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AT1405
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STUDENT OUTLINE

FIRING A JAVELIN WEAPON SYSTEM

TERMINAL LEARNING OBJECTIVE

1. Given a M98A1 Javelin command launch unit, a Basic Skills Trainer, and a simulation missile, while wearing a fighting load, qualify with a M98A1 Javelin by achieving hits on target for 8 of the 11 scenarios. (51TR.02.14)

ENABLING LEARNING OBJECTIVES

1. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, utilize the full stadia method to determine target engagability in accordance with TM 09397B-12/1. (51TR.02.14a)
2. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, determine the attack mode in accordance with TM 09397B-12/1. (51TR.02.14b)
3. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, activate the seeker in accordance with TM 09397B-12/1. (51TR.02.14d)
4. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, achieve seeker lock-on in accordance with TM 09397B-12/1. (51TR.02.14e)
5. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, launch a missile in accordance with TM 09397B-12/1. (51TR.02.14f)
6. Given a SL-3 complete M98A1 Javelin command launch unit, an encased missile, and a target, determine the attack mode in accordance with TM 09397B-12/1. (51TR.02.14c)

1. **STANDARD JAVELIN ENGAGEMENT PROCEDURES**

a. Prepare a Javelin for firing

- (1) Connect the Command Launch Unit (CLU) to the round.
- (2) Place CLU Power switch in NIGHT Position.
- (3) Remove the forward end cap.
- (4) Assume a Javelin firing position.
- (5) Identify the target and determine engagability.

b. CLU Display indicators. The display indicators are used to identify whether a target is in or out of range (stadia); the area of a scene that is

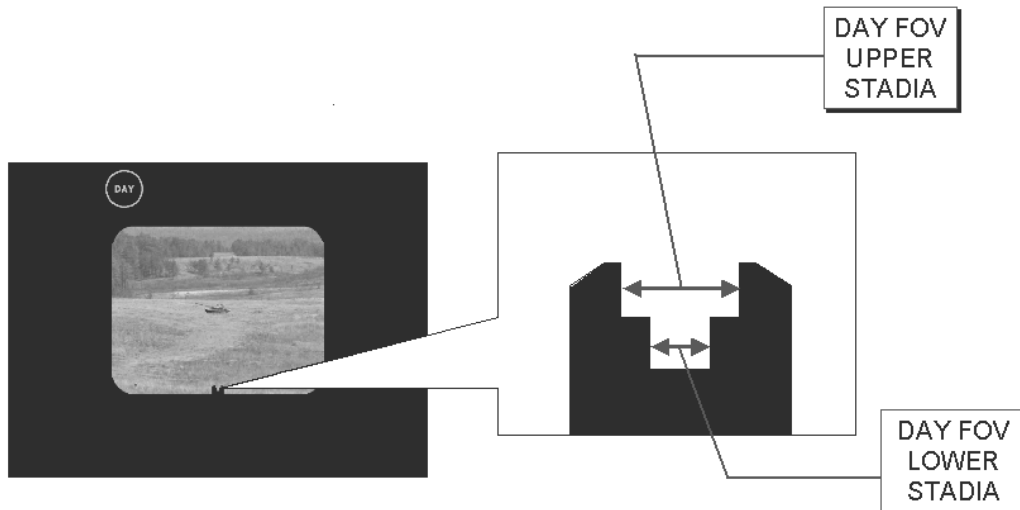
displayed in the next FOV (reticles); and seeker operation (track gates and crosshairs). They fall into four categories: stadia, reticles, track gates, and crosshairs.

(1) Stadia. Stadia are seen in all FOV's and appear differently depending on the FOV being displayed.

(a) Day FOV stadia. Day FOV stadia are attached permanently to and appear at the bottom center of the CLU display. The day FOV stadia are made up of the upper stadia and the lower stadia.

