STUDENT HANDOUT

M-16/XM-21 INTRODUCTION

5-294-2
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DRAFT

MARCH 1967

UNITED STATES ARMY AVIATION SCHOOL

FORT RUCKER, ALABAMA

DEPARTMENT OF TACTICS
UNITED STATES ARMY AVIATION SCHOOL
FORT RUCKER, ALABAMA 36360

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PERFORMANCE OBJECTIVES

M-16/XM-21 INTRODUCTION

1. KNOWLEDGES: Without references, the student will be able without error to:

   a. List two of the three major components of the M16/XM21.

   b. List the purpose of the cartridge drive on the M16 and the crossover drive on the XM21.

   c. List the two switches on the circuit control box and give a purpose for each.

   d. List the max effective range of the gun systems.

   e. List the constant rate of fire of the automatic gun system and the combined cyclic rate of fire of this machine gun system.

   f. Select from several possible limits the correct flexible limits for the automatic gun system and the machinegun system.

   g. List the effects the M16/XM21 installation has on the autorotational characteristics of the UH-1.

   h. List the longest burst of fire that can be delivered by the automatic gun.

   i. List the burst radius of the 2.75" rocket 10 lb. warhead.

2. SKILLS: None.

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ADVANCE SHEET

M16/XM21 INTRODUCTION

PURPOSE: This instruction is designed to acquaint you with the three major components of the M16/XM21 armament systems to include the operation and characteristics, capabilities and limitations of the various components and their effect on the aircraft. This sheet will also briefly cover loading of the automatic gun system.

CONSIDERATIONS:

1. During the last decade the development of armed helicopters has come a long way from the homespun Rube Goldberg devices that heralded our early beginnings.

2. From the two Browning machineguns mounted on the skids of an H-13 we have advanced to the devastating automatic minigun capable of firing 4000 shots per minute. We have added a flexing capability to our guns so they are now directed by the copilot/gunner independently of the helicopter's axis. We have in effect fully armed a flying carpet.

3. By way of clarification, the M16/XM21 armament subsystems covered in this two hour block consist basically of two gun mount assemblies, one ammunition feeding system, a fire control system, machineguns/ or electrically driven automatic guns, and necessary attaching hardware.

4. The M16 consists of a four gun machinegun system and two seven round launcher pods. It weighs 1275 pounds with 6700 rounds of 7.62mm ammunition and 14 2.75" rockets.

5. The XM21 uses two electrically driven automatic guns and two seven round rocket launchers with 6000 rounds of 7.62mm ammunition and 14 2.75" rockets w/10 lb warheads. This subsystem weighs about 1184 lbs.

