CHAPTER 7

AMMUNITION LOADING

Aircraft gun ammunition is developed for specific types of aircraft-mounted guns. The M61A1/A2 uses M50/PGU series 20-mm ammunition. The M50/PGU series consists of various types of cartridges developed for specific applications, including test cartridges, dummy cartridges, target practice, target practice tracer, armor piercing incendiary, high-explosive incendiary, and semi-armor piercing, high-explosive incendiary. Blank and dummy rounds are also used for practice and maintenance.

The M50/PGU series 20-mm ammunition is loaded into the M61A1/A2 gun through the linkless ammunition loading system (LALS) series. The LALS transports rounds from the transporter to the aircraft system, and simultaneously transports spent cases and cleared rounds from the aircraft system to the transporter.

AIRCRAFT GUN AMMUNITION

LEARNING OBJECTIVE: *Describe the 20-mm M50/PGU aircraft gun ammunition configuration. Identify M50/PGU 20-mm gun cartridges and describe their uses.*

M50 CONFIGURATION AMMUNITION

M50 configuration ammunition (fig. 7-1) for the M61A1/A2 Navy aircraft gun is issued in the form of cartridges (rounds). A complete service cartridge assembly consists of a cartridge case, electric primer, propellant, projectile, and fuze. All service cartridges have matched ballistics and are electrically primed.

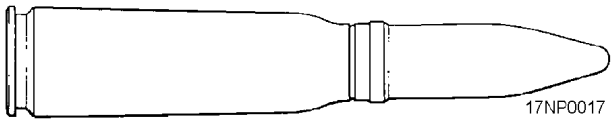

Figure 7-1.—M50 configuration cartridge.

CLASSIFICATION

The M50 configuration ammunition currently issued is classified as follows:

1. Dummy Cartridge M51A1B1, M51A2 (steel), or M254 (plastic)
2. High-Pressure Test Cartridge, M54A1 (HPT)
3. Target Practice Cartridge, M55A2 (TP)
4. High-Explosive Incendiary Cartridge, M56A3 (HEI)
5. Target Practice-Tracer Cartridge, M220 (TP-T)
6. High-Explosive Incendiary-Tracer Cartridge, M242 (HEI-T)

CARTRIDGE COMPONENTS, GENERAL DESCRIPTION

The cartridge components for M50-configured ammunition as used in a complete round are discussed in the following paragraphs.

Cartridge Case

The M103 (brass) and the M103B1 (steel) cartridge cases (fig. 7-2) are marked longitudinally. The

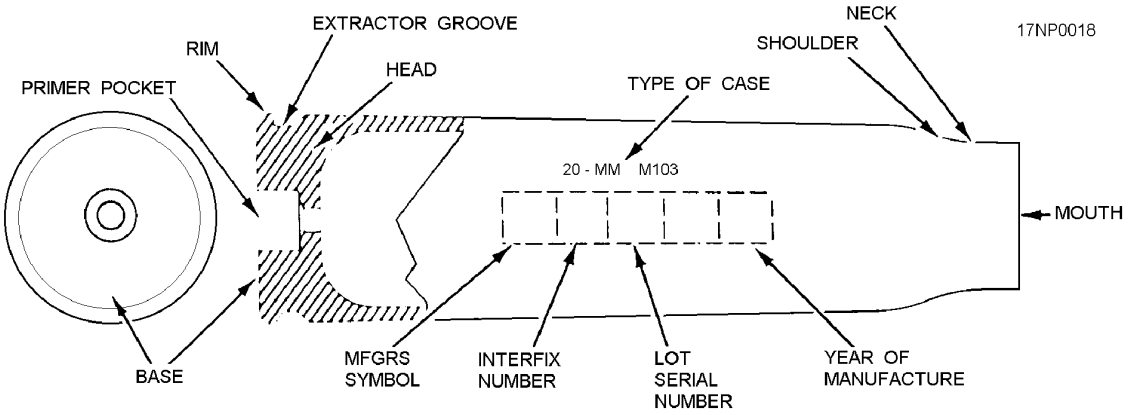

Figure 7-2.—M103 (brass) and M103B1 (steel) cartridge cases.

caliber/case designation is on the first line. The manufacturer symbol, interfix number, lot serial number, and year of manufacture are on the second line. The M103 case is loaded for use with all service ammunition, and the M103B1 is used with the M51A1B1/M51A2 dummy cartridges.

Propellant

All M50-configured cartridges are loaded with (double-base) ball spherical propellant WC 870 or 872.

M52A3B1 Electric Primer

The electric primer is used in all current M50 configurations. It consists of an open-ended brass cup that contains a brass button insulated from the cup by a plastic liner. The firing pin of the gun contacts this button. The ignition charge (a conductive explosive mixture) is in contact with the other side of the button, and is retained by a paper disk and a metal support cup. The electrically initiated primer ignites the propellant charge.

> **NOTE**: The primer explosive element is sensitive to electromagnetic and electrostatic energy.

Projectiles

All projectiles, except the HPT, have essentially the same external configuration. The rotating band is a copper alloy swaged into a circumferential groove near the aft end of the steel body.

Fuze M505A3 Point-Detonating (PD)

The PD fuze (fig. 7-3) consists of a body assembly, a rotor assembly, and a booster assembly. The fuze has a delayed arming distance of 20 to 35 feet after it leaves the muzzle of the gun. Before firing the HEI projectile, the rotor and the firing pin are locked in position by the rotor safety spring. (The rotor contains the detonator, which is out of line with the firing pin.) Centrifugal force causes the spring to open, allowing the rotor to move in-line with the firing pin. The fuze functions when the nose of the fuze is crushed against the target, forcing the firing pin against the detonator. The detonator, in turn, initiates the booster. The booster detonates and initiates the projectile's explosive charge.

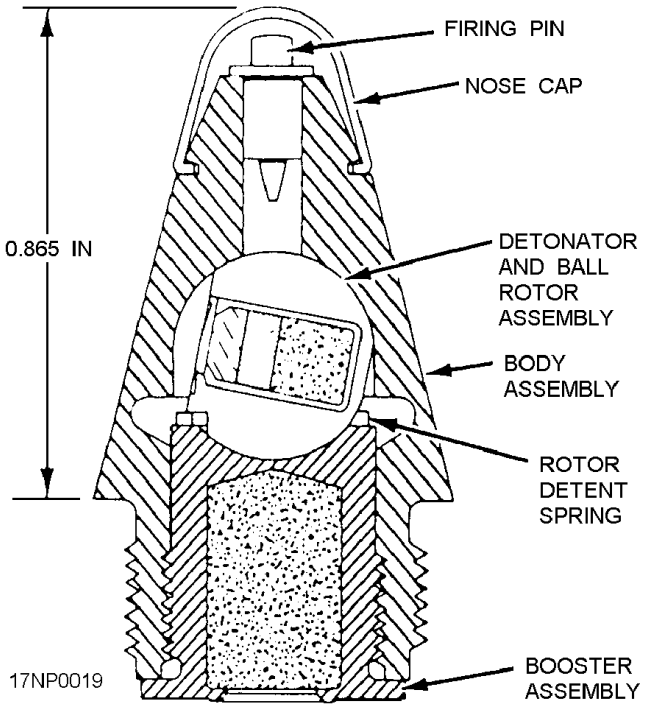

Figure 7-3.—M505A3 point-detonating fuze (unarmed).

Tracer

A tracer mix is direct-loaded into a cavity machined in the base of the TP-T and HEI-T projectiles. It is used in assembling the M220 and M242 cartridges, respectively. The heat and pressure of the propelling charge ignite the tracer. The tracer is visible for about 1,280 yards of projectile flight.

M51A1B1/M51A2 DUMMY CARTRIDGES

Dummy cartridges are completely inert assemblies. They are used for drill and testing the feeder assembly of a weapon. The dummy cartridge is assembled with the M51A1B1/M51A2 projectile and M103B1 cartridge case to simulate the service cartridge. The two cartridges are the same **except** for a change to the annulus/primer pocket. The cartridge contains approximately 635 grains of inert material. This material produces an average overall weight equal to that of the other M50-configured ammunition.

M254 DUMMY CARTRIDGE

The M254 cartridge is made of plastic. It is an alternate to the M51A1B1/M51A2 steel dummy

cartridge. You can tell the difference between the M254 and live ammunition by its appearance and by the feel of its nylon composition. M50 configuration characteristics are shown in table 7-1.

M54A1 HIGH-PRESSURE TEST CARTRIDGE

The M54A1 cartridge is used only for proof firing of the gun at the place of manufacture. The projectile is made from a solid steel bar. It has a standard rotating band. The M103 or M103B1 cartridge case is used with the M52A3B1 electric primer.

M55A2 TARGET PRACTICE CARTRIDGE

The M55A2 cartridge has no explosive filler in the projectile. The solid nose is made of aluminum alloy. The projectile shape and ballistic properties are similar to those of the other M50-configured ammunition. The cartridge is used for practice firing, boresighting weapons, and testing new guns. The M103 cartridge case and M52A3B1 electric primer make up this cartridge.

M56A3 HIGH-EXPLOSIVE INCENDIARY CARTRIDGE

The M56A3 or M56A4 projectile is used in the M56A3 cartridge. The projectile is loaded with an incendiary and explosive composition, giving the combined effect of the blast of a high-explosive charge plus a fire-starting ability.

Both the M56A3 and M56A4 are loaded with aluminized composition A-4. The major difference between the projectiles is their construction. The M56A3 has a baseplate to prevent ignition of the HEI charge by the propellant. The M56A4 does not have the baseplate, and it has approximately 10 more grains of A-4. Both cartridges use the M103 case, M52A3B1 electric primer, and the M505A3 PD fuze.

M220 TARGET PRACTICE-TRACER CARTRIDGE

The M221 projectile is used with the M220 cartridge. The M221 projectile is similar to the M55A2

Table 7-1.—M50 Configuration Ammunition Characteristics

Cartridge		Approximate Unit Weight (grains)				Total wt. (grains) (approx.)	Remarks
Designation	Type	M103 case	M52A3B1 Electric primer	Propellant	Projectile		
M51A1B1/ M51A2	Dummy	1,775	None	635 (inert)	1,520	3,850 (min)	M103A1 Steel case
M54A1	HPT	1,855	22	590	1,965	4,392	
M55A2	TP	1,855	22	590	1,521	3,935	
M56A3	HEI	1,855	22	590	1,565	3,965	M505A3 fuze required
M220	TP-T	1,855	22	590	1,470	3,935	
M242	HEI-T	1,855	22	590	1,535	3,865	M505A3 fuze required
M254	Dummy	n/a	None	None	n/a	4,005	Plastic

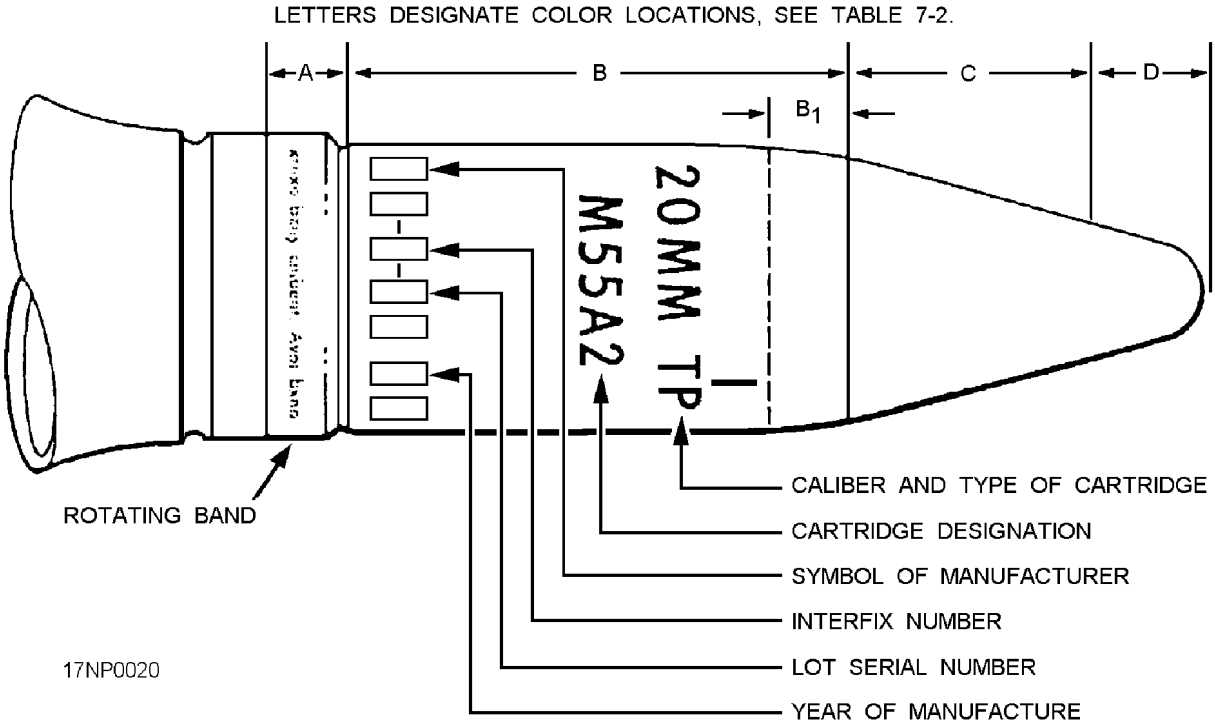

Figure 7-4.—Example of color coding and marking for M50 configuration ammunition.