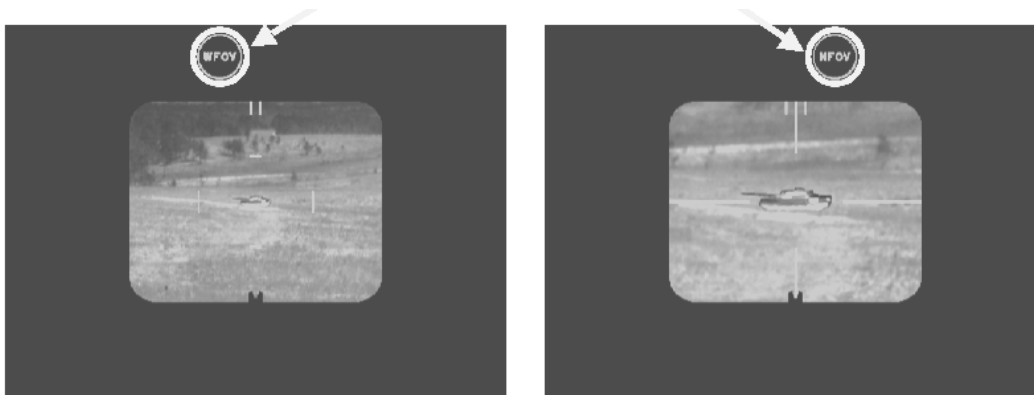
(b) Upper stadia. The day FOV upper stadia comprise the upper portion of the day FOV stadia (larger gap).

(c) Lower stadia. The day FOV lower stadia are located in the lower portion (smaller gap), directly below the day FOV upper stadia. The distance across the lower FOV stadia is approximately half that of the day FOV upper stadia.



(d) WFOV stadia. WFOV stadia consist of two vertical lines centered at the top of the CLU display. The WFOV stadia are only visible in WFOV.

(e) NFOV stadia. NFOV stadia also consist of two vertical lines centered at the top of the CLU display. The NFOV stadia are only visible in NFOV.

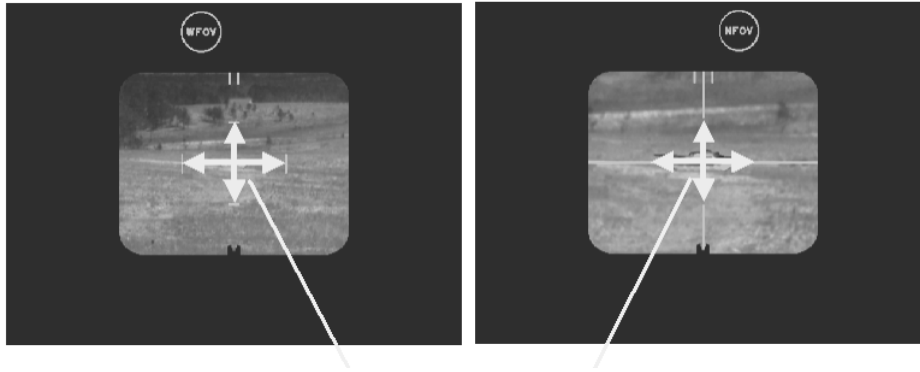


(2) Reticle. In WFOV or NFOV, vertical and horizontal lines appear on the CLU display. These lines, called a reticle, help the gunner to keep track of a target as he changes FOV. The reticle defines an area within the FOV being viewed. The scene within that area is what the gunner sees when he

changes to a FOV with a higher magnification. The idea is to keep the target in sight when changing Fields of View. To do this, the gunner must move the CLU to center the target within the reticle, then, change FOV.

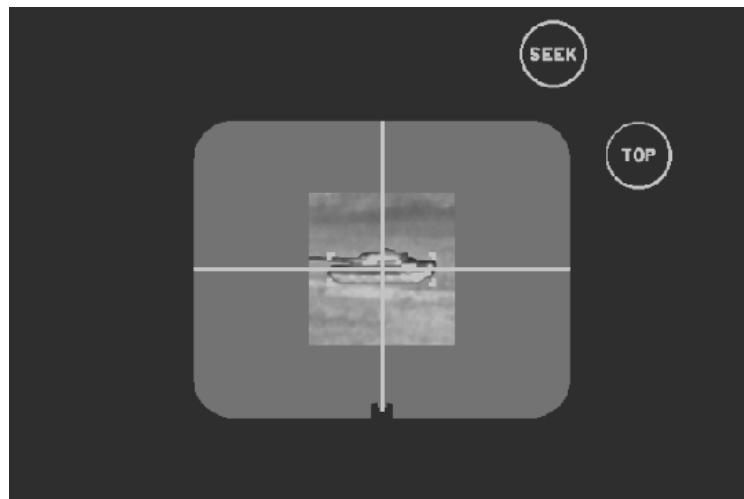
(a) WFOV reticle. In WFOV, the reticle looks like an open-cornered rectangle. There are two horizontal lines (one at the top and one at the bottom) and two vertical lines (one on either side). The inside of this rectangle represents the scene that the gunner sees when he selects NFOV.

