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AT1506
11 AUG 04

STUDENT OUTLINE

ENCASED MISSILE LOADING PROCEDURES

1. TERMINAL LEARNING OBJECTIVES

a. Given an M220E4 TOW2 weapon system encased missile, while wearing a fighting load, inspect a M220E4 TOW2 weapon system encased missile in accordance with TM 9-1425-450-12. (52TR.01.03)

b. Given an M220E4 TOW2 weapon system and an encased missile, while wearing a fighting load, load a ground mounted M220E4 TOW2 weapon system by preparing the weapon for firing. (52TR.01.04)

c. Given an M220E4 TOW2 weapon system mounted upon a M1045/46 hardback HMMWV and an encased missile, as an anti-tank team, while wearing fighting loads, load a vehicle mounted M220E4 TOW2 weapon system in accordance with TM 9-1425-450-12. (52TR.03.05)

d. Given a M220E4 TOW2 weapon system and an encased missile, While wearing a fighting load, unload a missile from M220E4 TOW2 weapon system in accordance with the TM 9-1425-450-12. (52TR.01.08)

e. Given an M220E4 TOW2 weapon system loaded with an empty encasement, while wearing a fighting load, unload an empty missile encasement from a M220E4 TOW2 weapon system in accordance with TM 9-1425-450-12. (52TR.01.09)

2. ENABLING LEARNING OBJECTIVES

a. Given a list of choices and a diagram of a TOW2 encased missile, identify the components of a TOW2 encased missile in accordance with TM 9-1425-450-12. (52TR.01.03a)

c. Given an M220E4 TOW2 weapon system mounted upon a M1045/46 hardback HMMWV and an encased missile, as an anti-tank team, while wearing fighting loads, unload a vehicle mounted M220E4 TOW2 weapon system in accordance with TM 9-1425-450-12. (52TR.03.05a)

BODY

1. TOW MISSILES. There are only two types of TOW missiles; ballistic guided missile (BGM), which is live, and inert ballistic training missile (BTM). However, there are five live attack models and four inert training models. These all have similar traits, but each of these missiles has slightly different characteristics and features. The TOW series of missiles date back to the late 1960's. It was designed by the Hughes Missile Corporation, which is now Raytheon, to replace the aging M-106 recoilless rifle. It was field tested by the Marine Corps and the Army in Vietnam and found to be quite proficient at destroying PT-76 and T-54/55 series vehicles. The Israeli's used it with devastating effectiveness against the Egyptians and the Syrians during 1973's Yom Kippur War. The five type of attack missiles are:

a. Basic TOW (BGM-71A). The BGM-71A was produced between 1970 and 1981. It was designed to defeat such armored threats as the T-55 and T-62. This missile has a minimum effective range of 65 meters, which allows the missile to arm itself a safe distance from the launcher, and a maximum effective range of 3,000 meters. In 1976 the Basic TOW was modified to extend the maximum range to 3,750 meters so that the Cobra helicopter could utilize it. The missile contains a 5 inch warhead filled with 5 pounds of Octol.

b. I-TOW (BGM-71C). The BGM-71C was produced between 1981 and 1983. It was designed to defeat such armored threats as the T-72. This missile has a minimum effective range of 65 meters, and a maximum effective range of 3,750 meters. A standoff probe was added to increase the effectiveness against targets fitted with explosive reactive armor. The missile contains a 5-inch warhead filled with 4.5 pounds of LX-14.

c. TOW 2 (BGM-71D). The BGM-71D was produced between 1983 and 1987. It was designed to defeat such armored threats as the T-64 and the T-80. This missile has a minimum effective range of 65 meters, and a maximum effective range of 3,750 meters. The standoff probe was improved and by incorporating a dual-track mode, additionally it has improved launch and flight motors. With the addition of a track-able thermal sight, the weapon system was renamed TOW 2. Additionally, this was the first TOW missile designed to be controlled from a Thermal Sight. The missile contains a 6-inch warhead filled with 6.9 pounds of LX-14.

d. TOW 2A (BGM-71E). The BGM-71E is currently in production, and has been since 1987. It was designed to defeat such armored threats as the T-90. This missile has a minimum effective range of 65 meters, and a maximum effective range of 3,750 meters. The standoff probe was improved with the addition of a small tip charge of PBXN-5. This helps to defeat newer generations of explosive reactive armor by exploding and actually blowing the reactive armor blocks out of the way of the incoming High Explosive Anti-Tank charge. The missile contains a 6-inch warhead filled with 7.0 pounds of LX-14.

