # Hammer Factor:

| No. of Blows | Accum. Depth | Accum. Blows | | No. of Blows | Accum. Depth | Accum. Blows |
|---|---|---|---|---|---|---|
| 2 | 20 | | | 1 | 900 | 75 |
| 2 | 80 | 4 | | 1 | 930 | 76 |
| 1 | 100 | 5 | | 1 | 970 | 77 |
| 2 | 130 | 7 | | 1 | 1000 | 78 |
| 3 | 150 | 10 | | 1 | 1030 | 79 |
| 4 | 175 | 14 | | 1 | 1060 | 80 |
| 2 | 200 | 16 | | 1 | 1100 | 81 |
| 2 | 225 | 18 | | 1 | 1150 | 82 |
| 5 | 250 | 23 | | 1 | 1170 | 83 |
| 4 | 275 | 27 | | 1 | 1220 | 84 |
| 4 | 310 | 31 | | | | |
| 4 | 350 | 35 | | | | |
| 3 | 375 | 38 | | | | |
| 4 | 400 | 42 | | | | |
| 4 | 425 | 46 | | | | |
| 2 | 475 | 48 | | | | |
| 4 | 500 | 52 | | | | |
| 2 | 525 | 54 | | | | |
| 2 | 550 | 56 | | | | |
| 2 | 580 | 58 | | | | |
| 2 | 620 | 60 | | | | |
| 4 | 650 | 64 | | | | |
| 1 | 700 | 65 | | | | |
| 2 | 725 | 67 | | | | |
| 2 | 775 | 69 | | | | |
| 3 | 800 | 72 | | | | |
| 1 | 830 | 73 | | | | |
| 1 | 875 | 74 | | | | |

CBR Layer Structure
Layer Thickness CBR

**Figure 2-3. Plotting Graph**



**2.6.2.2.** Plot points from test onto chart. (See Figure 2-4.)

**2.6.2.3.** Connect relative points by drawing straight lines. (See Figure 2-5.)

**2.6.2.4.** Draw horizontal & vertical lines where lines intersect.

**2.6.2.4.1.** Calculate layer depths & blows per layer using these numbers.

**2.6.2.4.2.** Identifies layers of soil. (See Figure 2-6.)

**2.6.2.4.3.** Subjective process.

**Figure 2-4. Plot Points**

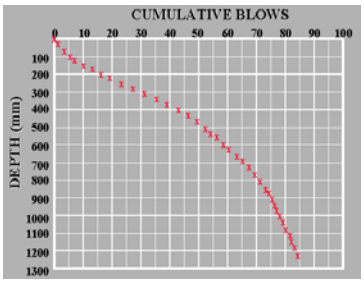



**Figure 2-5. Connecting Points**

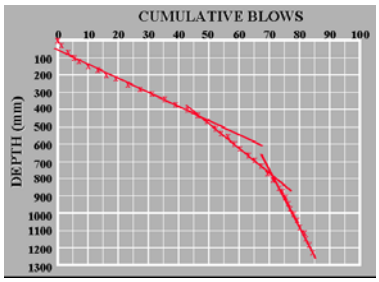
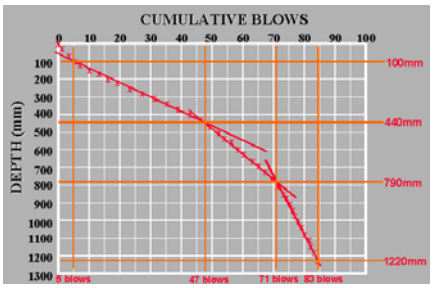