(b) NFOV reticle. In NFOV, the four reticle lines look like crosshairs with the center removed. The vertical lines split the day and NFOV stadia. The square area inside the ends of these four lines represents the scene that the gunner sees when he activates the seeker.



(3) Track gates. When the gunner activates the seeker, four marks called track gates appear on the CLU display. These look like the four corners of an open-sided square. The track gates are used by the gunner to lock the seeker onto the target. When the seeker FOV first comes up, the track gates are flashing. This is a visual indication that the missile seeker is active but not locked onto the target. Once the gunner adjusts the track gates to surround the target, he can lock the seeker on the target.

(4) Crosshairs. The crosshairs stretch completely across the CLU display from top to bottom and from side to side. When the gunner squeezes and holds the seeker trigger, flashing crosshairs appear. After seeker lock-on, the track gates and crosshairs stop flashing



c. Activate the seeker. When you activate the seeker, you also activate the BCU, which cools down the missile. Upon seeker activation the BCU will only be useable for 4 minutes. If you do not launch the missile prior to 4

minutes, then you will be required to attach a new BCU before you will be able to fire.

(1) Lift the seeker trigger guard on the left handgrip.

(2) Squeeze the seeker trigger and wait for the seeker (**SEEK**) and **MISSILE NOT READY** (⊗) indicators to light. (The **NARROW FIELD OF VIEW** (**NFOV**) indicator remains lit.)

(3) Within 4 seconds after release of the seeker trigger the following indicators will light: **SEEK** and **MISSILE NOT READY**.

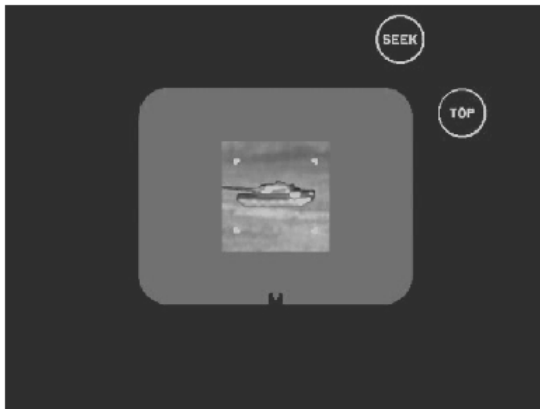
(4) Ten to fifteen seconds after the seeker activates, the **NFOV**, and **MISSILE NOT READY** indicators go out, and the **TOP** indicator comes on. The seeker FOV with flashing track gates appears on the CLU display.

d. Change attack mode, change if necessary

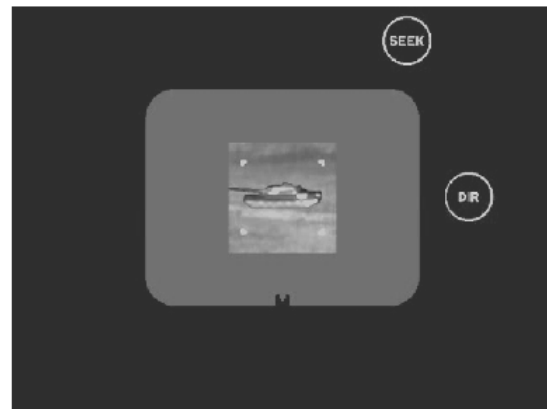
(1) Top attack is the default mode for the missile.

(2) If direct attack is the desired attack mode, select it using the attack select (ATTK SEL) switch. The direct attack mode must be selected before the seeker is locked onto a target.

(3) The attack mode can be changed between top attack and direct attack any time before seeker lock-on by pressing the ATTK SEL switch. The appropriate mode indicator lights on the CLU display.



TOP ATTACK



DIRECT ATTACK MODE

e. Adjust the track gates. The track gates are adjusted using the gate adjust/contrast and brightness (GATE ADJ/CTRS & BRT) switch.

(1) With the right thumb, press the GATE ADJ/CTRS & BRT switch up, down, left, or right. The track gates open or close around the center of the seeker FOV.

(2) Pressing the GATE ADJ/CTRS & BRT switch up or down increases or decreases the height of the track gates.