Table 7-2.—Color Coding and Marking for M50 Configuration Ammunition

Projectile Type (Expect as noted)	Color of Painting				Color of Marking
	Locations (See Figure 7-4)				
	A	B	C	D	
Dummy M51A1B1/M51A2	Chromate finish	Chromate finish	Chromate finish	Chromate finish	Black
High Pressure Test M54A1 (HPT)	No paint (copper)	Purple	Purple	Purple	Black
Target Practice (TP) M55A2/M55A2B1 M55A3/M55A3B1	No paint (copper)	Blue	Blue	Blue	White
High Explosive Incendiary (HEI) M56A3/M56A4	No paint (copper)	Yellow Red band in B_1 area	No paint (chromate)	No paint (chromate)	Black
Target Practice Tracer (TP-T) M221 (M220 cartridge)	No paint (copper)	Blue	Blue	Blue	White with Orange T's (at location B_1)
High Explosive Incendiary-Tracer (HEI-T) M242	No paint (copper)	Yellow Red band in B_1 area	No paint (chromate)	No paint (chromate)	Black with Red T's (below B_1)
Plastic Dummy Cartridge M254	No paint (white plastic)	No paint (white plastic)	No paint (white plastic)	No paint (white plastic)	Black

projectile, except it incorporates a tracer in the base of the projectile.

M242 HIGH-EXPLOSIVE INCENDIARY-TRACER CARTRIDGE

The M242 projectile is used with the M242 cartridge. The projectile has a tracer in the base and aluminized composition A-4 in the forward section. It has a combined effect of a high-explosive charge plus a fire-starting ability. The projectile is assembled with the M505A3 PD fuze, the M103 case, and the M52A3B1 electric primer.

IDENTIFICATION

Ammunition is identified by the color the projectile is painted and by the lettering on the body of the projectile.

Lettering

The lettering (fig. 7-4) is stenciled in waterproof marking ink around the body of the projectile. The first line of lettering identifies the caliber and type of cartridge; for example, 20MM HEI, 20MM TP, or 20MM HEI-T. The second line gives the cartridge designation; for example, M254, M55A2, or M220. The last line consists of a code number that identifies the manufacturer, interfix number, lot serial number, and year of manufacture. The color of the letters has no meaning.

Color Coding

The color codes for the M50-configured 20-mm ammunition are listed in table 7-2. You can see exactly where colors are located on the projectile. The projectile (fig. 7-4) is divided into sections marked A, B, C, and D. The sections on the projectile match the color code to columns in the figure.

By looking at table 7-2, you can identify high-explosive incendiary-tracer round M242. First, find the projectile and its color code in column A. Then, look at section A of the projectile. This section of the projectile isn't painted; therefore, section A of the projectile remains the natural color of the metal (copper). Look at column B and find the color for section B. Refer to section B of the projectile. This area is painted yellow (high explosives), and section B1 is painted red (incendiary). Use the same procedures for sections C and D. Also note the red T markings in the section B area just outside of the B1 section. The red T, and in some cases orange T, shows the presence of an incendiary explosive (tracer).

PGU CONFIGURATION AMMUNITION

The improved 20-mm (PGU) configuration ammunition for the M61A1/A2 aircraft guns is issued in the form of cartridges (fig 7-5). All service cartridges have matched ballistics and are electrically primed. Initially procured ammunition is not graded, and all accepted lots are serviceable for issue and use in applicable weapons.

CLASSIFICATION

The PGU configuration ammunition currently issued is classified as follows:

1. Target Practice Cartridge PGU-27/B
2. Semi-armor Piercing High Explosive Incendiary Cartridge PGU-28/B (SAPHEI)
3. Target Practice-Tracer Cartridge PGU-30/B (TP-T)

CARTRIDGE COMPONENTS, GENERAL DESCRIPTION

The cartridge components for PGU-configured ammunition as used in a complete round are discussed in the following paragraphs.

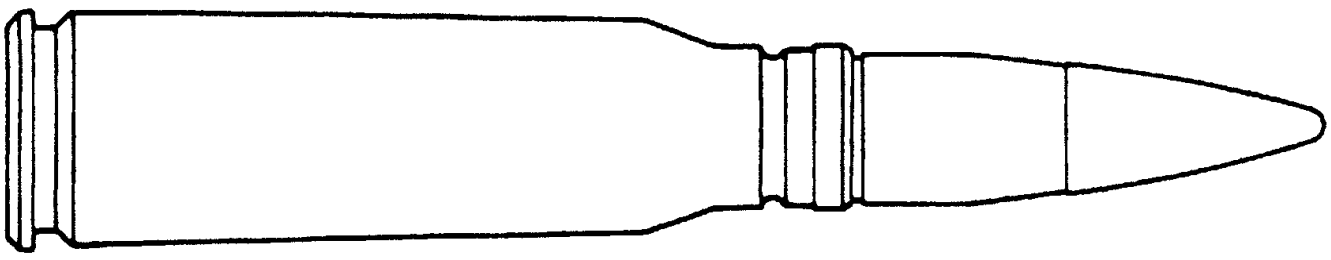

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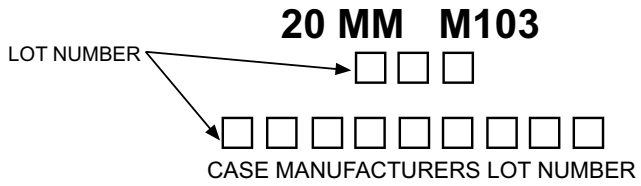
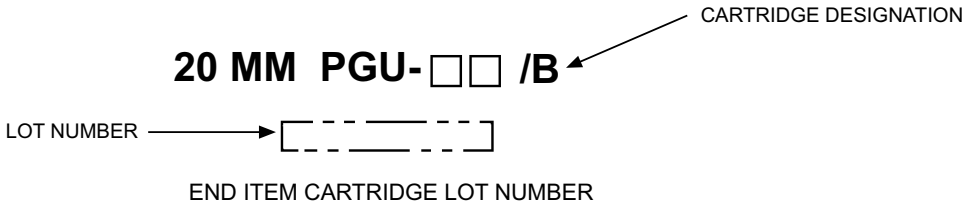
Figure 7-5.—PGU configuration cartridge.





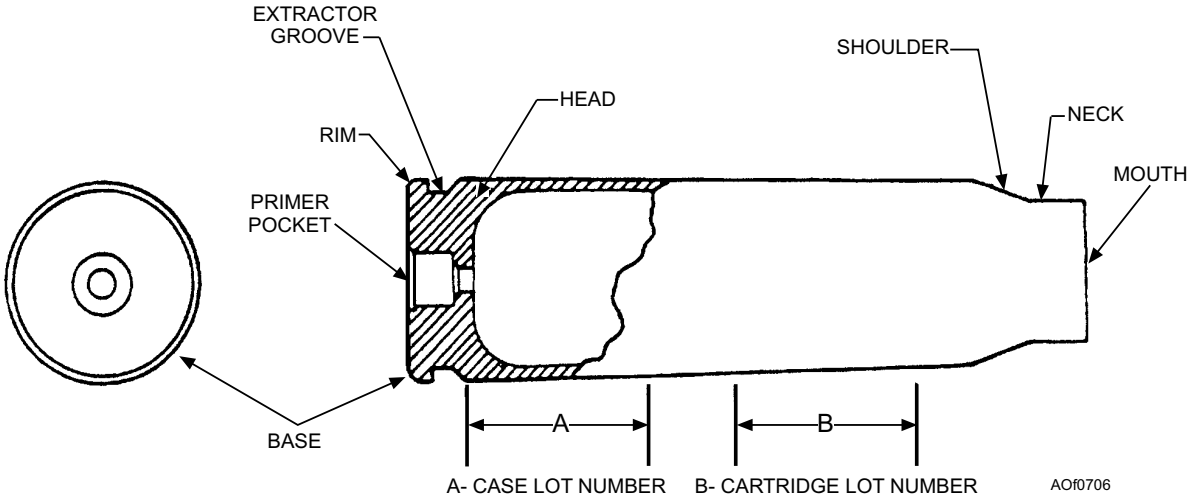


Figure 7-6.—M103 brass cartridge case and markings.

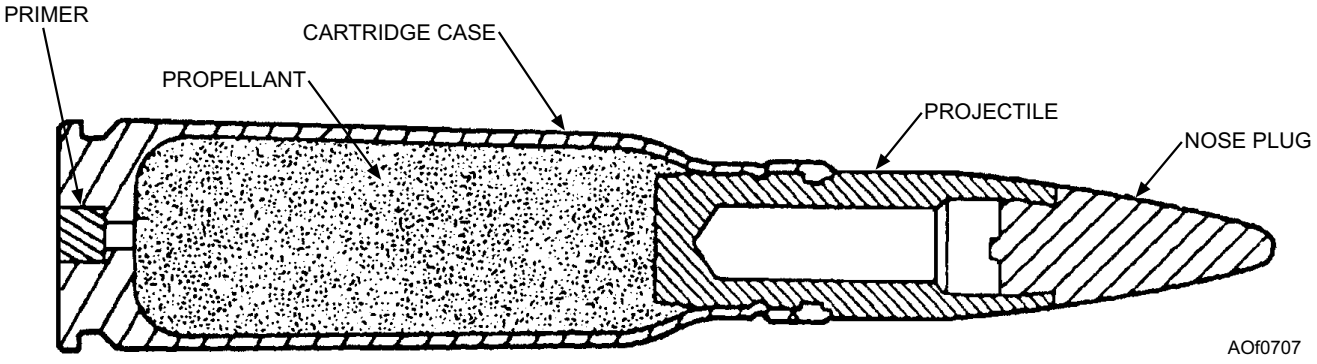


Figure 7-7.—PGU-27/B Target Practice Cartridge.

Cartridge Case

The M103 brass cartridge cases (fig. 7-6) are marked longitudinally or circumferentially with the caliber/case designation on the first line. The manufacturer symbol is on the second line. The interfix number, lot serial number, and year of manufacture are on the third line.

Propellant

All PGU-configured cartridges are loaded with ball spherical propellant WC 867.

M52A3B1 Electric Primer

The electric primer is used in all current PGU configurations. It consists of an open-ended brass cup that contains a brass button insulated from the cup by a plastic liner. The firing pin of the gun contacts this button. The ignition charge (a conductive explosive mixture) is in contact with the other side of the button, and is retained by a paper disk and a metal support cup. The electrically initiated primer ignites the propellant charge.

NOTE: The primer explosive element is sensitive to electromagnetic and electrostatic energy.

Projectiles

All projectiles have essentially the same external configuration. The rotating band is copper alloy swaged into a circumferential groove near the aft end of the steel body.

PGU-27/B Target Practice (TP)

The PGU-27/B projectile consists of a steel body with a solid aluminum nosepiece swaged or crimped to the steel body.

PGU-28/B Semi-Armor Piercing High Explosive Incendiary (SAPHEI)

The PGU-28/B projectile consists of a steel body with an internal cavity filled with a sponge Zirconium pallet, composition A-4 and RS 40 incendiary mix. The aluminum nose contains RS 41 incendiary mix and is swaged to the steel body.

PGU-30/B Target Practice-Tracer (TP-T)

The PGU-30/B consists of a steel body with an aft cavity containing the tracer pellet. The aluminum nose is swaged or crimped to the steel body.

Tracer

A tracer pellet is loaded into a cavity machined in the base of the TP-T projectile used in the assembling of the PGU-30/B cartridge. The heat and pressure of the propelling charge ignite the tracer pellet. The tracer is visible for approximately 3.2 seconds during projectile flight.