**Figure 2-6. Identifying Layers**




**2.6.2.5.** Determine layer depth - 440 – 100 = 340 (Difference in Depth).

**2.6.2.6.** Determine # of blows per layer - 47 – 5 = 42 (Diff in # of blows).

**2.6.2.7.** (Layer Depth ÷ # Blows per Layer) x Hammer Factor = DCP Index - 340 / 42 x 1 = **8.09 mm / blows.**

**2.6.2.8.** Reference Tabulated Correlation of DCP Index vs. CBR Charts.

**2.6.2.8.1.** 8.09 mm/blows = CBR 30**.** (Figure 2-8 on the next page.)

**2.6.2.8.2.** CH & CL soil types. (See Figure 2-7 on the next page.)

**2.6.2.8.3.** All other or unknown soil types. (See Figure 2-8 on the next page.)

**Figure 2-7. Tabulated Correlation of DCP Index vs. CBR CH and CL Type Soils**

| CH | | | | | | CL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DCP Index | | | DCP Index | | | DCP Index | | | DCP Index | | |
| mm/blow | in/blow | CBR | mm/blow | in/blow | CBR | mm/blow | in/blow | CBR | mm/blow | in/blow | CBR |
| 10 | 0.4 | 35 | 115 | 4.5 | 3 | 19 | 0.7 | 9.6 | 40 | 1.6 | 2.2 |
| 15 | 0.6 | 23 | 120 | 4.7 | 2.9 | 20 | 0.8 | 8.6 | 41 | 1.6 | 2.1 |
| 20 | 0.8 | 17 | 125 | 4.9 | 2.8 | 12 | 0.8 | 7.8 | 42 | 1.7 | 2 |
| 25 | 1 | 14 | 130 | 5.1 | 2.7 | 22 | 0.9 | 7.1 | 43 | 1.7 | 1.9 |
| 30 | 1.2 | 12 | 135 | 5.3 | 2.6 | 23 | 0.9 | 6.5 | 44 | 1.7 | 1.8 |
| 35 | 1.4 | 10 | 140 | 5.5 | 2.5 | 24 | 0.9 | 6 | 45 | 1.8 | 1.7 |
| 40 | 1.6 | 87. | 145 | 5.7 | 2.4 | 25 | 1 | 5.5 | 46 | 1.8 | 1.6 |
| 45 | 1.8 | 7.7 | 150 | 5.9 | 2.3 | 26 | 1 | 5.1 | 47 | 1.9 | 1.6 |
| 50 | 2 | 7 | 155 | 6.1 | 2.3 | 27 | 1.1 | 4.7 | 48 | 1.9 | 1.5 |
| 55 | 2.2 | 6.3 | 160 | 6.3 | 2.2 | 28 | 1.1 | 4.4 | 49 | 1.9 | 1.4 |
| 60 | 2.4 | 5.8 | 165 | 6.5 | 2.1 | 29 | 1.1 | 4.1 | 50 | 2 | 1.4 |
| 65 | 2.6 | 5.4 | 170 | 6.7 | 2 | 30 | 1.2 | 3.8 | 51 | 2 | 1.3 |
| 70 | 2.8 | 5 | >175 | >6.9 | <2 | 31 | 1.2 | 3.6 | 52 | 2 | 1.3 |
| 75 | 3 | 4.6 | | | | 32 | 1.3 | 3.4 | 53 | 2.1 | 1.2 |
| 80 | 3.1 | 4.3 | | | | 33 | 1.3 | 3.2 | 54 | 2.1 | 1.2 |
| 85 | 3.3 | 4.1 | | | | 34 | 1.4 | 3 | 55 | 2.2 | 1.1 |
| 90 | 3.5 | 3.9 | | | | 35 | 1.4 | 2.8 | 56 | 2.2 | 1.1 |
| 95 | 3.7 | 3.7 | | | | 36 | 1.4 | 2.7 | 57 | 2.2 | 1.1 |
| 100 | 3.9 | 3.5 | | | | 37 | 1.5 | 2.5 | 58 | 2.3 | 1 |
| 105 | 4.1 | 3.3 | | | | 38 | 1.5 | 2.4 | >59 | >2.3 | <1 |
| 110 | 4.3 | 3.2 | | | | 39 | 1.5 | 2.3 | | | |