e. TOW 2B (BGM-71F). The BGM-71F is currently in production, and has been since 1991. It was designed to defeat such armored threats as the later generation T-80 and T-90. Unlike its predecessors, the TOW 2B is a fly over, shoot down missile, not a point-of-aim, point-of-impact missile. It does NOT need a standoff probe. This missile tracks 2.5 to 5.0 meters above the gunner's line of sight. Once it is directly over the target, it fires its two warheads down through the thinner armor on top of the target. The warheads sit one behind the other in the nose section of the missile. There is no conventional explosive in the warheads themselves. They consist of two bowl-shaped explosively formed penetrators. The missile has a minimum effective range of 288 meters, and a maximum effective range of 3,750 meters.

f. Below is a list of all attack variants of the TOW missile, by model designation:

MODEL	WARHEAD	RANGE	WEIGHT	MAX VELOCITY	TIME OF FLIGHT
Basic TOW					
BGM-71A	5.3lbs Octol	3,000 meters	56 lbs.	299 M/Secs	15.1 Secs
BGM-71A-1	5.3lbs Octol	3,000 meters	56 lbs.	299 M/Secs	15.1 Secs
BGM-71A-2	5.3lbs Octol	3,000 meters	56 lbs.	299 M/Secs	15.1 Secs
BGM-71A-2A	5.3lbs Octol	3,000 meters	56 lbs.	299 M/Secs	15.1 Secs
BGM-71A-3	5.3lbs Octol	3,750 meters	56 lbs.	299 M/Secs	21 Secs
BGM-71A-3A	5.3lbs Octol	3,750 meters	56 lbs.	299 M/Secs	21 Secs

I-TOW					
BGM-71C	4.5 lbs LX-14	3,750 meters	56 lbs.	296 M/Secs	21.6 Secs
BGM-71C-1	4.5 lbs LX-14	3,750 meters	56 lbs.	296 M/Secs	21.6 Secs
BGM-71C-1A	4.5 lbs LX-14	3,750 meters	56 lbs.	296 M/Secs	21.6 Secs
BGM-71C-2B	4.5 lbs LX-14	3,750 meters	56 lbs.	296 M/Secs	21.6 Secs
BGM-71C-4B	4.5 lbs LX-14	3,750 meters	56 lbs.	296 M/Secs	21.6 Secs
TOW 2					
BGM-71D	6.9 lbs LX-14	3,750 meters	62 lbs.	329 M/Secs	20 Secs
BGM-71D-1B	6.9 lbs LX-14	3,750 meters	62 lbs.	329 M/Secs	20 Secs
BGM-71D-3B	6.9 lbs LX-14	3,750 meters	62 lbs.	329 M/Secs	20 Secs
TOW 2A					
BGM-71E	7.0 lbs LX-14	3,750 meters	64 lbs.	311 M/Secs	20.7 Secs
BGM-71E-1B	7.0 lbs LX-14	3,750 meters	64 lbs.	311 M/Secs	20.7 Secs
BGM-71E-3B	7.0 lbs LX-14	3,750 meters	64 lbs.	311 M/Secs	20.7 Secs
BGM-71E-4B	7.0 lbs LX-14	3,750 meters	64 lbs.	311 M/Secs	20.7 Secs
BGM-71E-5B	7.0 lbs LX-14	3,750 meters	64 lbs.	311 M/Secs	20.7 Secs
TOW 2B					
BGM-71F	2 X E.F.P.'S	3,750 meters	49.8 lbs.	301 M/Secs	21 Secs
BGM-71F-1	2 X E.F.P.'S	3,750 meters	49.8 lbs.	301 M/Secs	21 Secs

Although the variants of each model of the TOW missile are somewhat different internally, each variant is almost identical on the outside. This is why knowledge of the model number is extremely important. It would be tactically unsound to engage a late model T-80UV at 3,500 meters with a BGM-71A-2A, as the missile only has a maximum range of 3,000 meters.

g. Below is a list of all inert variants of the TOW missile, by model designation:

MODEL	WARHEAD	RANGE	WEIGHT	MAX VELOCITY	TIME OF FLIGHT
Basic TOW					
BTM-71A	N/A	3,000 meters	56 lbs.	299 M/Sec	15.1 Secs
BTM-71A-1	N/A	3,000 meters	56 lbs.	299 M/Sec	15.1 Secs
BTM-71A-2	N/A	3,000 meters	56 lbs.	299 M/Sec	15.1 Secs
BTM-71A-2A	N/A	3,000 meters	56 lbs.	299 M/Sec	15.1 Secs
BTM-71A-2B	N/A	3,000 meters	56 lbs.	299 M/Sec	15.1 Secs
BTM-71A-3	N/A	3,750 meters	56 lbs.	299 M/Sec	21 Secs
BTM-71A-3A	N/A	3,750 meters	56 lbs.	299 M/Sec	21 Secs
I-TOW					
BTM-71C	N/A	3,750 meters	56 lbs.	296 M/Sec	21.6 Secs
TOW 2					
BGM-71D-1B	N/A	3,750 meters	62 lbs.	329 M/Sec	20 Sec
TOW 2A					
BGM-71E-2B	N/A	3,750 meters	64 lbs.	311 M/Sec	20.7 Sec
BGM-71E-3B	N/A	3,750 meters	64 lbs.	311 M/Sec	20.7 Sec

The BTM inert series of training missiles have the same response time and flight characteristics as their BGM counterparts. These missiles have identical external and internal components, with the exception of a warhead. Instead of a warhead, they are fitted with an equal amount of inert, weighted material.

2. TOW MISSILES COMPONENTS. Although each model of the TOW missile is slightly different, they share many of the same components. The shared components are as follows:

a. Control Surfaces and Wings. Control of the missile is maintained by two sets of four control surfaces. These controls are folded into the missile when in the launch container. Upon firing, the wings and control surfaces are extended and lock into position.

b. Propulsion System. The missile utilizes two separate solid fuel motors. The launch motor propels the missile out of the tube, and the flight

motor propels the missile downrange. The flight motor burns out approximately 1.6 seconds after ignition.

(1) Launch Motor. This motor is 15 inches long and has a diameter of 2.1 inches. The launch motor completes its burn before the missile leaves the launch tube and accelerates the missile to 215 feet per second.

(2) Flight Motor. The flight motor has a diameter of 5.8 inches and length of 7.5 inches. The propellant weights 5.7 pounds. The motor burns for only 1.6 seconds and accelerates the missile to a velocity of 1020 feet per second. This motor burns out within 100 meters. The motor's initial thrust enables the missile to coast to its target.

c. Wire Subsystem. Two rolls of wire are mounted in the aft end of the missile. One is for azimuth corrections, and the other for elevation. Correction commands are transmitted from the launcher to the missile via these command-link wires. Each roll contains exactly 3,850 meters of 0.005 inch diameter insulated wire. The extra 100 meters compensates for wire drag. The wire has a tensile strength of 530,000 pounds per square inch. The wire is wound onto the spools in such a way, that it is actually thrown off the spool faster than the missile is traveling.

d. Electronic Unit. The missile electronic unit receives missile steering signals from the command-link wire and initial missile attitude signals from the gyro.

e. Thermal Batteries. Three identical 60-volt thermal batteries are used to provide pre-ignition power for the missile. The power to activate the thermal batteries is provided by the launcher prior to launch.

f. Xenon Beacon. The xenon beacon provides a signal that can be detected by the I.R. tracker in the optical sight to determine the missile's position while in flight.

g. Thermal Beacon. The thermal beacon generates heat by means of a small, controlled, chemical reaction. The launcher commands the shutter to open and close and the thermal sight tracks the beacon.

h. Gyroscope. The gyroscope provides initial attitude reference for the missile. 0.1 seconds after the trigger is pressed, high-pressure nitrogen gas forces the gyroscope to rotate at 40,000 rpms. The gyroscope provides the missile reference for the first 0.76 seconds of flight and roll reference for the entire flight.

i. Warhead. The internal explosive device used to destroy the target. Each warhead, with except for TOW2B/BGM-71F, consists of the one or more of the following components:

(1) Crush Switch. This thin copper plate is an open circuit. Once the missile impacts on the target, the plate is crushed, thus completing the electrical circuit and detonating the warhead.

(2) Filler/Liner. This substance forms the mold for the shaped charge used by the explosive.

(3) Safety and arming device. The safety and arming device rotates and aligns the detonator with the warhead, when powered and the missile reaches a force of 19 G's.

j. Extendable probe. The extendable probe is located inside of the missile until firing, when the missile exits encasement the probe is pushed into position. The extendable probe allows the warhead to detonate while the missile is 8 to 12 inches from the target.