PGU-27/B TARGET PRACTICE CARTRIDGE

This cartridge (fig. 7-7) has no explosive filler in the projectile. The cartridge is used in practice firing, for boresighting of weapons, and testing of new guns. The projectile shape and ballistic properties are similar to those of other PGU configuration ammunition. PGU configuration ammunition characteristics are shown in table 7-3.

Table 7-3.—PGU Configuration Ammunition Characteristics

Cartridge		Approximate Unit Weight (grains)				Total wt. (grains) (approx.)
Designation	Type	M103 case	M52A3B1 Electric primer	Propellant	Projectile	
PGU-27/B	TP	1,855	22	585	1,550	3,900
PGU-28/B	SAPHEI	1,855	22	585	1,580	3,900
PGU-30/B	TP-T	1,855	22	585	1,554	3,900

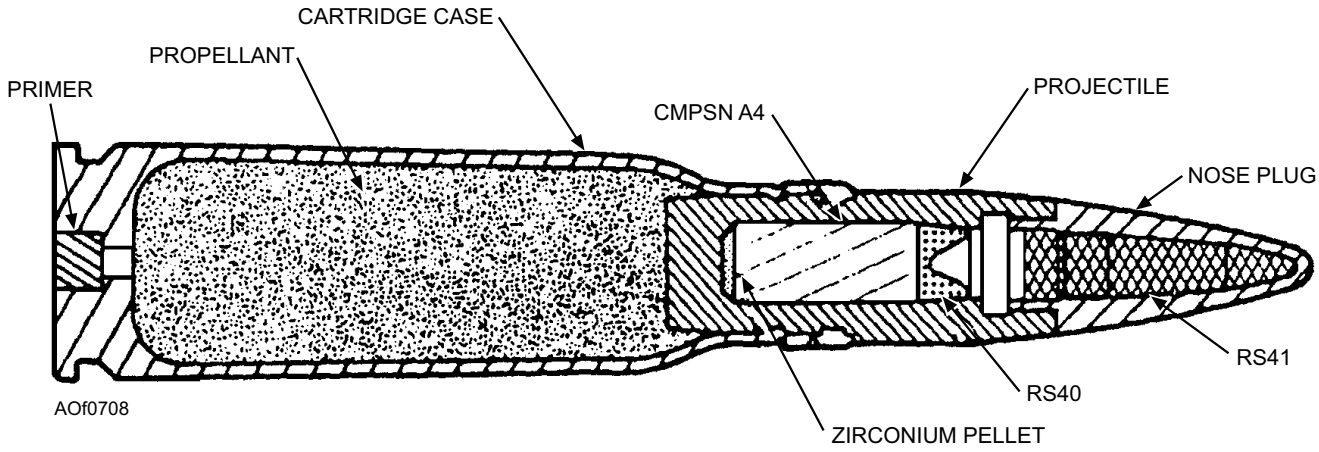


Figure 7-8.—PGU-28/B Semi-Armor Piercing High Explosive Incendiary.

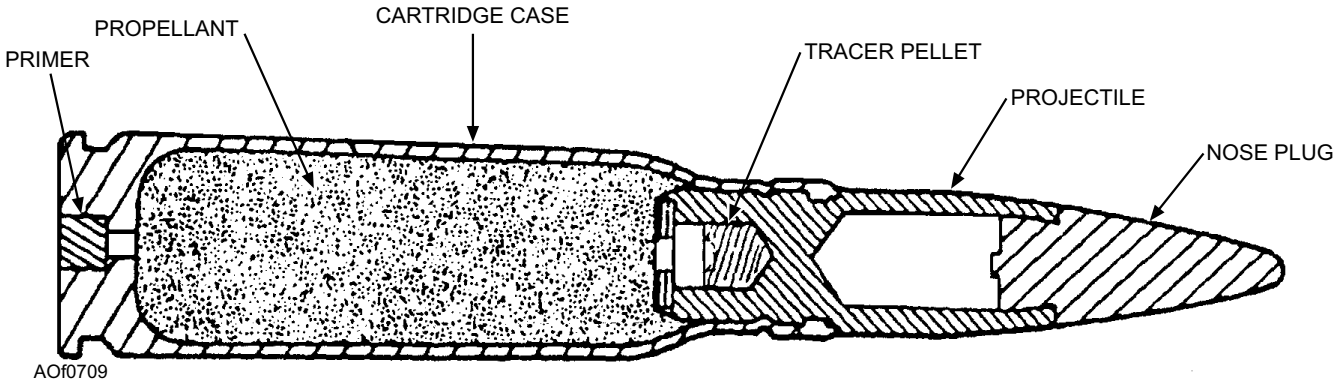


Figure 7-9.—PGU-30/B Target Practice-Tracer.

PGU-28/B SEMI-ARMOR PIERCING HIGH EXPLOSIVE INCENDIARY CARTRIDGE

This cartridge (fig. 7-8) is for use against aircraft and light material targets, and functions with semi-armor piercing, high explosive, and incendiary effect.

PGU-30/B TARGET PRACTICE-TRACER CARTRIDGE

This cartridge (fig. 7-9) is virtually the same as the PGU-27/B projectile, except it incorporates a tracer in the base of the projectile.

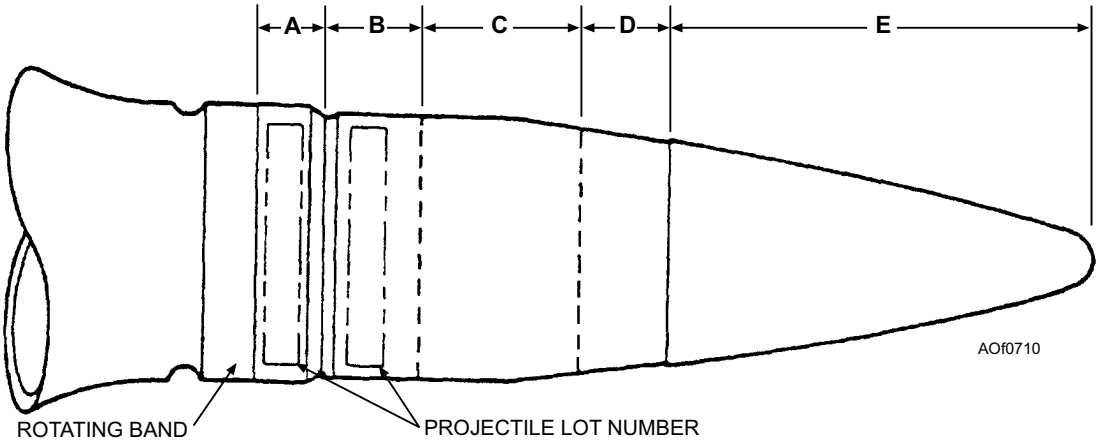


Figure 7-10.—Color Coding and Marking for PGU Configuration Ammunition.

Table 7-4.—Color Coding and Marking for PGU Configuration Ammunition.

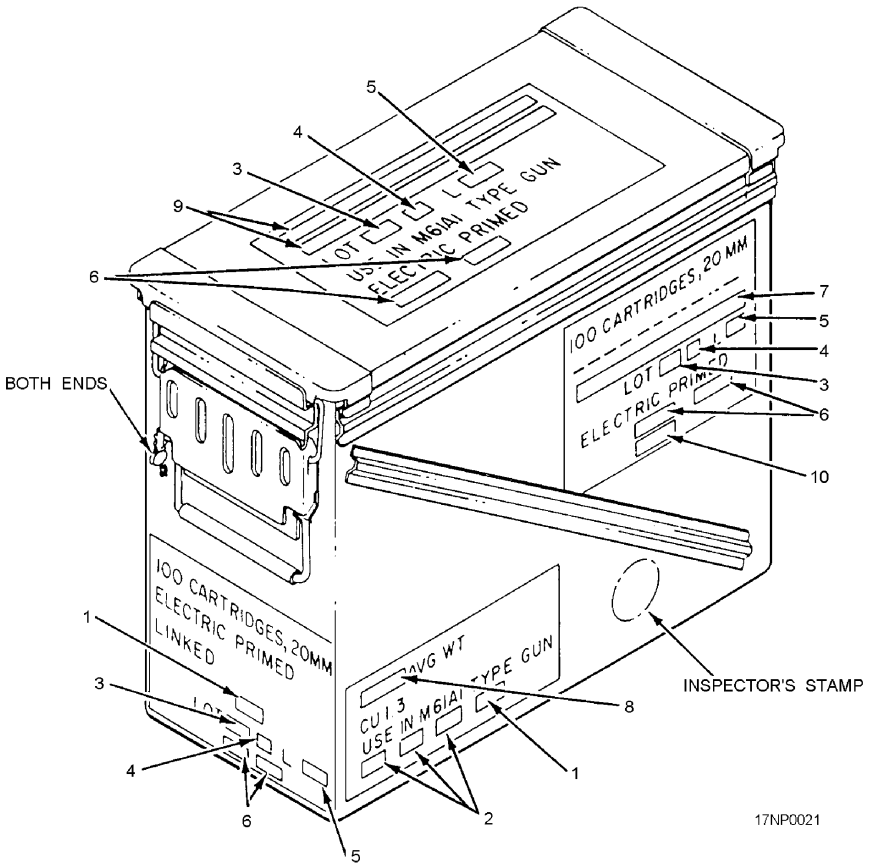
Projectile Type	Color of Painting					Color of Marking
	Locations (See Figure 7-10)					
	A	B	C	D	E	
Target Practice (TP) PGU-27/B	No paint (copper)	Blue	Blue	Blue	Blue	White
Semi-Armor Piercing High Explosive Incendiary (SAPHEI) PGU-28/B	No paint (copper)	Black	Yellow	Red	No paint (chromate)	White
Target Practice Tracer (TP-T) PGU-30/B	No paint (copper)	Blue	Blue	Blue	Blue	White with Orange T's (location D)

PGU IDENTIFICATION

Ammunition type is identified by the color the projectile is painted and by the lettering on the body of the projectile. Refer to (fig. 7-10 and table 7-4) for PGU ammunition identification.

AMMUNITION CONTAINER M548

The M548 container (fig. 7-11) is made of metal. Quick-release latches at both ends attach the lid. Required information about the ammunition contained inside is listed on the outside of the container. Do not break the moisture-resistant seal between the lid and the container until the ammunition is to be used.



1. DOD cartridge identification code
2. Federal stock number of cartridge
3. Symbol of cartridge manufacturer
4. "S" if steel cartridge case
5. Lot number of cartridge
6. Month and year of cartridge manufacture
7. Type and model of cartridge
8. Average weight of packed container
9. Type of projectile
10. Coast Guard classification

Figure 7-11.—Ammunition container M548 (typical).

NOTE: M50/PGU series ammunition is normally packed in the M548 container, as loose rounds (not prebelted). The Linkless Ammunition Loading System (LALS) eliminated the requirement for prebelted ammunition.

The rounds are packed in the container in layers. There are cardboard partitions between each layer and between the rounds on all sides of the container. Each round has a tubular-shaped cardboard protector around the projectile. Use these cardboard partitions and tubular protectors when repackaging the ammunition in the containers.

LINKLESS AMMUNITION LOADING SYSTEM (MHU SERIES)

LEARNING OBJECTIVE: *Identify the components of the linkless ammunition loading system to include loader ammunition transporter, drum loader and drum unload assemblies, and the conveyor system. Identify the operating procedures to follow when loading/downloading the transporter and aircraft gun system.*

The Linkless Ammunition Loading System (LALS) (fig. 7-12) consists of a loader ammunition transporter MHU-131/E32K, a drum loader assembly MHU-133/E32K, a conveyor system MHU-130/E32K, and a drum unload assembly MHU-132/E32K. The components of the LALS allow 1,400 rounds of electrically primed, M50/PGU-series ammunition to be handled without the use of links while the ammunition is still RADHAZ safe. The system is used to transport ammunition, load and download aircraft, and load and download the loader ammunition transporter.

COMPONENTS

A brief description of the components in the Linkless Ammunition Loading System (LALS) is contained in the following paragraphs.

Loader Ammunition Transporter MHU-131/E32K

Unfired rounds and/or empty cases are stored in the loader ammunition transporter, also known as the *transporter* (fig. 7-13). The transporter is primarily intended to move rounds/cases through the exit and entrance ends during operation. Except for size, the transporter is similar to the aircraft drum assembly.

The transporter can be locked onto the MHU-191/M transporter or stacked three high for storage purposes. The transporter has an ammunition drum mounted in a rigid-frame drum adapter assembly.