**Figure 2-8. Tabulated Correlation of DCP INDEX vs. CBR**

| DCP Index | | | DCP Index | | | DCP Index | | |
|---|---|---|---|---|---|---|---|---|
| mm/blow | in/blow | CBR | mm/blow | in/blow | CBR | mm/blow | in/blow | CBR |
| <3 | 0.10 | 100 | 12 | | 18 | 56-57 | 2.2 | 3.2 |
| | 0.11 | 92 | | 0,50 | 17 | 58 | | 3.1 |
| | 0.12 | 84 | 13 | | 16 | 59-60 | | 3 |
| 3 | | 80 | 14 | 0.55 | 15 | 61-62 | 2.4 | 2.9 |
| | 0.13 | 76 | 15 | 0.60 | 14 | 63-64 | 2.5 | 2.8 |
| | 0.14 | 70 | 16 | 0.65 | 13 | 65-66 | 2.6 | 2.7 |
| | 0.15 | 65 | 17 | 0.70 | 12 | 67-68 | | 2.6 |
| | 0.16 | 61 | 18-19 | | 11 | 69-71 | 2.8 | 2.5 |
| 4 | | 60 | 20-21 | 0.80 | 10 | 72-74 | | 2.4 |
| | 0.17 | 57 | 22-23 | 0.90 | 9 | 75-77 | 3.0 | 2.3 |
| | 0.18 | 53 | 24-26 | 1.0 | 8 | 78-80 | | 2.2 |
| 5 | 0.19 | 50 | 27-29 | | 7 | 81-83 | | 2.1 |
| | 0.20 | 47 | 30-34 | 1.2 | 6 | 84-87 | 3.4 | 2 |
| | 0.21 | 45 | 35-38 | 1.4 | 5 | 88-89 | 3.5 | 1.9 |
| | 0.22 | 43 | 39 | | 4.8 | 92-96 | | 1.8 |
| | 0.23 | 41 | 40 | | 4.7 | 97-101 | 4.0 | 1.7 |
| 6 | | 40 | 41 | 1.6 | 4.6 | 102-107 | | 1.6 |
| | 0.24 | 39 | 42 | | 4.4 | 108-114 | | 1.5 |
| | 0.25 | 37 | 43 | | 4.3 | 115-121 | | 1.4 |
| 7 | 0.26 | 35 | 44 | | 4.2 | 122-130 | 5.0 | 1.3 |
| | 0.27 | 34 | 45 | | 4.1 | 131-140 | | 1.2 |
| | 0.28 | 32 | 46 | 1.8 | 4 | 141-152 | | 1.1 |
| | 0.29 | 31 | 47 | | 3.9 | 153-166 | 6.0 | 1 |
| 8.09 | | | | | | | | |
| 8 | 0.30 | 30 | 48 | | 3.8 | 166-183 | 7.0 | 0.9 |
| 9 | 0.35 | 25 | 49-50 | | 3.7 | 184-205 | 8.0 | 0.8 |
| | 0.40 | 22 | 51 | 2.0 | 3.6 | 206-233 | 9.0 | 0.7 |
| 10-11 | | 20 | 52 | | 3.5 | 234-271 | 10.0 | 0.6 |
| | 0.45 | 19 | 53-54 | | 3.4 | 272-324 | | 0.5 |
| | | | 55 | | 3.3 | >324 | | <0.5 |

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

***Exercise #1.***

Determine CBR for remaining layers:

**1.** Repeat 2.6.2.5. – 2.6.2.8. to identify CBR for each remaining layer.

**2.** *Results are very subjective when determining where to break layers, # of layers, # of blows per layer, etc.*

(A.) Layer Depth:

(B.) Blows per Layer:

(C.) mm/blow:

(D.) CBR:

**Step 3: DCP SOFTWARE**

**3.1. Kessler Program:**

**3.1.1.** Automatically generates plot from data input. (See Figure 3-1.)

**3.1.2.** Manually determine layer depths. (See Figure 3-2.)

**3.1.2.1.** Draw horizontal line at a point, which deviates significantly.

**3.1.2.2.** Transfer information to bottom of data sheet.

**3.1.3.** Manually determine CBR values. (See Figure 3-3.)

**3.1.3.1.** Draw vertical line through average range of CBR scale.

**3.1.3.2.** Read CBR value from top of horizontal scale.

**3.1.3.3.** Transfer information to bottom of data sheet.

**NOTE:**
Soil type must be through lab or field tests prior to DCP tests.

**Figure 3-1. DCP Test Data**

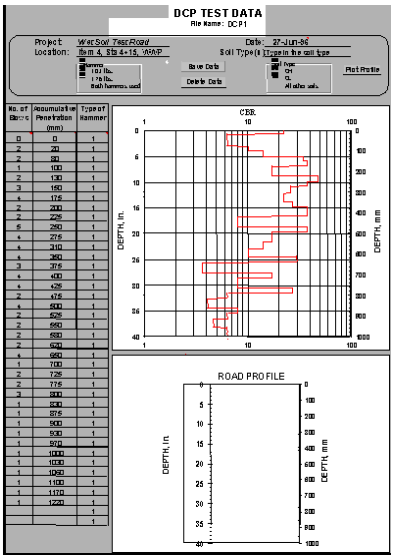



**Figure 3-2. DCP Test Data**

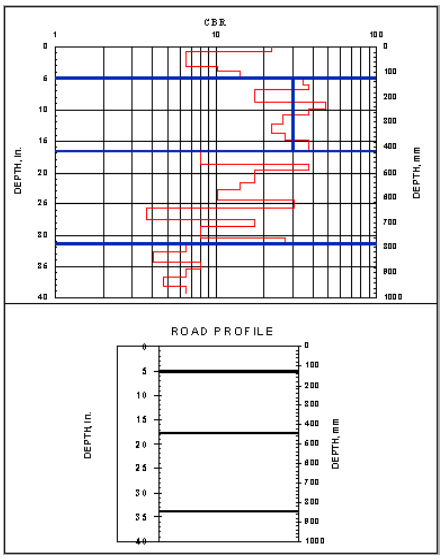
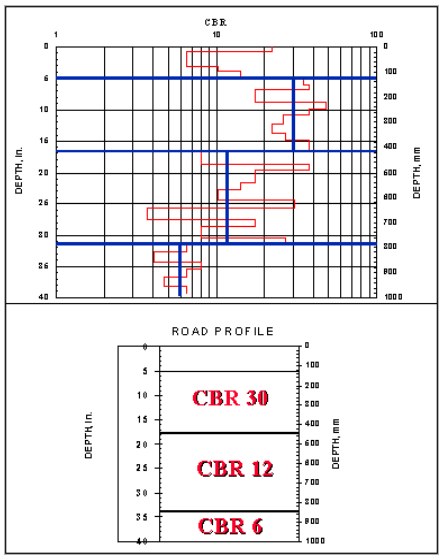



**Figure 3-3. DCP Test Data**




**3.2. PCASE:**

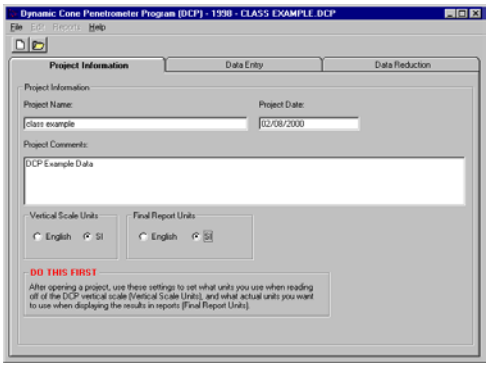
**3.2.1.** Enter new project data under Project Information Tab. (See Figure 3-4.)

**3.2.1.1.** Project Name.

**3.2.1.2.** Project Date.

**3.2.1.3.** Vertical Scale & Final Report Units.

**Figure 3-4. Project Information Tab**

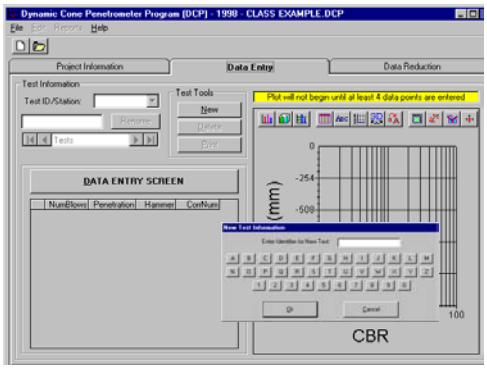


**3.2.2.** Click on Data Entry Tab. (See Figure 3-5.)

**3.2.2.1.** Click on New under Test Tools.

**3.2.2.2.** Identify test alphanumerically & Click Ok.

**Figure 3-5. Data Entry Tab**




**3.2.3.** Click Data Entry Screen button and enter field data. (See Figure 3-6.)

**3.2.3.1.** # Blows.

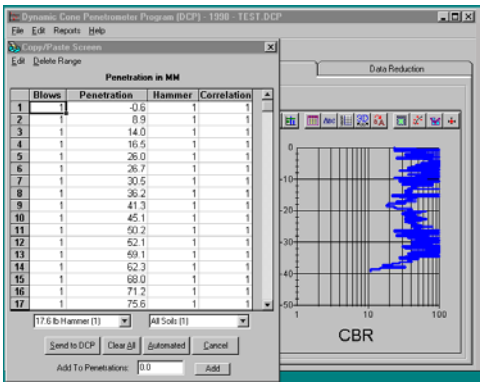
**3.2.3.2.** Penetration.