(1) Tip Crush Switch. This switch is found in the tip of the standoff probe. It allows the warhead to detonate while still 8 to 12 inches from the target. This magnifies the explosive effect of the Warhead.

(2) Tip Charge. This small charge of PBXN-5 is found in the end of the standoff Probe on the TOW2A/BGM-71E. This charge actually blows away most of the reactive armor in the path of the main charge.

3. The Monroe Effect. Even though the TOW missile's **warhead** is only 8 to 10 percent of the total missile weight, the warhead is capable of defeating most armored threats. This is because of the Monroe effect. Named after Dr. Charles Monroe, Chief of the Naval Torpedo Station at Newport, Rhode Island, in the 1880s. It is a generic term applied to any shaped charge designed to destroy an armored threat. The warhead of the TOW is shaped like an inverted cone, held this way by a stiff, formed liner. This directs and concentrates the majority of the blast against a small, specific area. When this warhead strikes a target, the charge is detonated from the rear. A detonation wave sweeps forward and begins to collapse the liner at its apex. The collapse of the cone results in the formation and ejection of a continuous high velocity molten jet of liner material. The jet is then followed by a slug that consists of about 80% of the liner mass. The slug has a velocity of 600 meters per second. When the jet strikes the target's armor, the target material flows like a fluid out of the path of the jet. This phenomenon is called Hydrodynamic Penetration. Simply stated, the Monroe effect is, when the concentrated gasses from the shaped charge cause a molten stream of metal to burn its way through the target. If the target vehicle has fuel and ammunition aboard, these items will sympathetically explode, thus aiding in the complete destruction of the target.

4. ENCASED MISSILE INSPECTION PROCEDURES. Each encased missile must be inspected before loading it in the launcher. Missiles are inspected by the a-gunner to ensure:

a. Inspect the wooden crate to ensure that it has no severe damage, ensure the nose end is pointed down range.

b. Inspect the humidity indicator in the aft end ensuring that the humidity indicator reads blue.

(1) If the humidity indicator reads pink then there is too much humidity in the missile, missile should only be used when ordered to do so.

(2) If the humidity indicator reads white then there is too much humidity in the missile or there is a defective humidity card in the missile, the missile should only be used in combat when ordered to do so.

c. Ensure that the serial number on the encasement matches the serial number on the crate (remove the missile to do so).

d. Re-inspect the humidity indicator in the aft end of the missile, ensuring that it is blue.

e. Inspect the rear diaphragm on the aft end of the missile, ensuring that it is intact with no rips or tears.

f. Inspect the rear half of the encasement for punctures, cracks, dents or bulges.

g. Ensure that the electrical connector dust cover is present then remove the dust cover and retain on body.

h. Ensure that the electrical connector has ease of movement with no bent pins or debris.

i. Inspect the rubber detent boot ensuring that there is no dry rotting and there is ease of movement.

j. Inspect the guide rails (for trunnion) for damage.

k. Inspect the forward end of the missile ensuring that there are no gouges, punctures, cracks, dents or bulges.

l. Inspect the indexing lugs at the nose end of the missile to ensure that they are not damaged and are aligned with the guide rails.

m. Ensure that the forward handling ring and quick-release clamp are present. Then remove them and keep near missile.

n. Inspect the forward diaphragm for rips or tears.

o. Ensure that there are four small pin-holes in the forward diaphragm.

p. Replace the forward handling ring and quick release clamp back onto the nose end of the missile.

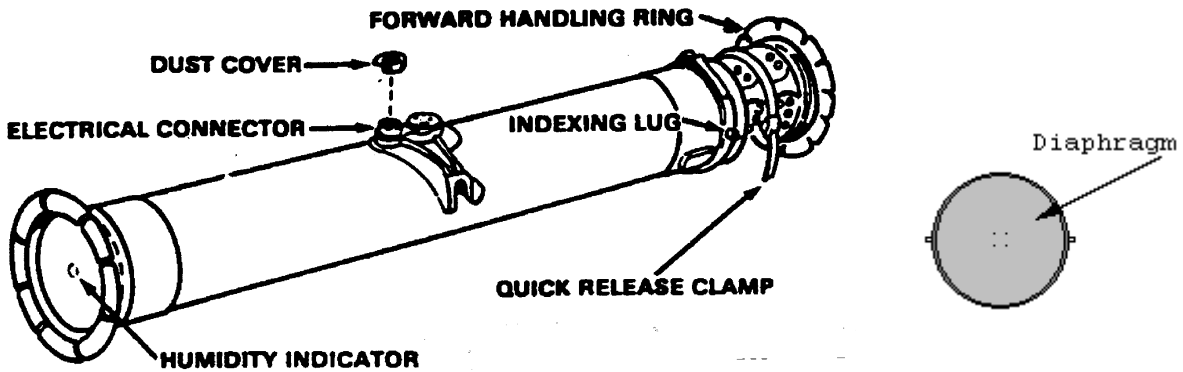
q. Replace the electrical connector dust cover back onto the electrical connector on the missile.