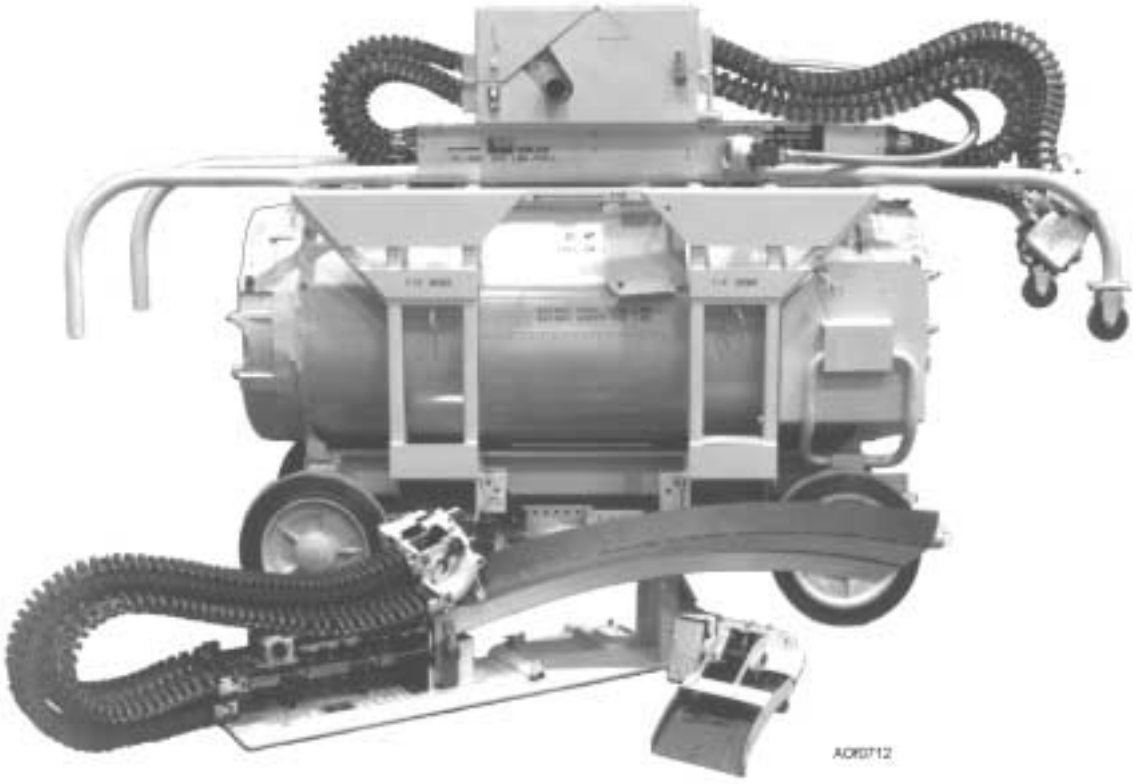


Figure 7-12.—Linkless ammunition loading system (LALS).

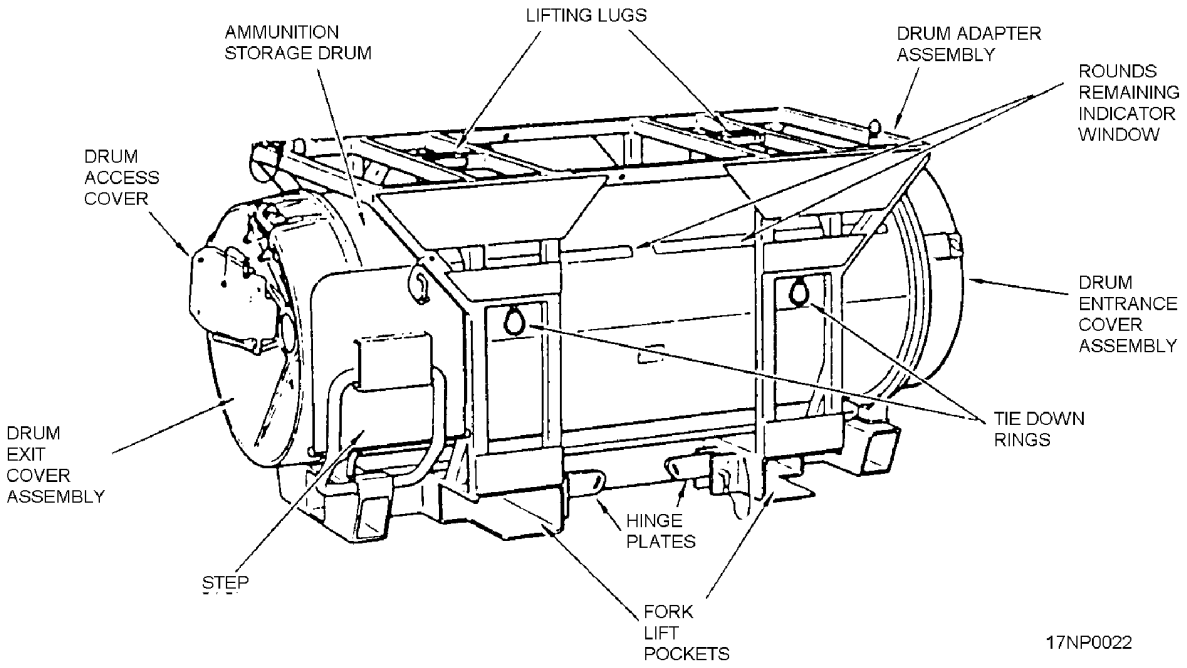


Figure 7-13.—Transporter.

The drum adapter assembly is a box-type structure that allows the transporters to be stacked. Four hinge plates and four quick-release pins are used to lock the transporter onto the MHU-191/M transporter. Two lifting lugs (on 30-inch centers) mate with a weapons carrier so that an overhead crane can be used to lift the transporter. Additionally, there are two forklift pockets that allow the forklift truck to move the transporter. There are four tie-down rings to secure the transporter to the deck. Foldout steps, if needed, are located at the exit end of the transporter to provide personnel with the additional height to operate the LALS.

The ammunition drum is a cylindrical structure that consists of an outer drum structure, an inner drum, two scoop disk assemblies, and two cover assemblies.

OUTER DRUM.—The outer drum is a storage container for ammunition, and it provides a housing for the inner drum. There is a rounds-remaining indicator window so you can determine the number of rounds remaining in the drum. The drum partitions, mounted longitudinally within the outer drum to hold the rounds in place, hold the rounds radially around the outer drum with their bases in an outward direction.

INNER DRUM.—The inner drum is a welded assembly with a mounting ring at each end. There are sheet metal leaves welded to the outer surface of the core that form a double-lead helix. When the inner drum is rotated, it moves the rounds along the drum partitions from the entrance end to the exit end of the drum.

SCOOP DISK ASSEMBLIES.—A scoop disk assembly is mounted on each end of the inner drum. There are three rails on the scoop disk assemblies, forming a continuation of the inner drum helix. Also, two sets of gear-driven sprockets and scoop extensions are located on the scoop disks 180 degrees apart. These sprockets and scoop extensions transfer the rounds from the entrance cover to the outer drum partitions and from the outer drum partitions to the exit cover. The entrance scoop disk has two pins that hold the scoop extensions closed when they are activated by a cam in the outer drum. This prevents feeding rounds into the empty space where the drum partitions cannot control the rounds.

DRUM COVER ASSEMBLIES.—A drum cover assembly is mounted on each end of the outer drum. The drum cover assemblies accept rounds from the entrance unit, load units, or from the scoop disk assembly. It then places the rounds into the scoop disk assembly (entrance end) or exit unit, respectively. The retainer partitions on the retainer gear maintain control of the rounds between the scoop disk assemblies and the entrance or exit units. A spring-loaded timing pin on each drum cover is used to index the drum during installation of the entrance and exit units. The exit drum cover assembly also contains brackets for mounting a drive assembly.

Drum Loader Assembly MHU-133/E32K

The drum loader assembly (fig. 7-14) is used to load the transporter with unlinked ammunition. The drum loader assembly places the unlinked rounds into the conveyor elements, which carry the rounds to the load unit assembly. The load unit assembly removes the rounds from the elements and places them into the retainer partitions in the entrance drum cover. You can time the load unit assembly by inserting a pin through the cover, through a hole in one of the gears, and into a hole in the housing. The drum loader consists of a load tray (onto which the rounds are placed), a belt of elements, two chutes (which control the rounds and elements when they are between the tray and the load unit), and a load unit assembly. The load unit assembly contains two gear-driven sprocket assemblies that transfer the rounds from the belt of elements to the drum cover partitions and a gearbox that drives the drum loader assembly. The gearbox can be driven by a 1/2-inch drive hand crank, making it easier to transport the rounds. A resettable counter indicates the number of rounds that have been loaded into the transporter.

Drum Unload Assembly MHU-132/E32K

The drum unload assembly (fig. 7-15) removes rounds and/or spent cases from the transporter and separates them from each other. The drum unload assembly contains a gear-driven sprocket that removes the rounds/spent cases from the drum exit cover and places them on a tray. The tray has a hole that lets spent cases drop through while the rounds must travel the length of the tray. You can time the drum unload assembly by inserting a pin through the cover, through a hole in one of the gears, and into a hole in the housing.

Conveyor System MHU-130/E32K

The conveyor system (fig. 7-16) transports rounds from the transporter to the aircraft system. It simultaneously transports spent cases and cleared rounds from the aircraft system to the transporter. The conveyor system is mounted on the top of the transporter. It consists of a chute support assembly, three ammunition chutes, two element chutes, an exit unit assembly, an interface unit assembly, an entrance unit assembly, and a drum drive assembly that is driven by a flexible drive shaft.

CHUTE SUPPORT ASSEMBLY.—The chute support assembly is a rigid structure that supports other units. It also provides stowage for other units when they aren't in use. A portion of the chute that is required for the control of spent cases and elements is a rigid wire-form chute. This chute is part of the chute support assembly. Casters are provided on one end of the chute support assembly to aid in moving the assembly when it is not mounted on a transporter.

CHUTES.—The ammunition and element chutes control the elements and rounds or spent cases when the system is operating. The chutes are flexible enough to permit interconnection of the various units.

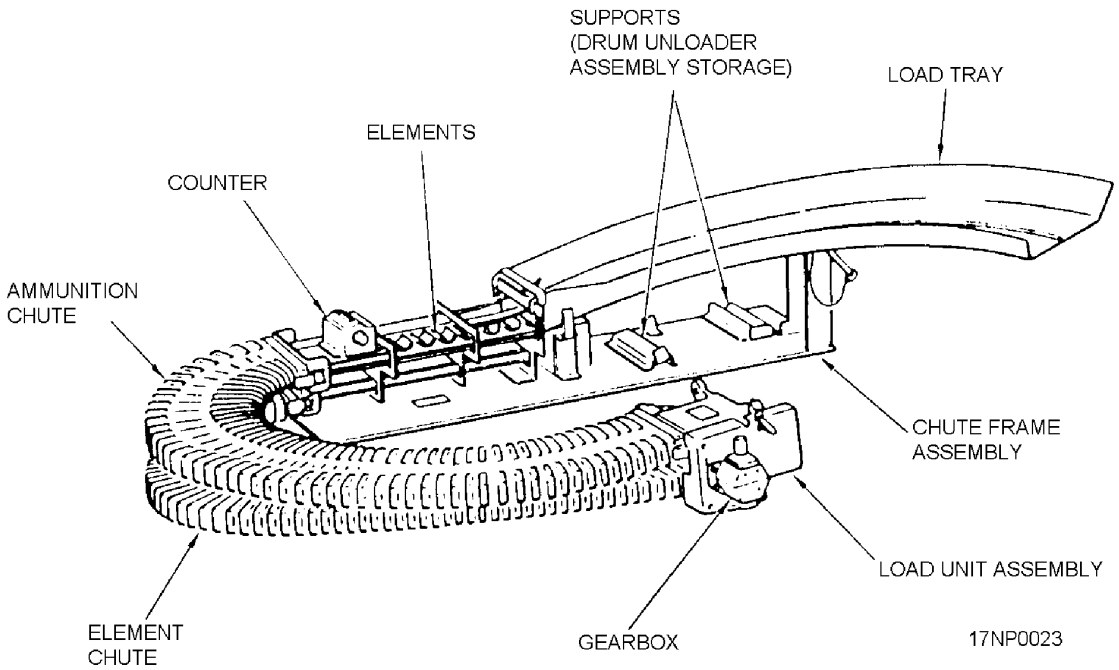


Figure 7-14.—Drum loader.