**3.2.3.3.** Hammer Factor.

**3.2.3.4.** Correlation (Soil Type).

**3.2.4.** Click Send to DCP button and an automated plot will appear. (See Figure 3-6.)

**Figure 3-6. Data Entry Screen**



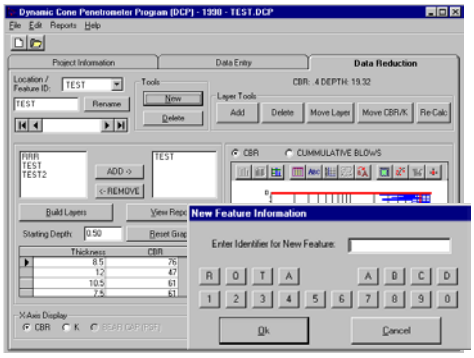

**3.2.5.** Click Data Reduction Tab. (See Figure 3-7.)

**3.2.5.1.** Click on New button under Tools.

**3.2.5.2.** Enter Alphanumeric identifier.

**3.2.5.3.** Click Ok.

**Figure 3-7. Data Reduction Tab**



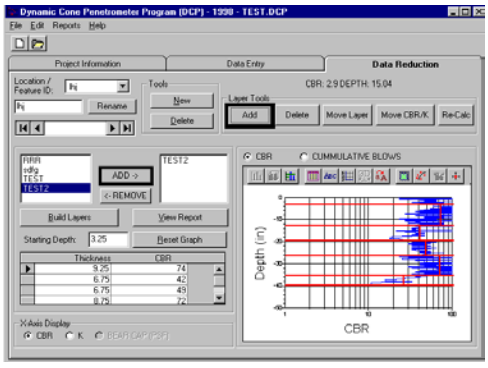

**3.2.6.** Click ADD button and plot should automatically appear. (See Figure 3-8.)

**3.2.7.** Click Add button under Layer Tools.

**3.2.7.1.** Subjectively click mouse where layer breaks should appear.

**3.2.7.2.** Automatically calculates CBR values.

**Figure 3-8. Data Entry Screen**



## REVIEW QUESTIONS
## FOR
## DETERMINE FIELD CALIFORNIA BEARING RATION (CBR) USING DYNAMIC CONE PENETROMETER (DCP) (20.17.)

| QUESTION | ANSWER |
|---|---|
| 1. Which is **NOT** a typical use for the DCP test? | a. Determine soil type.<br>b. Determine soil CBR.<br>c. Evaluate MAAS installation area.<br>d. Checking contractor compaction work. |
| 2. Which hammer is used on soil with CBR values of 10 or less? | a. 4.6 kg / 10.1 lbs.<br>b. 8 kg / 17.6 lbs. |
| 3. The DCP is not suitable for what size of aggregate? | a. ¾".<br>b. 1-1/2".<br>c. 1-3/4".<br>d. 2-1/4". |
| 4. When should a DCP test be stopped? | a. If it takes more than 10 blows to penetrated 25 millimeters.<br>b. If the rod moves off its vertical axis more than 6 inches.<br>c. To remove a soil layer that cannot be penetrated.<br>d. All of the choices are correct. |
| 5. What is determined by the point(s) where straight lines cross on a manual DCP plot? | a. Type of soil.<br>b. CBR strength.<br>c. Soil layer breaks.<br>d. Distance per DCP blow. |

## DETERMINE FIELD CALIFORNIA BEARING RATION (CBR) USING DYNAMIC CONE PENETROMETER (DCP) (20.17.)

## PERFORMANCE CHECKLIST

**INSTRUCTIONS:**

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. perform the DCP test correctly? | | |
| 2. record the DCP test data correctly? | | |
| 3. plot the DCP test data correctly? | | |
| 4. determine the layer structure correctly? | | |
| 5. calculate the CBR correctly? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