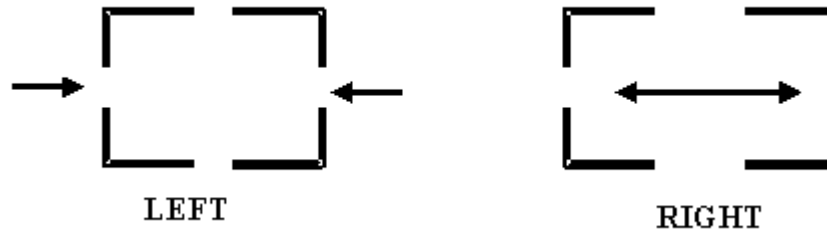
(3) Pressing the GATE ADJ/CTRS & BRT switch left or right increases or decreases the width of the track gates.

(4) Position the track gates around the target.

(5) Position target in the center of the seeker FOV.

(6) Adjust the track gates to position the left track gate on the left edge of the target and the right track gate on the right edge of the target.

(7) If the target is too large to position the track gates around it, adjust the track gates around the outside edges of the target's center of mass.



f. Achieve Lock-On

(1) Squeeze-and-hold the seeker trigger. Flashing crosshairs appear to indicate lock-on is in progress. Keep track gates and crosshairs on the target while the seeker is locking on. Two things happen to show lock-on has occurred, the track gates and crosshairs stop flashing.

(2) It is very important to keep the track gates and crosshairs on the target while the seeker is locking on to the target.

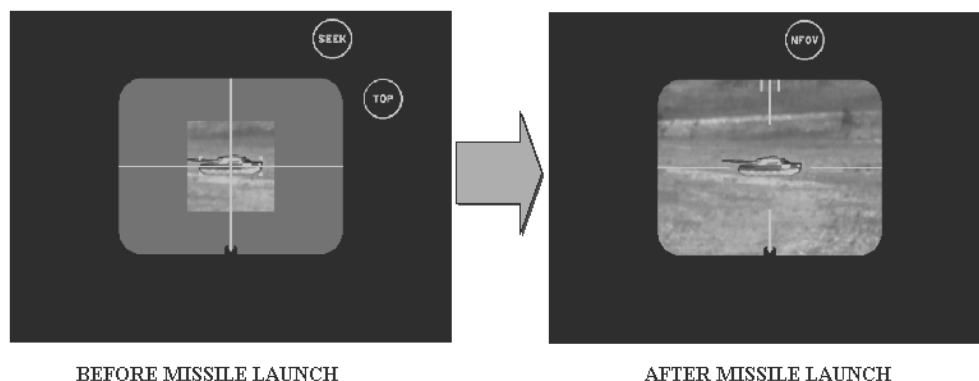
g. Launch the missile

(1) Ensure track gates and crosshairs are not flashing. Missile will not launch if they are flashing.

(2) Center the crosshairs on the target, then, squeeze-and-hold the fire trigger until the missile launches.

(3) Do not release the seeker trigger until after the missile launches, otherwise, the seeker breaks lock-on. The seeker may not always lock-on to a target. This is indicated when the gunner squeezes and holds the seeker trigger, the crosshairs are displayed, and the track gates and/or crosshairs flash.

(4) After the missile launches and the CLU display reverts back to the last FOV, release the fire and seeker triggers.



h. Perform battle damage assessment. The gunner can proceed in one of three ways:

(1) Remove the empty Launch Tube Assembly (LTA), relocate to a new firing position and reacquire the fired-upon target.

(2) Reload and observe the fired-upon target through the CLU.

(3) Continue observing the target through the CLU until the missile impacts on the target.

i. Javelin Rapid Engagement Technique. This technique is designed to enable the gunner to rapidly engage a target when he does not have the time for the NVS to cool down. All the steps are the same as in the standard engagement procedure except that in step a., the gunner activates the seeker before he assumes a firing position. This action starts the 10-second seeker cool down. By the time the gunner gets into a firing position, he should have seeker FOV.

(1) Prepare the Javelin for firing.

(2) Connect the CLU to a round and turn the CLU power switch to the Night position.

(3) Activate the seeker (hold the seeker trigger and listen for the BCU to "pop" before releasing seeker trigger).

(4) Remove the forward end cap.

(5) Assume a firing position and check the CLU display for the **DAY**, **SEEK**, and **TOP** indicators are lit and that the Seeker FOV and flashing track gates are present.