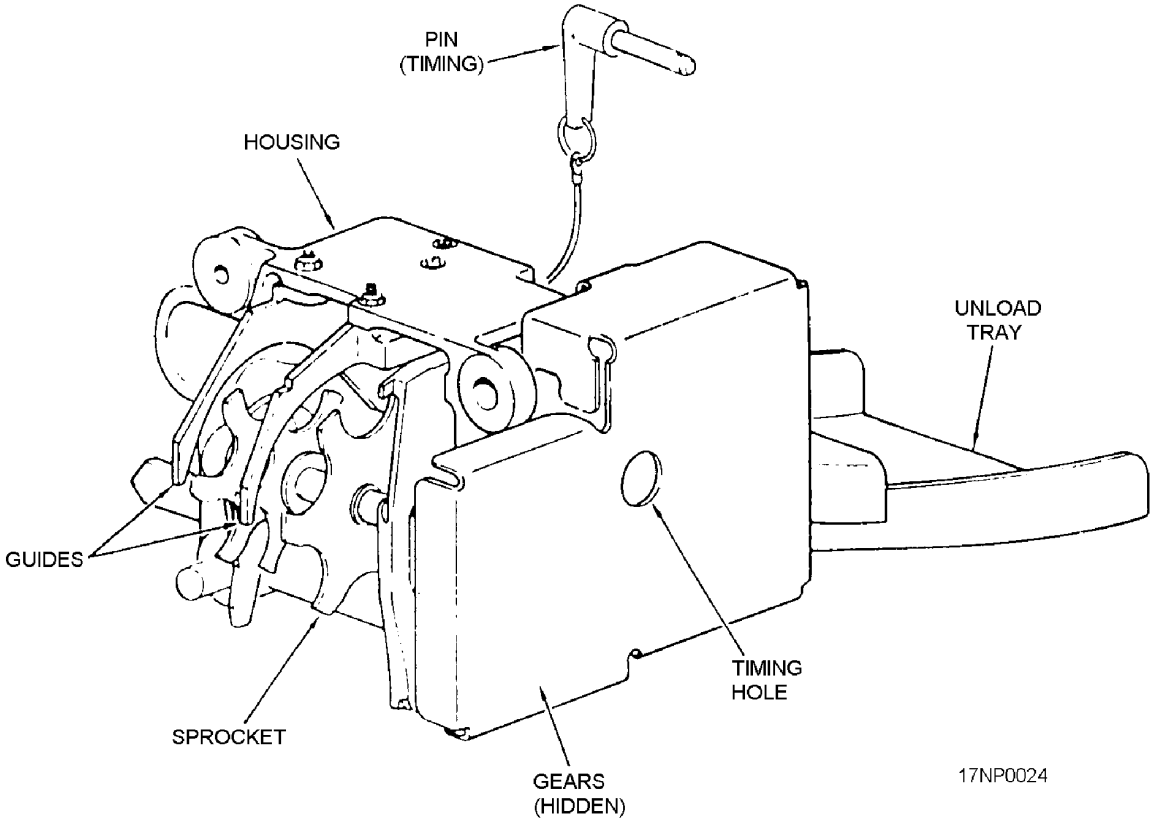


Figure 7-15.—Drum unloader.

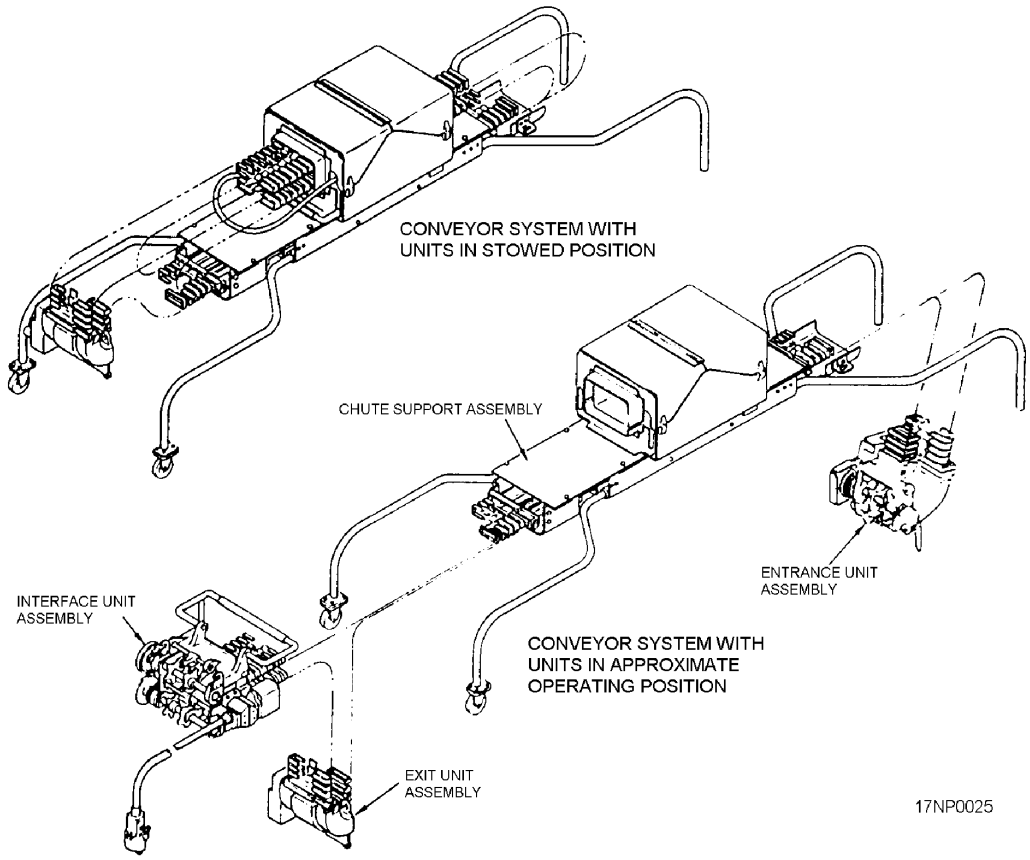


Figure 7-16.—Conveyor system.

EXIT UNIT ASSEMBLY.—The exit unit assembly removes rounds from the transporter and places them into the elements. Two gear-driven sprocket assemblies are used to transfer the rounds from the transporter to the elements. You can time the exit unit assembly by inserting a pin through the cover, through a hole in one of the gears, and into a hole in the housing.

INTERFACE UNIT ASSEMBLY.—The interface unit assembly transfers the rounds coming from the exit unit assembly to the aircraft system and the spent cases coming from the aircraft system to the elements going to the entrance unit. A bypass mode of operation permits the rounds to be cycled through the transporter/conveyor system without an interchange of rounds at the interface unit. The interface unit assembly has a gearbox drive that drives the transporter/conveyor system at the speed required for correct hand-off between the interface unit and the aircraft system. The three gear-driven sprockets control the elements and rounds as they pass through the interface unit assembly. A resettable counter indicates the number of rounds that have been loaded into the aircraft system.

ENTRANCE UNIT ASSEMBLY.—The entrance unit assembly removes spent cases/cleared rounds from the elements and places them into the transporter. There are three gear-driven sprockets that control the elements and spent cases as they pass through the entrance unit assembly. A counter indicates the total number of elements that have been cycled.

DRUM DRIVE ASSEMBLY AND FLEXIBLE DRIVE SHAFT.—The drum drive assembly is mounted on the exit end of the transporter and drives the transporter drum. The drive power is transmitted from the interface unit to the drum drive assembly by the flexible drive shaft.

REVIEW NUMBER 1

Q1. List the components of the Linkless Ammunition Loading System (LALS).

Q2. How many rounds of electrically primed M50/PGU ammunition can be loaded on the components of the LALS?

Q3. What weapons skid is used with the LALS?

Q4. What is the purpose of the loader ammunition transporter?

Q5. What is the purpose of the drum loader assembly?

Q6. What is the purpose of the conveyor system?

Q7. What components transfer rounds from the transporter to the elements in the exit unit assembly?

Q8. The drive power is transmitted from the interface unit to the drum drive assembly by the _____.

OPERATION

Operation of the LALS is divided into three modes: loading/downloading the transporter, loading/ downloading aircraft gun systems and bypass.

Loading/Downloading Transporter

Ammunition primers are exposed when you conduct transporter loading/downloading operations. Therefore, loading/downloading must be done in a RADHAZ safe area.

As you read this section, refer to figure 7-17. When you are loading the transporter, attach the timed drum loader assembly to the timed drum entrance cover of the transporter, and attach the timed drum unload assembly to the timed drum exit cover. If you are simultaneously loading/downloading, attach both the timed drum loader assembly and drum unload assembly to the timed drum entrance cover and to the timed drum exit cover. When downloading only, the transporter is driven by a hand crank in the retainer at the center of the entrance end of the transporter. When loading or simultaneously loading/downloading, the transporter is driven by the load unit assembly.

Ammunition is placed in the load tray of the drum loader at the specified ratio. The curve and tilt of the tray lets the rounds roll freely toward the elements. As the hand crank drives the load unit assembly, each element picks up one round and carries it through the ammunition chute to the load unit assembly. As the rounds enter the ammunition chute, the rounds counter is actuated. The load unit assembly removes the rounds from the elements and places them in the retainer partitions of the drum entrance cover. The scoop disk assembly removes the rounds from the retainer partitions and places them into the drum partitions, where the inner drum (helix) moves them from the entrance cover toward the exit cover. Since there is a space in the outer drum where no controlling partitions exist, a cam on the outer drum engages a pin on the scoop disk assembly that closes the scoop extension. With the scoop extension closed, no rounds can be

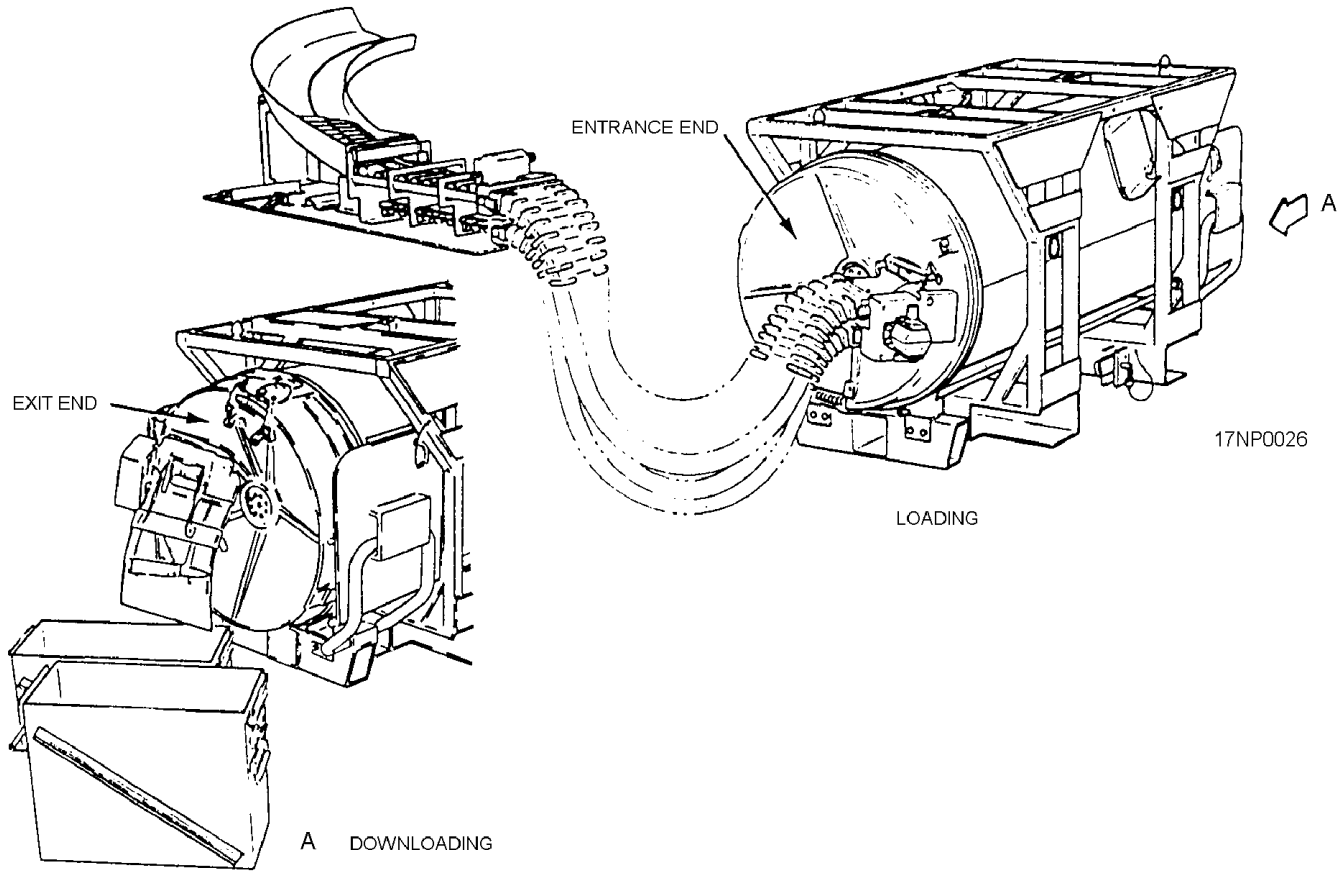


Figure 7-17.—Loading and downloading transporter.

placed in the empty space. As the inner drum moves the rounds or spent cases toward the drum unload assembly, the scoop disk assembly removes the rounds from the drum partitions and places them into the retainer partitions of the drum exit cover.