## MODULE 20 AFQTP UNIT 18

## FORCE PROTECTION ENGINEERING CONSIDERATIONS AND MEASURES (20.18.)

## FORCE PROTECTION ENGINEERING CONSIDERATIONS AND MEASURES

## *Task Training Guide*

| | |
|---|---|
| **STS Reference Number/Title:** | 20.18. – (Apply) force protection engineering considerations and measures. |
| **Training References:** | 1. Career Development Course (CDC) 3E551A Engineering Journeyman, Volume 2, Unit 1, *Contingency Bare Base Planning*.<br>2. Air Force Handbook (AFH) 10-222, Volume 3, *Guide to Civil Engineer Force Protection*.<br>3. Training Video # 613397, *Engineer Force Protection, Jul 98.* |
| **Prerequisites:** | 1. **Possess as a minimum a 3E551 AFSC**.<br>2. **Review the following references:**<br>2.1. AFH 10-222, Volume 3.<br>2.2. CDC 3E551A, Volume 2, Unit 1.<br>3. **Complete Training Video # 613397.** |
| **Equipment/Tools Required:** | 1. Facility site plan.<br>2. Facility priority list (contained in Contingency Response Plan).<br>3. List of critical assets for facility. |
| **Learning Objective:** | Given scenario, develop force protection plan for a facility. |
| **Samples of Behavior:** | The trainee will be able to develop force protection planning. |
| **Note:** | |
| Trainer needs to provide a scenario. | |

## FORCE PROTECTION ENGINEERING CONSIDERATIONS AND MEASURES

**1. Background.** The types of facilities US forces may operate from include main operating bases, collocated operating bases, stand-by bases, forward operating bases, and bare bases. These installations may be developed or consist of only a runway. As long as a base can support its wartime and contingency missions adequately, the Air Force will use it. Engineer force protection planning consists of five major steps:

**1.1.** Determine assets to be protected.

**1.2.** Define threats and attack probabilities.

**1.3.** Determine levels of protection for assets.

**1.4.** Identify constraints, and

**1.5.** Design protective systems to counter threats.

Your job is to determine the requirements necessary to make the bare base fully functional using the combat air base planning process.

**2.** Review the training videos # 613397, *Engineer Force Protection*, Jul 98 for information on force protection. **Upon completion of the above-mentioned video, properly develop a force protection plan using the step-by-step procedures listed below.**

**3. Follow these steps to perform this task:**

**Step 1: Trainee is provided with scenario.**

**Step 2: Develop a force protection plan.**

**NOTE TO TRAINER:**
In order for the trainee to accomplish this task, ensure the trainee has access to the items listed in the Equipment/Tools Required. Build an exercise scenario where the trainee will have to develop a force protection plan for a bare base deployment.

## FORCE PROTECTION ENGINEERING CONSIDERATIONS AND MEASURES

## PERFORMANCE CHECKLIST

## INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

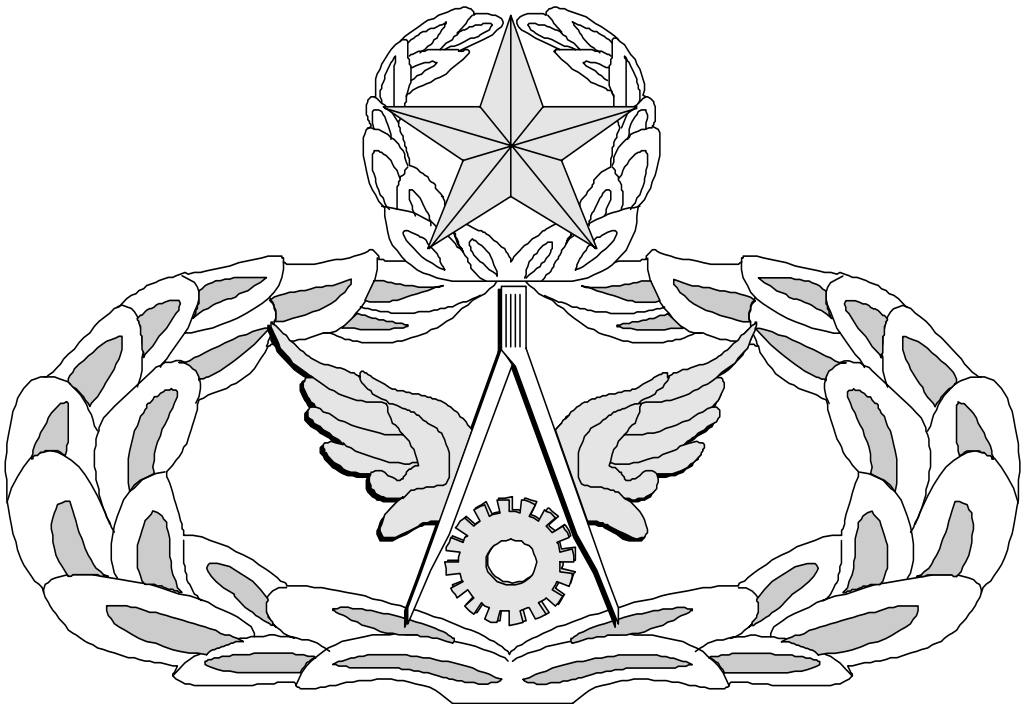
| DID THE TRAINEE…. | YES | NO |
|---|---|---|
| 1. consider functional grouping? | | |
| 2. make sure proposed area is adequate to support the number of shelters necessary for the base population? | | |
| 3. use the existing terrain and vegetation to hinder observation of site from air? | | |
| 4. locate shelters to take advantage of the concealing features of trees and hills? | | |