5. ENCASED MISSILE LOAD PROCEDURES

a. The a-gunner will remove the electrical connector protective cover (dust cover) and place it in his right trouser pocket for safe keeping.

b. The gunner will ensure that the traversing unit is locked down in both the azimuth and the -8 degree position in elevation. The gunner looks to the left of the optical sight and visually selects a target down range. He then raises the bridge clamp, indicating to the a-gunner that the weapon system is ready to be loaded.

c. The a-gunner will remove the electrical connector dust cover from the missile and retain the dust cover on his body. Then he will place the nose end of the missile on his right boot and then release the quick release clamp and remove the forward handling ring from the encased missile.



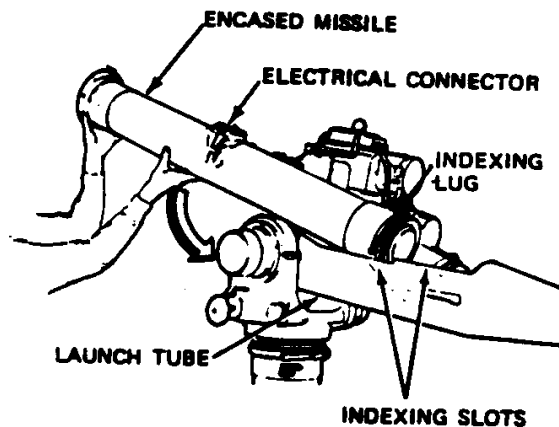
ENCASED MISSILE (Figure 6-1)

d. The a-gunner will then cradle the missile with the electrical connector pointed up and the encased missile pointed down range. Holding the encased missile with the back end raised to about 45 degrees, he will then insert the indexing lugs into the indexing slots (or ramp loading slots) of the launch tube and slide the encased missile forward and down until the lugs are seated firmly at the bottom position (See Figure 6-1).

e. The a-gunner will then lower the aft end of the encased missile into the launch tube breech, and ensure that it is properly seated by pressing down firmly on the aft end of the missile.

f. Ensuring that the electrical connector on the missile is aligned with the electrical connector on the bridge clamp. The a-gunner will secure the encased missile into position by lowering the bridge clamp and moving the bridge clamp-locking lever into the locked position.

g. The a-gunner then sounds off "LOADED".



LOADING ENCASED MISSILE (Figure 6-2)

6. UNLOADING AFTER FIRING PROCEDURES

a. ARM

(1) The gunner will acquired his target.

(2) The a-gunner will ensure that the backblast area is free of troops and equipment and raise the arming lever.

b. FIRE

(1) The gunner will raise the trigger protective cover and press the trigger. He will track his target until missile impact.

(2) Upon impact, the gunner will lower the trigger protective cover and lock the traversing unit in both the azimuth and elevation.

c. UNLOAD

(1) The a-gunner will forcibly raise the bridge clamp-locking lever without lowering the arming lever, which will cut the command-link wires and shut down the system.

(2) The a-gunner will then raise the bridge clamp, raise the aft end of the empty launch container, remove it from the launcher, and discard it.

(3) The a-gunner will then check the launch tube for serviceability, stability, and debris, and sound off "**Weapon Clear**".

(4) The gunner will recheck the launch tube for serviceability, stability, and debris; check the electrical connector for serviceability and debris; lower the bridge clamp; and sound off "**ALL CLEAR**".