The drum unload assembly removes the rounds from the retainer partitions and places them on the unload tray. A hole in the unload tray lets spent cases drop into a spent case container. Rounds are moved across the hole in the tray to a live-rounds container. These rounds must be restrained to prevent impact with the container or other rounds.

Loading/Downloading Aircraft Gun Systems

In a load and/or download operation, any combination of the following conditions may exist: A fully loaded, partially loaded, or empty transporter may be mated to a fully loaded, partially loaded, or empty gun system. Each set of possible combination dictates a unique load and/or downloads operational sequence. The load or download operational sequence explained in the following paragraph refers to a fully loaded transporter mated to a fully loaded gun system.

For you to load or download an aircraft gun system, the conveyor system must be mounted on the transporter with the timed entrance and exit unit assemblies mounted to a timed drum. The timed interface unit assembly must be mated to the timed aircraft gun system by the aircraft adapter assembly. The rounds pass from the transporter, through the exit unit assembly, through an ammunition chute, to the interface unit assembly. When the interface unit

assembly mode selector is in the bypass position (fig. 7-18) and the system is cycled, the rounds are guided around the element sprocket and into an ammunition chute, which returns them to the entrance end of the transporter.

When you first connect or remove the interface unit to or from the aircraft adapter, the interface unit assembly must be in the bypass position. When the interface unit assembly mode selector is in the load position (fig. 7-19) and the system is cycled, the rounds are removed from the elements by a sprocket and guided into the elements in the aircraft adapter.

The rounds are carried from the aircraft adapter to the aircraft drum. The elements entering the aircraft adapter from the aircraft system contain spent cases or cleared rounds. These rounds are removed from the aircraft elements and are guided by a sprocket into the elements of the conveyor system for transfer to the transporter.

For further information concerning the LALS MHU series refer to NAVAIR 19-1-125.

REVIEW NUMBER 1 ANSWERS

A1. The Linkless Ammunition Loading System (LALS) consists of a loader ammunition transporter, a drum loader assembly, a conveyor system, and a drum unload assembly.

A2. The LALS can hold 1,400 rounds of electrically primed, M50/PGU ammunition.

A3. The MHU-191/M transporter is used with the LALS.

A4. The loader ammunition transporter is used to move rounds/cases through the exit and entrance ends during operation.

A5. The purpose of the drum loader assembly is to load the transporter with unlinked ammunition.

A6. The conveyor system is used to transport rounds from the transporter to the aircraft system. It simultaneously transports spent cases and cleared rounds from the aircraft system to the transporter.

A7. Two gear-driven sprocket assemblies in the exit unit assembly transfer rounds from the transporter to the elements.

A8. The drive power is transmitted from the interface unit to the drum drive assembly by the flexible drive shaft.

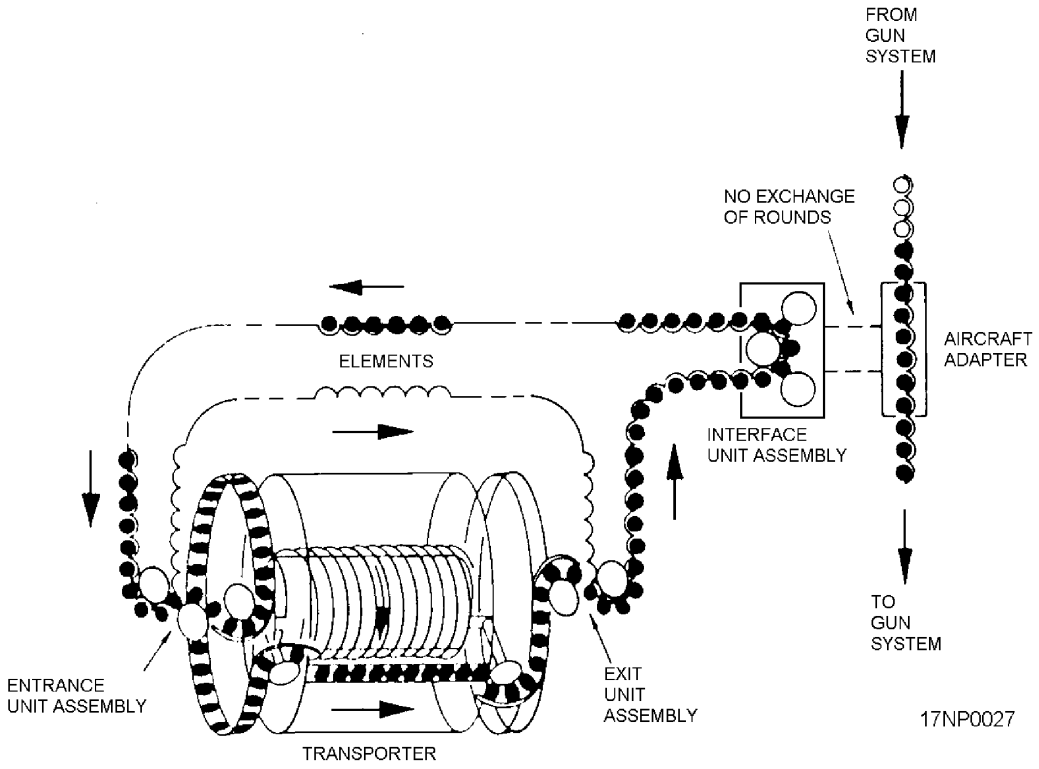


Figure 7-18.—Ammunition flow in bypass mode.

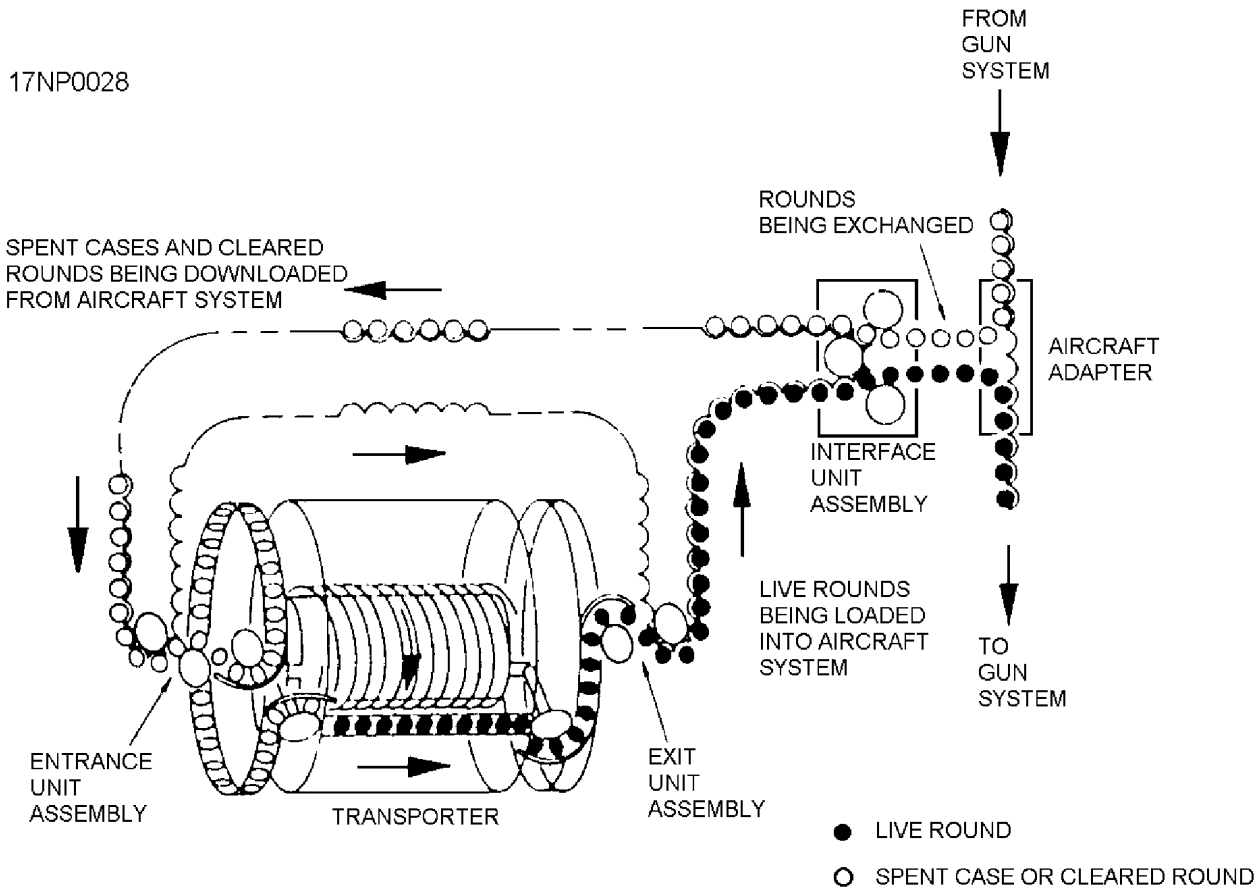


Figure 7-19.—Ammunition flow in load/download mode.

REVIEW NUMBER 2

Q1. In what type of environment must transporter loading or downloading operations be conducted?

Q2. List the conditions that might exist in a given load or download operation.

Q3. When you connect or remove the interface unit to or from the aircraft adapter, it must be in what position?

LINKLESS AMMUNITION LOADING SYSTEM A/E32K-7

LEARNING OBJECTIVE: *Identify the components of the linkless ammunition loading system to include the ammunition loader and ammunition replenisher.*

The Linkless Ammunition Loading System (LALS) (fig. 7-20) consists of an ammunition loader and an ammunition replenisher. The components of the LALS allows a load of 1,800 rounds of 20mm ammunition to be simultaneously loaded and downloads the spent cases and unfired rounds.

COMPONENTS

A brief description of the components in the Linkless Ammunition Loading System (LALS) is contained in the following paragraphs.

Ammunition Loader

The ammunition loader (fig. 7-21) is a mechanical, ammunition storage and loading device driven by a hand crank, or a pneumatic drive tool. It consists of four Weapons Replaceable Assemblies (WRSs): a storage container, conveyor assembly, transfer unit assembly, and support frame assembly. The support frame assembly consist of three Shop Replaceable Assemblies (SRA's): a forward housing assembly, aft housing assembly, and base frame assembly.