**FEEDBACK:** Trainer/Certifier should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer/certifier.

# Air Force Civil Engineer

## QUALIFICATION TRAINING PACKAGE (QTP)

### REVIEW ANSWER KEY



**FOR**

## ENGINEERING

**(3E5X1)**

## MODULE 20

## AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES

**Notice.** This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## PERFORM INITIAL AIRFIELD ASSESSMENT
**(3E5X1-20.2.1.)**

| QUESTION | ANSWER |
|---|---|
| 1. Who can perform an initial airfield assessment? | d. An personnel in the area can call in damage to the Survival Recovery Center. |
| 2. What are the three main areas of concern on the airfield? | b. Runway, Taxiways, and Aprons. |

## PERFORM AIRFIELD DAMAGE ASSESSMENT
**(3E5X1-20.2.2.)**

| QUESTION | ANSWER |
|---|---|
| 1. What is the Airfield Damage Assessment Team (DAT) composition? | a. 2- EOD technicians, 1-3E5X1s, 1-Augmentee. |
| 2. When expressing crater location what measurement is used? | b. The center of the crater. |
| 3. What does the letter “S” identifies when locating airfield damage? | a. Spall. |
| 4. How are grid coordinates read? | b. Right and up. |
| 5. How are large bomblet fields located? | b. Using the double point coordinate system. |

## PLOT AIRFIELD DAMAGE
**(3E5X1-20.7.)**

| QUESTION | ANSWER |
|---|---|
| 1. How are crater sizes plotted? | b. Double the apparent diameter. |
| 2. When plotting the coordinate X450 R60, what does the number 450 indicate? | a. Distance down the runway from the threshold. |
| 3. When plotting the coordinate S850 R35 W50 F1900 L15 W75 N250, what does N250 indicate? | a. 250 spalls. |

## 0DETERMINE FIELD CALIFORNIA BEARING RATION (CBR) USING DYNAMIC CONE PENETROMETER (DCP) (20.17.)

| QUESTION | ANSWER |
|---|---|
| 1. Which is **NOT** a typical use for the DCP test? | a. Determine soil type |
| 2. Which hammer is used on soil with CBR values of 10 or less? | b. 8 kg / 17.6 lbs. |
| 3. The DCP is not suitable for what size of aggregate? | d. 2-$^{1}/_{4}$". |
| 4. When should a DCP test be stopped? | d. All of the choices are correct. |
| 5. What is determined by the point(s) where straight lines cross on a manual DCP plot? | c. Soil layer breaks. |

**APPENDIX A**

MEMORANDUM FOR HQ AFCESA/CEOF
139 Barnes Drive Suite 1
Tyndall AFB, FL 32403-5319

FROM:

SUBJECT: Qualification Training Package Improvement

1. Identify module.

   Module # and title_____

2. Identify improvement/correction section(s):

   _____ STS Task Reference
   _____ Training Reference
   _____ Evaluation Instructions
   _____ Performance Resources
   _____ Steps in Task Performance
   _____ Performance Checklist
   _____ Feedback
   _____ Format
   _____ Other

3. Recommended changes--use a continuation sheet if necessary.

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

4. You may choose to call in your recommendations to DSN 523-6322 or FAX DSN/Commercial 523-6488 or (850) 283-6488 or email ceof.helpdesk@tyndall.af.mil.

5. Thank you for your time and interest.

YOUR NAME, RANK, USAF
Title/Position