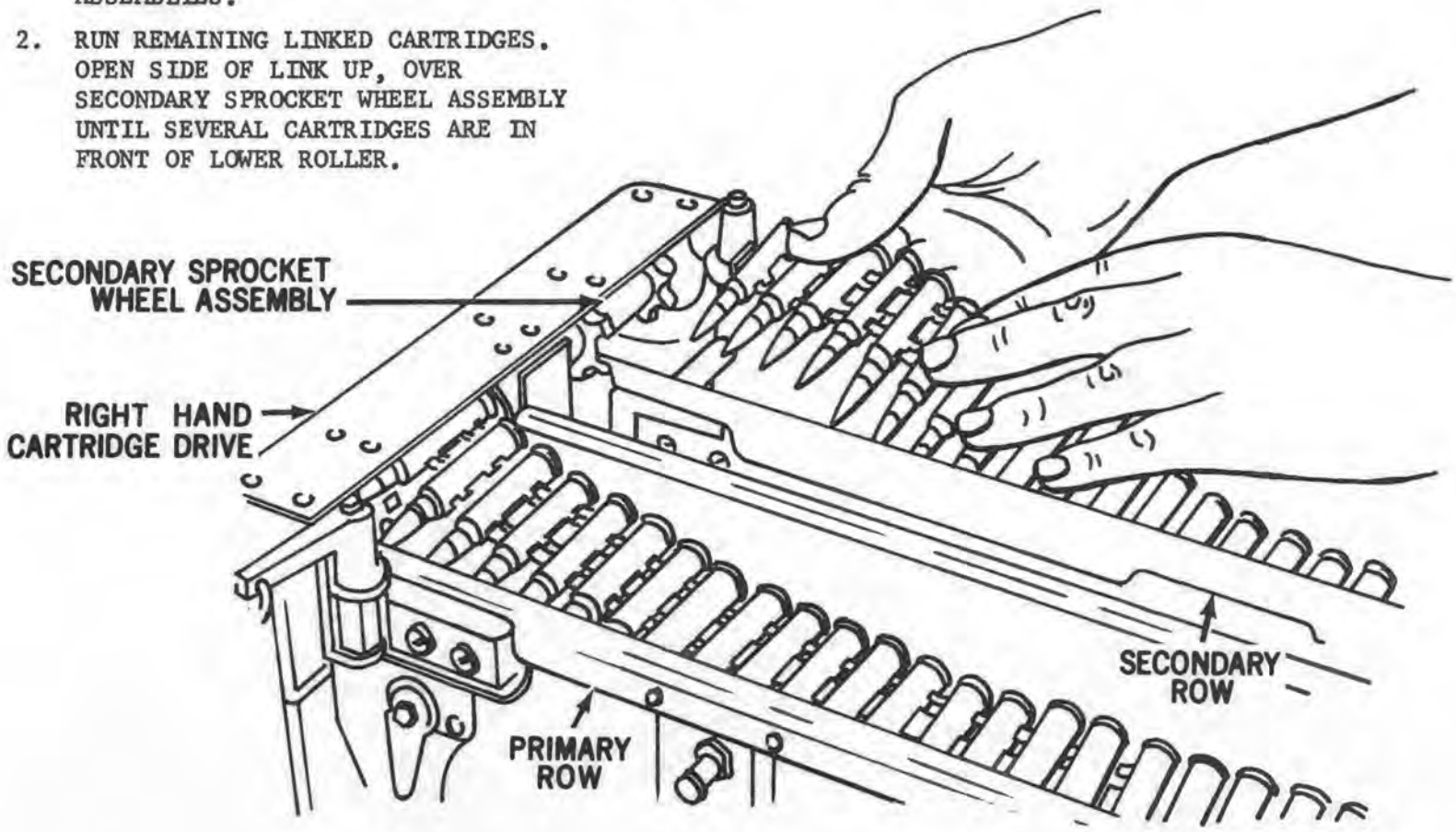
6. Should a fire or explosion occur in the launchers, they should be jettisoned. Care must be taken when this is done above 80 knots air-

speed as absolute aircraft trim must be assured. These external stores can also be jettisoned when the pilots discretion deems they would impare a successful forced landing.

7. The most common cause or stoppages in both of these systems is improper loading. It can also be said that the majority of our problems are operator induced. Because all of you will soon be operators we have inserted the following information.