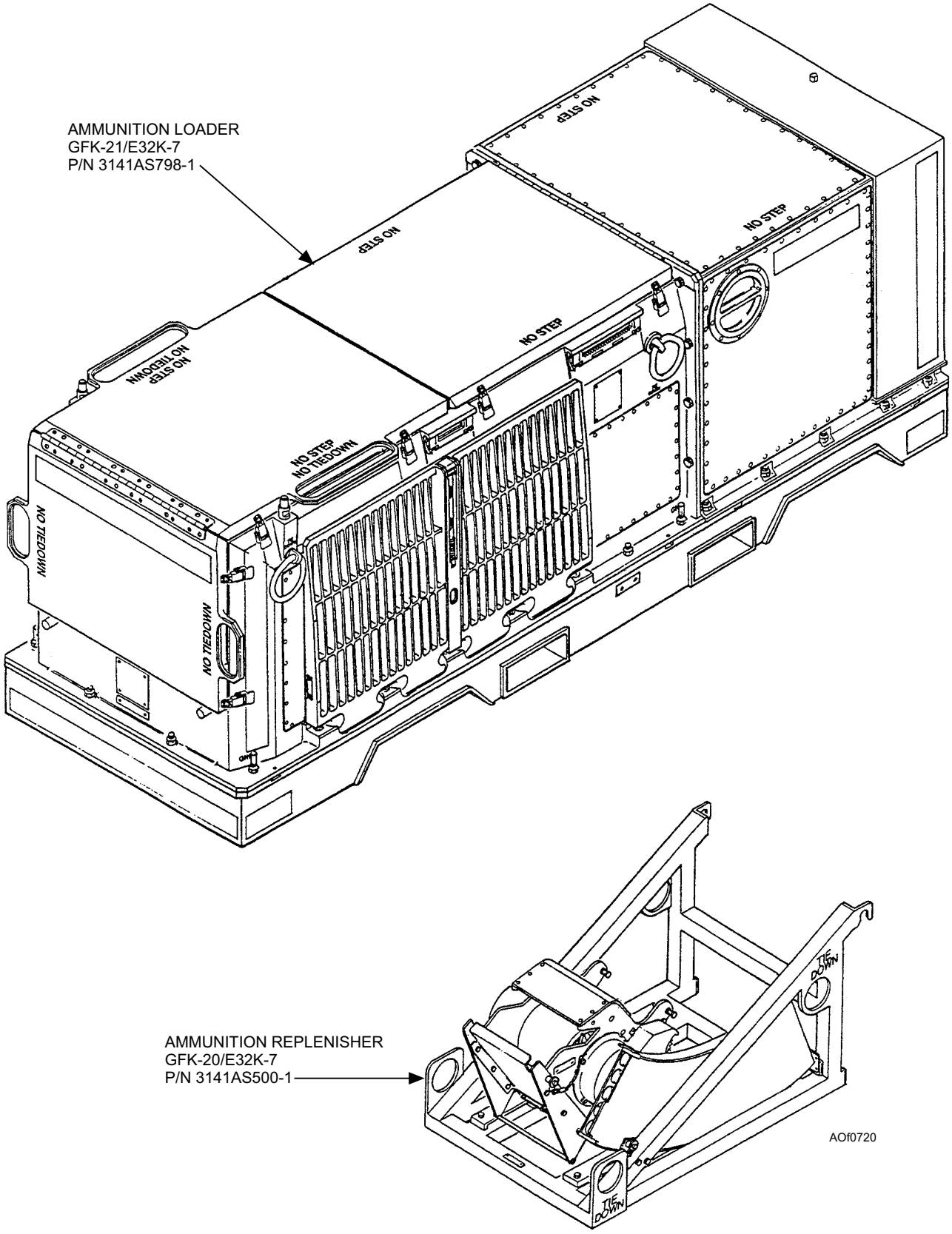


Figure 7-20.—Linkless Ammunition Loading System (A/E32K-7).

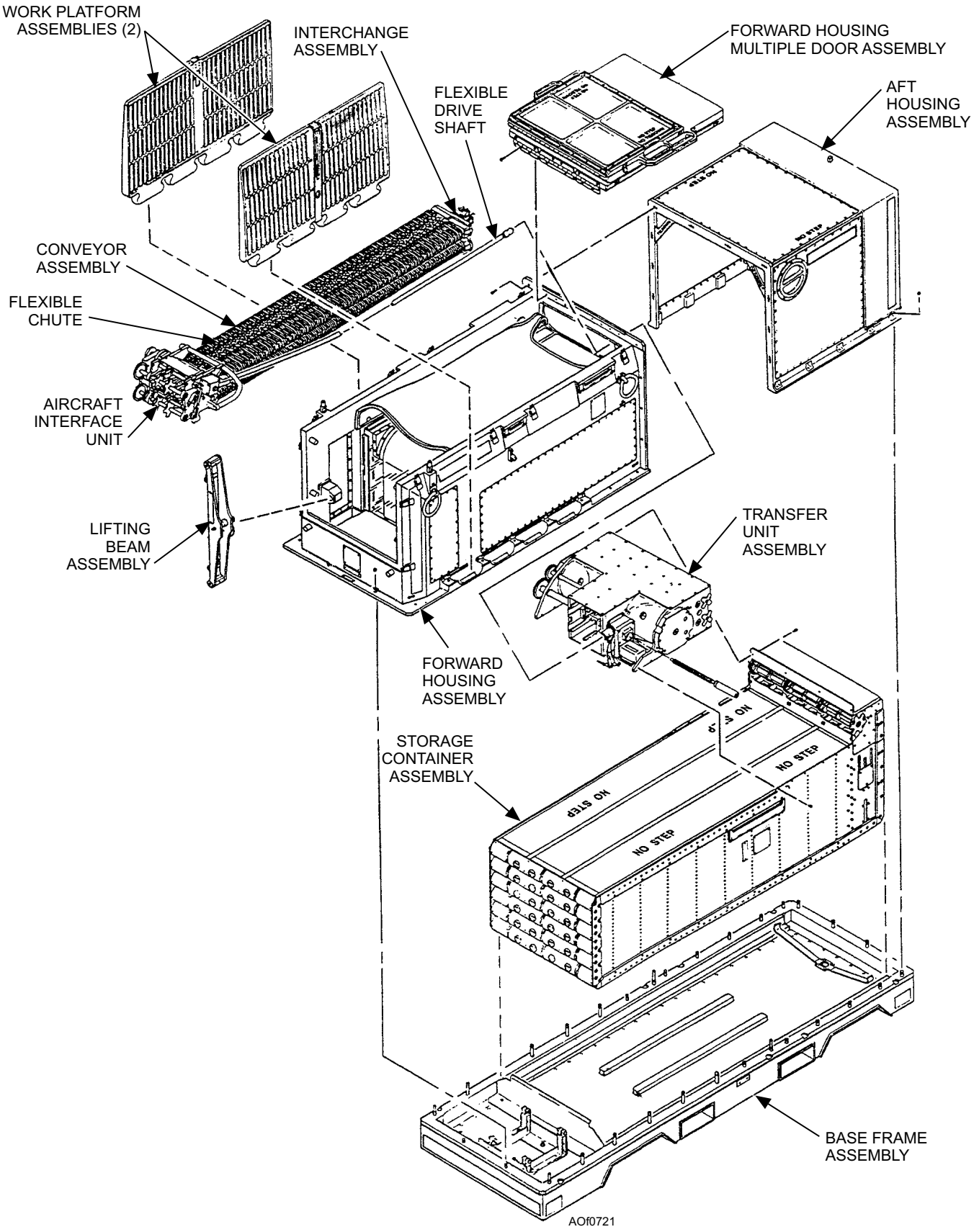


Figure 7-21.—Ammunition Loader.

Ammunition Replenisher

The ammunition replenisher (fig. 7-22) is a mechanical ammunition feed device, which interfaces with the ammunition loader during replenishment. It consists of a load tray assembly, dump tub chute assembly, replenisher interchange assembly, and replenisher mounting base assembly.

OPERATION

Operation of the LALS is divided into four modes: replenishment mode, aircraft servicing mode, transport mode and storage mode. Replenishment mode is an intermediate level function and aircraft-servicing mode is an organizational level function.

Replenishment mode

To load the ammunition loader, the access door is unlatched, folded up and back to the open position and secured. The ammunition replenisher is mounted on the ammunition loader (fig. 7-23). The aircraft, Aircraft Interface Unit (AIU) is then unlatched (fig. 7-23) and removed from its stowed position. The conveyor chute is rotated 180 degrees in either direction and the AIU is attached to the ammunition replenisher. Attach load tray assembly to replenisher interchange assembly. Three empty ammunition containers are placed beneath the ammunition replenisher. One container collects the spent cases downloaded from the ammunition loader; the second container stores the unfired rounds; and the third container, if required, catches the cardboard tubes which are stripped off the tube-packed ammunition. Ammunition is hand-fed into the load tray assembly with the rounds pointing as pictured on load tray.

During replenishment, the ammunition loader is driven in the reverse direction. As the hand crank drives the ammunition replenisher, the ammunition is transferred out of the load tray assembly by the detuber rotor. If ammunition is tubed, the cardboard tubes are stripped off the rounds as they travel around the detuber rotor. The cardboard tubes are diverted into the tube dump chute and the rounds are transferred to the replenisher conveyor belt elements. The ammunition rounds are then handed off from the conveyor belt elements to the ammunition loader conveyor assembly and into the ammunition loader transfer unit. In the ammunition loader transfer unit the single stream of ammunition is divided into three streams decelerated and transferred into the three bays in the storage container assembly. At the same time, the spent cases and unfired rounds are downloaded from the ammunition loader through the lower half of the replenisher interchange assembly. The ammunition is transferred from the “download rotor” on the aircraft interface unit into the conveyor belt assembly. As the ammunition moves along the bottom of the conveyor belt assembly, the spent cases fall into a spent case

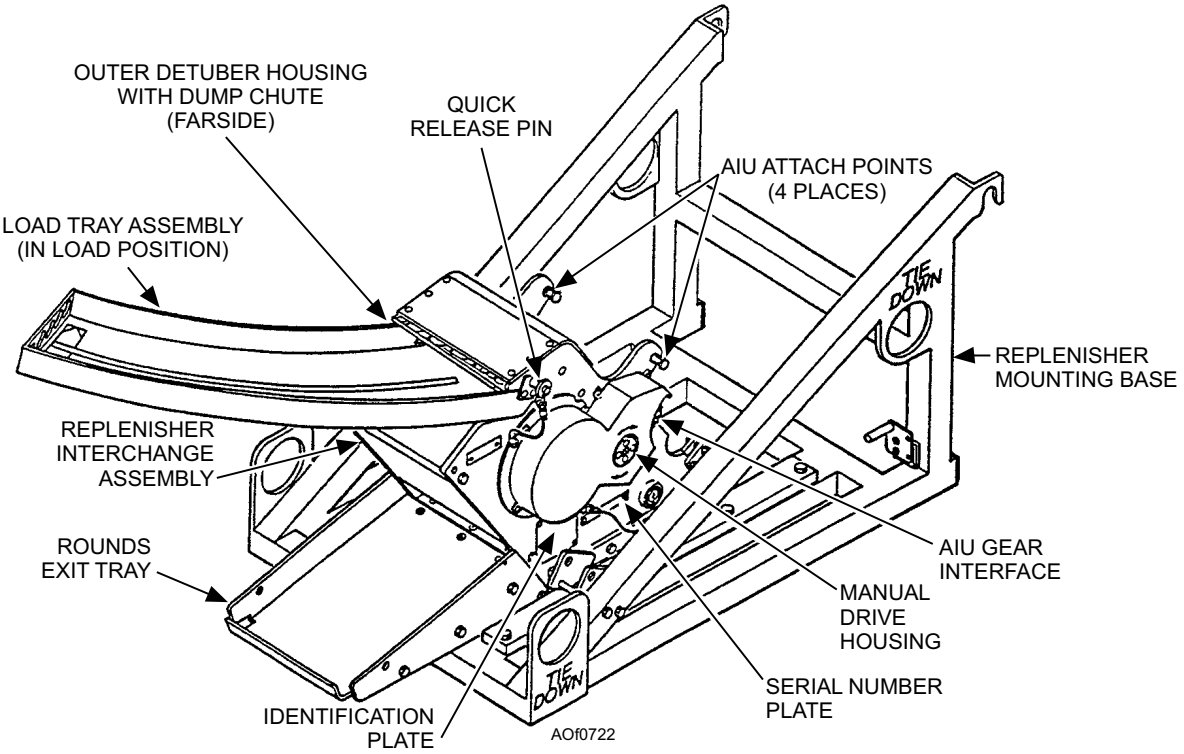


Figure 7-22.—Ammunition Replenisher.