7. UNLOADING IF A MISSILE FIRING WAS NOT ATTEMPTED

a. The gunner will first lower the trigger protective cover, and then lock the traversing unit down in both azimuth and elevation.

b. The a-gunner will then lower the arming lever, raise the bridge clamp-locking lever and raise the bridge clamp.

c. The a-gunner will then remove the encased missile from the launcher by raising the aft end and lifting it from the launch tube.

d. The a-gunner will then replace the forward handling ring, quick release clamp, and electrical connector protective cover onto the encased missile.

e. The a-gunner must now secure the encased missile into the missile rack of his vehicle or return the missile to the Ammunition Supply Point.

REFERENCES: Operator's and Organizational Maintenance Manual for the TOW2 Weapons System TM 9-1425-450-12 pages: 2-120 through 2-127, 2-396.1 through 2-407, and 4-7 through 4-10.

PERFORMANCE EXAMINATION CHECKLIST

EXAM TITLE: Encased Missile Inspection Procedures Performance Examination

EXAM ID: AGM1406P1

TLO/ELO: 52TR.01.03

STUDENT INSTRUCTIONS:

1. You are an anti-tank guided missileman and must inspect a TOW2 encased missile.
2. There is no time limit for this task.
3. To achieve mastery, you must perform each of the performance steps correctly.

PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:

Performance Steps	1 st		2 nd		3 rd	
	ATTEMPT		ATTEMPT		ATTEMPT	
	M	NM	M	NM	M	NM
1. Inspect the wooden missile crate for severe damage; ensuring the forward end is pointed down range.						
2. Inspect the humidity indicator card by looking through the window on the wooden missile crate to ensure the humidity indicator card on the missile is blue.						
3. Remove the encased missile from the wooden missile crate.						
4. Ensure the serial number from the encased missile matches the serial number on the wooden missile crate.						
5. Inspect the humidity indicator card on the encased missile again to ensure that the first reading was accurate.						
6. Inspect the rear diaphragm on the encased missile for rips and tears.						
7. Inspect the rear half of the encased missile for cracks, dents, or bulges.						
8. Remove the electrical connector dust cover on the encased missile.						
9. Inspect the electrical connector on the encased missile for ease of movement, bent pins, and debris.						
10. Inspect the rubber detent boot on the encased missile for dry rot and ease of movement.						
11. Inspect the guide rails on the encased missile for damage.						
12. Inspect the forward half of the encased missile for cracks, dents, or bulges.						

13. Inspect the index lugs on the encased missile for stability, ensuring they are not bent and are aligned with the guide rails.						
14. Remove the quick release clamp and forward handling ring from the encased missile.						
15. Inspect the forward diaphragm on the encased missile for rips and tears.						
16. Ensuring there are four small pinholes on the forward diaphragm.						
17. Replace the forward handling ring and quick release clamp on the encased missile.						
18. Replace the protective cover on the encased missile.						

PERFORMANCE EXAMINATION CHECKLIST

EXAM TITLE: Ground Mounted Loading Procedures Performance Examination

EXAM ID: AGM1406P2

TLO/ELO: 52TR.01.04

STUDENT INSTRUCTIONS:

1. You are an anti-tank guided missileman and must load a M220E4 TOW2 weapon system.
2. There is no time limit for this task.
3. To achieve mastery, you must perform each of the performance steps correctly and in order.

PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:

Performance Steps	1 st		2 nd		3 rd	
	ATTEMPT		ATTEMPT		ATTEMPT	
	M	NM	M	NM	M	NM
1. Lock the traversing unit down into the negative eight (-8) degree locked position.						
2. Raise the bridge-clamp on the traversing unit by raising the bridge-clamp-locking lever, ensuring the bridge-clamp remains at a 90-degree angle.						
3. Remove and retain the electrical connector dust cover from the encased missile.						
4. Remove and retain the forward handling ring and quick release clamp from the encased missile.						
5. Turn the encased missile so that the electrical connector is facing up.						
6. Slide the index lugs on the encased missile into the index slots located on the launch tube.						
7. Slide the encased missile forward and down into the launch tube until the index lugs are firmly in place.						
8. Lower the aft end of the encased missile, ensuring it is placed so that the electrical connector will join with the bridge-clamp.						
9. Push down on bridge-clamp and pull bridge-clamp locking lever backwards and down to lock the encased missile in the launch tube.						

PERFORMANCE EXAMINATION CHECKLIST

EXAM TITLE: Unload an M220E4 TOW2 weapon system

EXAM ID: AGM1406P2/AGM1406P3

TLO/ELO: 52TR.01.08

STUDENT INSTRUCTIONS:

1. You are an anti-tank guided missileman and must unload an encased missile.
2. There is no time limit for this task.
3. To achieve mastery, you must perform each of the performance steps correctly.

PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:

Performance Steps	1 st		2 nd		3 rd	
	ATTEMPT		ATTEMPT		ATTEMPT	
	M	NM	M	NM	M	NM
1. Gunner will lower the trigger protective cover and lock the TU down in both azimuth and the elevation.						
2. Lower the arming lever, raise the bridge clamp-locking lever, and raise the bridge clamp to the 90 degree open position.						
3. Raise the aft end of the encased missile and remove it from the weapon system.						
4. A-gunner will replace the forward handling ring, quick release clamp and protective cover onto the encased missile.						
5. A-gunner will secure the encased missile into the missile rack of the vehicle or return the missile to the ammunition supply point.						

PERFORMANCE EXAMINATION CHECKLIST

EXAM TITLE: Unload an empty missile encasement from a M220E4 TOW2 weapon system

EXAM ID: AGM1406P2/AGM1406P3

TLO/ELO: 52TR.01.09

STUDENT INSTRUCTIONS:

1. You are an anti-tank guided missileman and must unload a M220E4 TOW2 weapon system.
2. There is no time limit for this task.
3. To achieve mastery, you must perform each of the performance steps correctly.

PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:

Performance Steps	1 st		2 nd		3 rd	
	ATTEMPT		ATTEMPT		ATTEMPT	
	M	NM	M	NM	M	NM
1. Gunner lowers trigger protective cover and locks the traversing unit down in both the azimuth and elevation.						
2. Forcibly raise the bridge clamp locking lever and raise the bridge clamp to the 90 degree open position.						
3. Raise the aft end of the empty encasement, remove it from the weapon system and discard the empty encasement.						
4. Check the launch tube for serviceability, stability and debris and upon a successful check sound of "WEAPON CLEAR".						
5. Gunner will recheck the launch tube, check electrical connector for serviceability and debris, lower the bridge clamp and upon a successful check sound of "ALL CLEAR".						

PERFORMANCE EXAMINATION CHECKLIST

EXAM TITLE: Vehicle Mounted Loading Procedures Performance Examination

EXAM ID: AGM1406P3

TLO/ELO: 52TR.03.05

STUDENT INSTRUCTIONS:

1. You are an anti-tank team and must load a M220E4 TOW2 weapon system mounted on a M-1045 HMMWV.
2. There is no time limit for this task.
3. To achieve mastery, you must perform each of the performance steps correctly and in order.

PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:

Performance Steps	1 st		2 nd		3 rd	
	ATTEMPT		ATTEMPT		ATTEMPT	
	M	NM	M	NM	M	NM
1. Gunner places the elevation and azimuth locks on the traversing unit into the lock position.						
2. Gunner will rotate the traversing unit until it locks into place, and then will rotate the control knobs on the traversing unit until the trunnion locks into place.						
3. Gunner will push the bridge clamp locking lever forward and then lift the bridge clamp to the open position.						
4. Driver/assistant gunner will open the forward end of the cargo hatch, and push the cargo shell door up and back to a 90-degree angle.						
5. Driver/assistant gunner will release missile #1 from the Missile #1 slot on the missile rack, by opening the securing straps.						
6. Driver/assistant gunner will pull up on the quick release clamp at the forward handling ring and remove it from the encased missile.						
7. Driver/assistant gunner will turn the inside portion of the protective cover on the electrical connector on the encased missile two complete turns counterclockwise.						
8. Driver/assistant gunner will turn the protective cover counterclockwise and remove it from the electrical connector.						

9. Driver/assistant gunner will rotate the encased missile until the electrical connector is facing in the up position, and hand the missile to the gunner.						
10. Gunner will raise the aft end of the encased missile and slide the encased missile forward ensuring that the indexing lugs on the forward end of the encased missile are aligned into the indexing slots on the launch tube.						
11. Gunner will firmly lower the aft end of the encased missile ensuring that the electrical connector will properly join with the bridge clamp.						
12. Gunner will lower the bridge clamp over the encased missile, press down on top of the bridge clamp, and pull down the bridge clamp locking lever to lock the bridge clamp over the missile and then sound off, "loaded".						
13. Driver/assistant gunner will close the cargo shell door on the back of the vehicle.						
14. Driver/assistant gunner will move to the front of the vehicle and occupy the driver side seat.						