(6) Change attack mode, if necessary.

(7) Adjust track gates and lock-on the target.

(8) Check crosshairs and track gates.

(9) Launch the missile and perform battle damage assessment.

3. BREAK LOCK AND OTHER ACTIONS. The gunner must constantly be aware of target location, with respect to any battlefield cover and other friendly forces. Depending on the target's location on the battlefield, it may be possible for the target to find cover or to enter an area of high IR clutter. Also, the target's movement to the proximity of friendly troops may cause an engagement to be terminated. It is very important that the gunner recognize the conditions that may lead up to a "break-lock", or a "terminate an engagement" situation.

a. Break-Lock Situation. A break-lock occurs when the seeker crosshairs and the track gates flash. A break-lock situation can occur under one of the following situations: Seeker trigger release, target reaches cover, failure to maintain tracking rate, and target enters IR clutter.

b. Seeker Trigger Release. If the gunner wishes to break seeker lock, he releases his hold on the seeker trigger. The seeker crosshairs disappear and the track gates resume flashing. If the gunner releases the trigger by accident (hand slip) then break lock will occur.

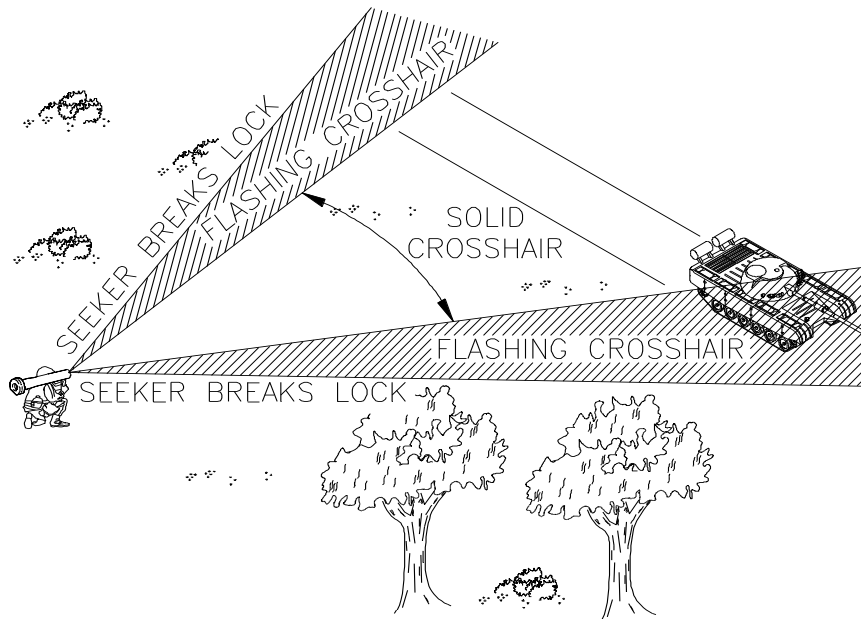
c. Target Reaches Cover. Break-lock can also occur when the target disappears from the seeker FOV and goes behind an object or a terrain feature (i.e., hill, woods, buildings, etc).

(1) If the target does not reappear then the gunner must reacquire a new target before expiration of the BCU, or terminate engagement.

(2) If the target reappears within five seconds then the seeker may lock onto the target again.

d. Failure to maintain tracking rate. If the gunner allows the crosshairs to move off the target (outside the track gates), the crosshairs start to flash. The gunner must move the crosshairs back on the target (inside the track gates).

(1) If the gunner does not maintain his tracking rate and allows the crosshairs to move even further off the target (outside the track gates) both the crosshairs and track gates start to flash and break-lock occurs.



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e. Infrared Clutter. IR clutter is defined as a scene where the surrounding area or background radiates as much heat or more heat than the target itself. This results in the target being washed out or undetectable with an IR system. IR clutter may be natural or man made. Examples of Natural IR clutter would include terrain features such as rocks, sand, boulders, etc. Examples of man made IR clutter would include burning vehicles, burning debris and flares that are hotter than the engagement target. When the target enters an area containing high IR clutter, the gunner may have to attempt to re-lock onto the target with smaller track gates or wait for the target to leave the IR clutter area before he can lock onto the target. The seeker may also break-lock due to the lack of temperature variations or if the background is hotter than the target.

f. Actions for a Break-Lock

(1) Release the seeker trigger and reacquire the target in seeker FOV. Maintain the target in the center of the seeker FOV.