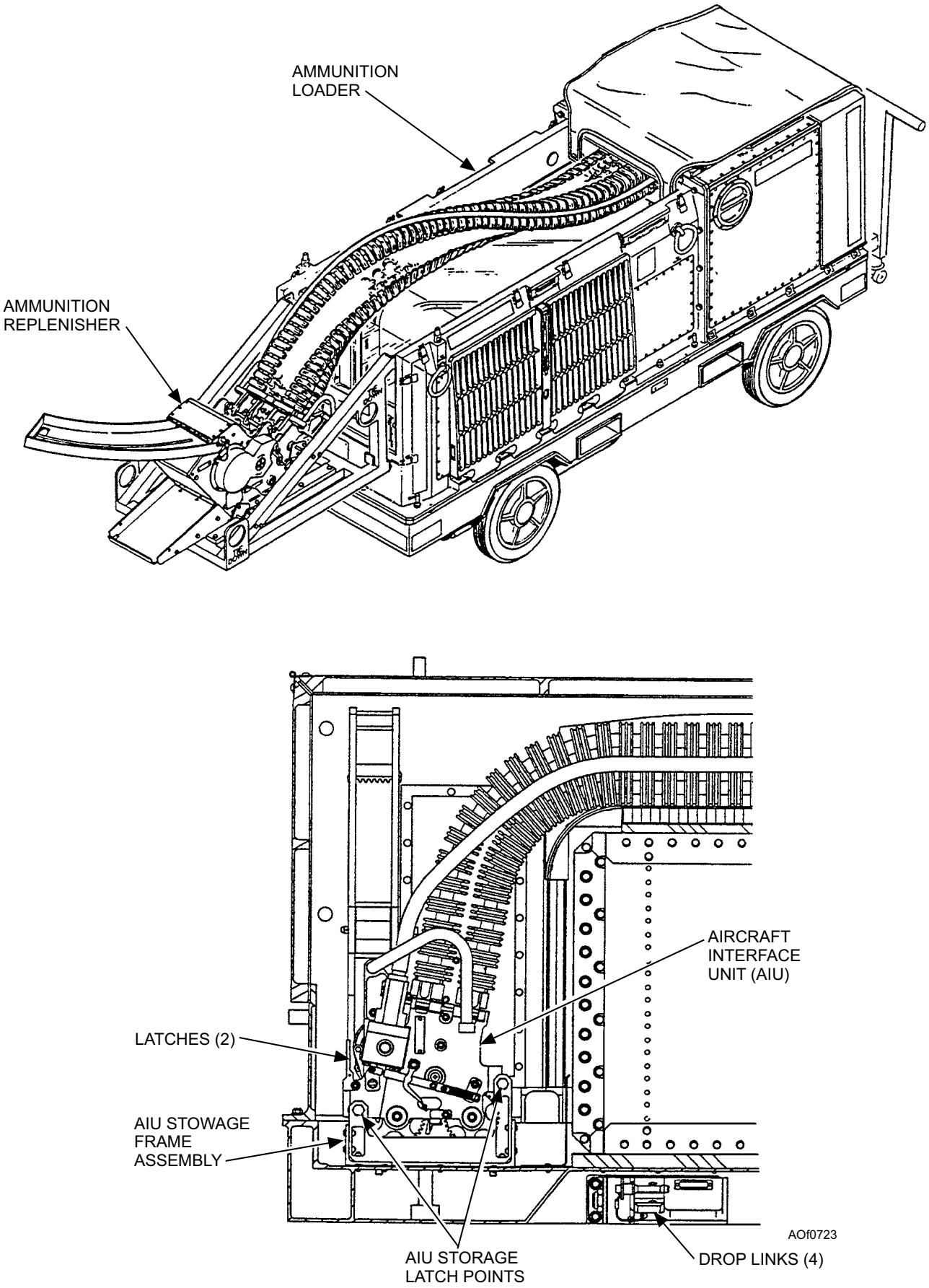


Figure 7-23.—AIU Stowage Frame Assembly Position.

container. Unfired rounds continue further upstream into the unfired round tray where they are manually placed into an ammunition container

Aircraft Servicing Mode

The M61A1/A2 aircraft gun system can be serviced while simultaneously removing expended casings and unfired rounds. To service the aircraft gun system, the Aircraft Gun Feed System (AGFS) must be timed. The AIU is positioned to provide operator crew access. The AIU shift lever handle is placed in the down (BYPASS) position, the manual drive knob is rotated to align the AIU to the timed position and the timing pin is engaged. The AIU is then attached to the AGFS and the timing pin is disengaged. The AIU shift lever handle is then placed in the up (LOAD) position. A hand crank or pneumatic drive tool is attached to the AGFS gun drive socket and is used to cycle the ammunition through the storage container assembly into the aircraft gun systems. As the rounds from the three bays in the loader travel through the terminal drive sprockets, they are fed into the lower half of the transfer unit. All three streams of ammunition are merged and accelerated into a single stream of ammunition.

From the transfer unit assembly, the ammunition is driven through the lower half of the conveyor chute assembly into the aircraft interface unit and is passed into the aircraft gun system. At the same time, unfired rounds and spent cases are downloaded through the upper rotor of the aircraft interface unit into the upper half of the conveyor chute assembly. At the transfer unit assembly, the single stream is decelerated, divided into three streams and transferred into the three bays of the storage container assembly.

REVIEW NUMBER 2 ANSWERS

A1. *When transporter loading/downloading operations are conducted, they must be done in an RADHAZ-free environment.*

A2. *In a given load/download operation, any of the following conditions may exist: A fully loaded, partially loaded, or empty transporter may be mated to a fully loaded, partially loaded, or empty gun system.*

A3. *When you connect or remove the interface unit to or from the aircraft adapter, it must be in the bypass position.*

Transport Mode

In the transport mode, the ammunition loader is used to transport ammunition from the magazine to the aircraft. It can be mounted on a variety of transporter and trailers. A forklift truck can be utilized to move the ammunition loader short distances. Forklift guides are an integral part of the mounting base assembly. When ashore, the ammunition loader will be transported on A/M32K-4A, MHU-126/M, MHU-126A/M, MHU-151/M or MHU-202/M trailers. Afloat, the ammunition loader will be mounted on an MHU-191/M.

Stowage Mode

The ammunition loader and ammunition replenisher (fig. 7-24) will be stored in a designated storage area. The ammunition loader and ammunition replenisher must be empty of all ammunition and spent cases. To ensure the ammunition loader is empty, one marked dummy round is cycled completely through the storage container assembly, transfer unit assembly and conveyor assembly. A dummy round will also be cycled through the ammunition replenisher prior to storing it. The ammunition loader can be moved to the designated storage area with a forklift or a chain hoist and rail system. A lifting beam mounted in the ammunition loader is used to attach the ammunition loader to the chain hoist. The lifting of the ammunition loader should be accomplished by at least two personnel to ensure the ammunition loader is under control at all times. Both the ammunition loader and the ammunition replenisher are secured to the deck using tie-downs.

For further information on the LALS A/E32K-7 refer to Organizational Operation Instructions NAVAIR 19-1-267 or Intermediate Operation and Maintenance Instructions NAVAIR 19-1-269.

REVIEW NUMBER 3

Q1. *The Linkless Ammunition Loading System (LALS) A/E32K-7 consists of what two components?*

Q2. *What modes of operation does the LALS A/E32K-7 have?*

Q3. *What equipment must be timed to service the aircraft gun system?*

Q4. *What must be done to the ammunition replenisher prior to storing it?*

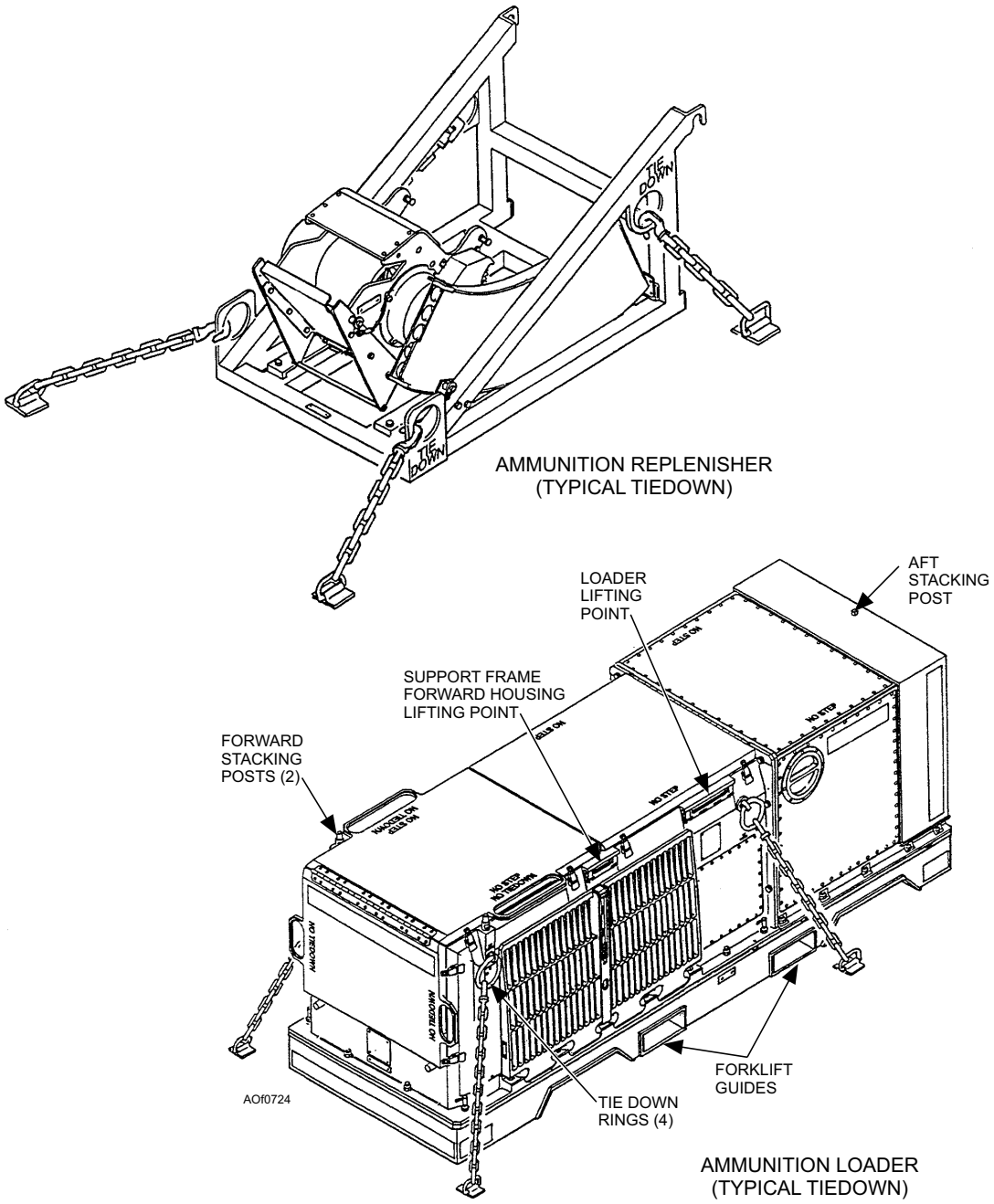


Figure 7-24.—Stowage Mode.

SAFETY PRECAUTIONS

LEARNING OBJECTIVE: *Identify safety precautions to follow when working with the LALS.*

The following general safety precautions are not related to any specific equipment or procedure. These precautions are recommended safety precautions that all personnel should follow when operating and maintaining equipment.

- All persons who supervise or perform work in connection with the ammunition handling should be familiar with the *United States Ordnance Safety Precautions*, NAVSEA OP 3347.
- When test firing is conducted using live ammunition, observe all existing range regulations.
- Before undertaking any operation for which a check off list exists, you must read the check off

list to all personnel who will take part in the operation.

- When provided, always use safety devices to prevent accidents. Keep safety devices in good operating order at all times.
- Electrically primed ammunition can be fired by percussion. NEVER cycle live ammunition through a gun for testing purposes.
- The explosive elements in electric primers are highly sensitive to static electricity. Make sure the primer button does not come into contact with the human body.
- Observe fire regulations and maintain good ventilation when using cleaning solvents and other volatile maintenance materials.
- Before performing maintenance actions involving pneumatic or hydraulic pressurized components, ensure that all pressure is removed and the component is in the safest possible condition.

REVIEW NUMBER 4

Q1. *If a check off list is to be used during an operation, what action must take place first?*

Q2. *To prevent explosive primers on gun ammunition from being exposed to static electricity, what action should be taken?*

REVIEW NUMBER 3 ANSWERS

A1. *The Linkless Ammunition Loading System (LALS) A/E32K-7 consists of an ammunition loader and an ammunition replenisher.*

A2. *The LALS A/E32K-7 has four modes: replenishment mode, aircraft servicing mode, transport mode and storage mode.*

A3. *To service the aircraft gun system, the Aircraft Gun Feed System (AGFS) must be timed.*

A4. *A dummy round will be cycled through the ammunition replenisher prior to storing it.*

REVIEW NUMBER 4 ANSWERS

A1. *If a check off list is to be used during an operation, it must be read to all personnel who will take part in the operation.*

A2. *To prevent explosive primers on gun ammunition from being exposed to static electricity, make sure that the primer button of the ammunition doesn't come into contact with the human body.*