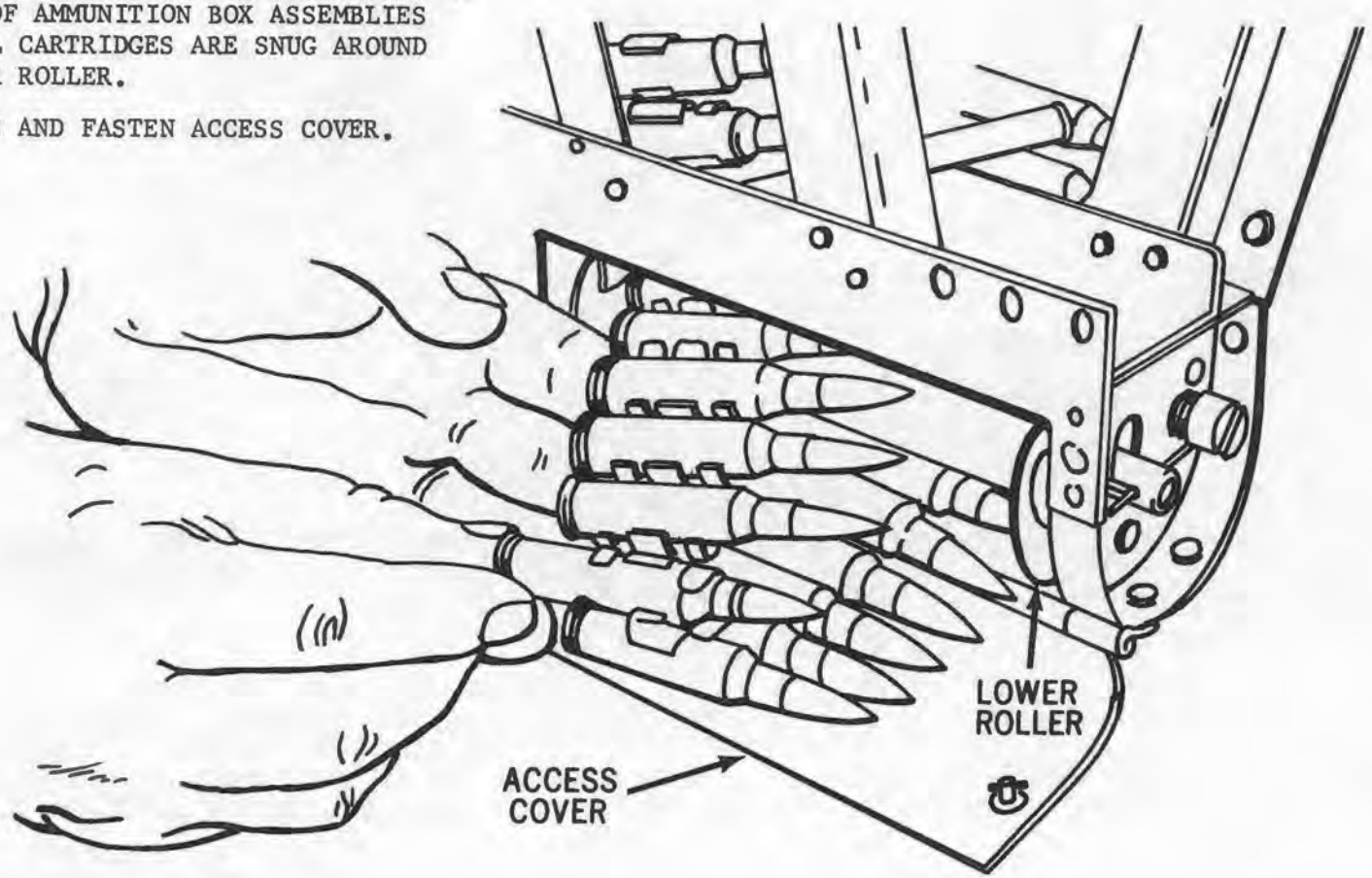
1. START LOADING LINKED CARTRIDGES IN OUTBOARD AMMUNITION BOX ASSEMBLY WITH LINK DOUBLE LOOP END FIRST, BULLETS TO FRONT, AND OPEN SIDE OF LINK UP. FOLD BACK AND FORTH TO FILL OUTBOARD, CENTER, AND INBOARD AMMUNITION BOX ASSEMBLIES.

2. RUN REMAINING LINKED CARTRIDGES. OPEN SIDE OF LINK UP, OVER SECONDARY SPROCKET WHEEL ASSEMBLY UNTIL SEVERAL CARTRIDGES ARE IN FRONT OF LOWER ROLLER.