(2) Re-adjust the track gates until they touch all four edges of the target.

(3) Squeeze and hold the seeker trigger. Lock-on is re-established if the track gates stop flashing and solid crosshairs appear on the CLU display.

(4) If lock-on cannot be reestablished after several tries, end the engagement and replace the BCU.

g. Terminate an Engagement after Seeker Activation. There are a few reasons why you would terminate an engagement after seeker activation. Your squad leader may order you to terminate the engagement. Also, after a break-lock, if the gunner cannot re-establish lock and launch the missile before the BCU is spent then you might also have to terminate the engagement. Or, if the break-lock occurs because the target reaches cover, or enters an area of high IR clutter and then break lock occurs (the gunner ends the engagement and replaces the BCU.)

(1) Release the seeker trigger.

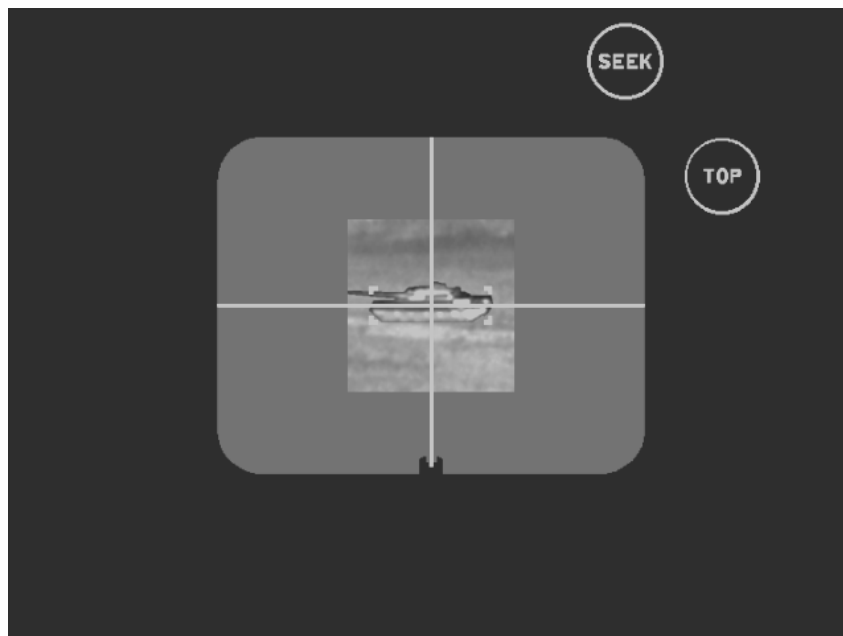
(2) Ground the Javelin.

(3) Remove spent BCU and install a new BCU on the round.

(4) Continue the mission or restore the Javelin to a carry configuration.

4. LOCK QUALITY. Lock quality is important because it effects the accuracy of the missile.

a. Proper track gate size.



(1) Track gates too large. When the track gates are too large, they include part of the surrounding terrain. This is undesirable in that the seeker may lose the target during missile flight and impact on the "ground" part of the target, instead of the "vehicle" part of the target. If the track gates are too large, the gunner should break-lock, adjust the track gates so that they are smaller, and attempt to lock-on to the target again.

He, also, may try moving the position of the target within the track gates and attempt lock-on, again. This should be done until an acceptable lock-on is achieved.

(2) Track gates too small. When the track gates are too small, the track gates only surround a portion of the target instead of the complete target. If the track gates are too small, the gunner should break-lock, adjust the track gates so that they are larger, and re-lock onto the target. The gunner may also try moving the position of the target within the track gates and attempt lock-on, again. This should be done until a acceptable lock-on is achieved.

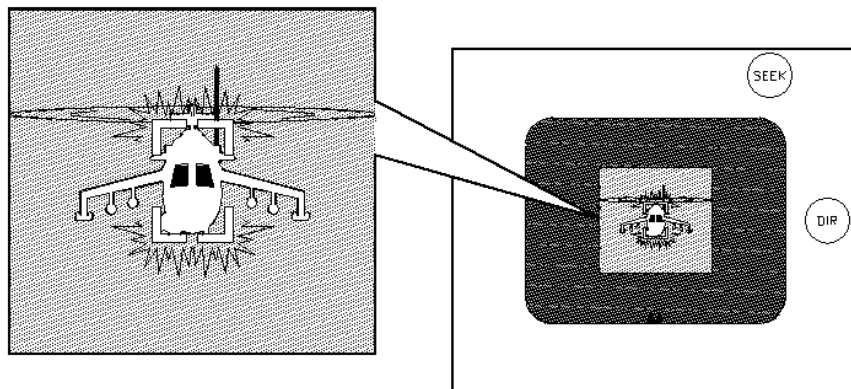
(3) Unstable track gates. If the track gates seem to jump from one position to another at lock-on (unstable), the seeker does not have a good lock-on the target. Some object in the track gates that may not be seen by the gunner causes this. However, the seeker can see the object and is trying to incorporate it into the lock-on solution. The gunner should break-lock, decrease the size of the track gates, and attempt to lock-on to the target again.

b. IR Crossover. The gunner must wait until the delta-Ts in the target scene change. Delta-Ts change when the target scene warms due to solar heating, if it cools from a lack of solar heat, or if the target warms itself from movement and/or running the engine.

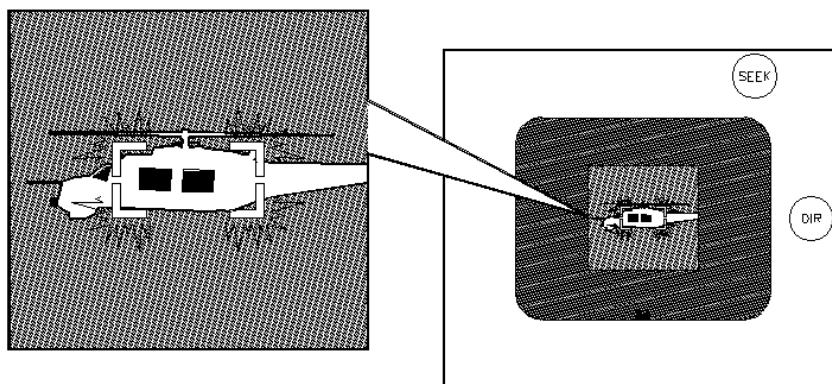
5. ADDITIONAL TARGETS

a. Hovering Helicopters. The Javelin is capable of attacking hovering helicopters, although you must use the direct attack mode, as the static electricity from the rotating blades may cause disruption in the Javelin missile while in top attack mode.

(1) Frontal target. Adjust the track gates so that they surround only the nose of the fuselage. Any appendages (such as armaments, wings, rotor, etc.) should be ignored.



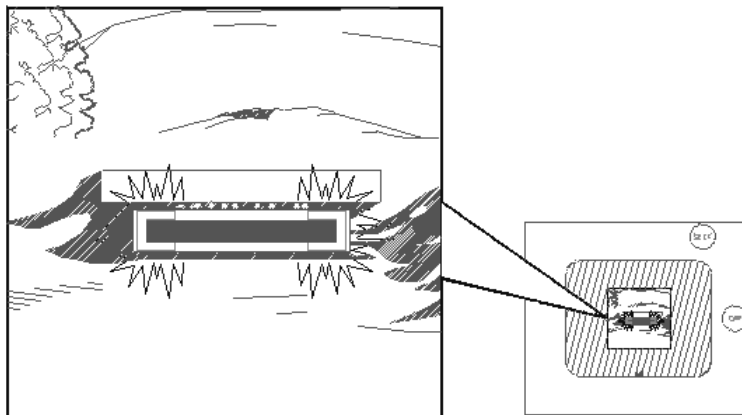
(2) Flank targets. Adjust the track gates to surround only the passenger/engine compartment or main body (for those helicopters without a passenger compartment). Again, all appendages are to be ignored.



b. Bunkers. Track gate adjustment for a bunker revolves around the perceived size of the bunker's firing port. This depends on your range to the bunker.

(1) Close range bunker. If the bunker is at close range (less than 1500 meters), place the track gates around the internal opening of the firing port.

(2) Far range bunker. If the bunker is at a range far enough so that the firing ports cannot be seen adjust the track gates so that they surround the firing port frame.



References: TM 09397B-12/1, Operator and Organizational Maintenance Manual Javelin, pages 2-75 through 2-80, 2-87 through 2-115, 2-129 through 2-136