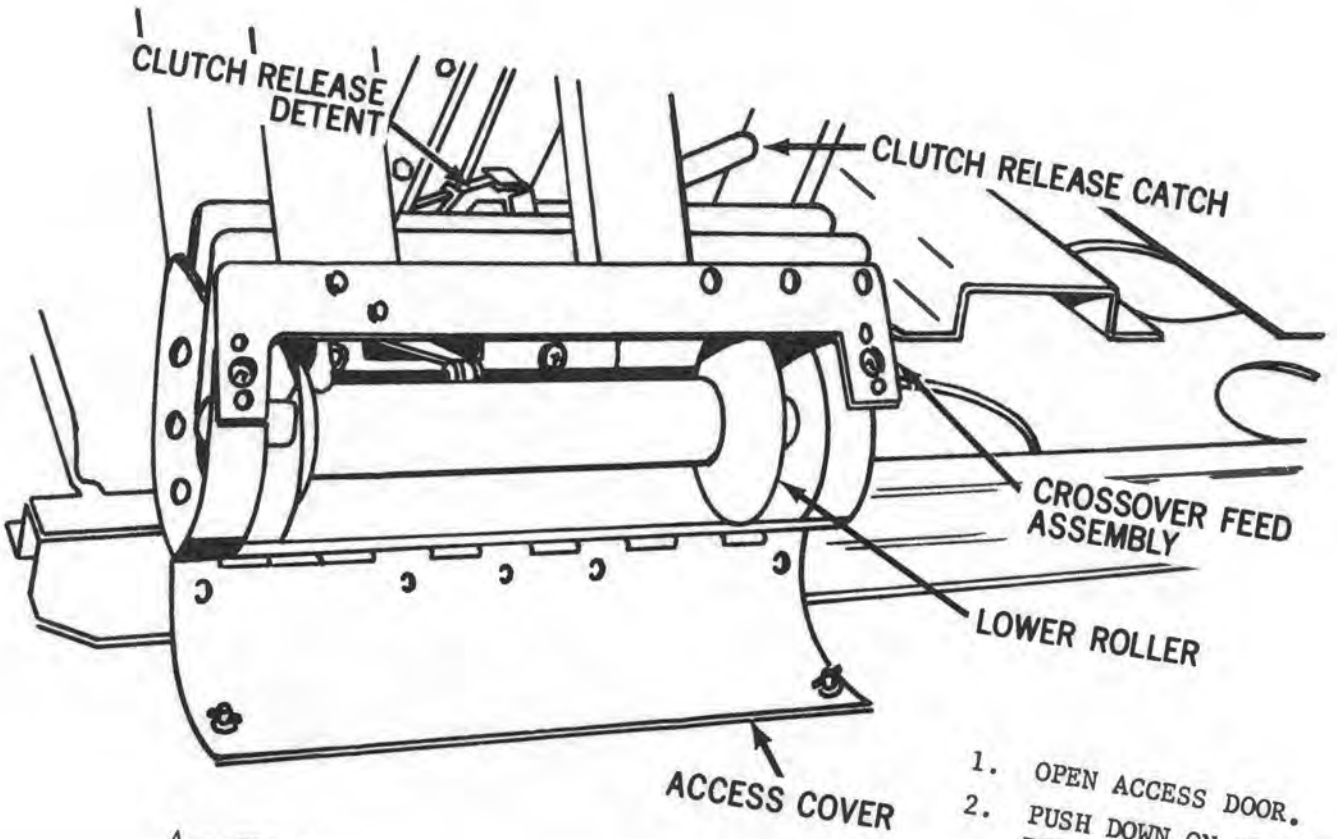
A - LOADING SECONDARY ROW OF AMMUNITION BOX ASSEMBLIES.

1. MATE FREE ENDS OF THE TWO BELTS OF CARTRIDGES AND JOIN BY INSERTING ONE CARTRIDGE IN THE LINK LOOPS.
2. FULL CARTRIDGES BACK INTO SECONDARY ROW OF AMMUNITION BOX ASSEMBLIES UNTIL CARTRIDGES ARE SNUG AROUND LOWER ROLLER.
3. CLOSE AND FASTEN ACCESS COVER.



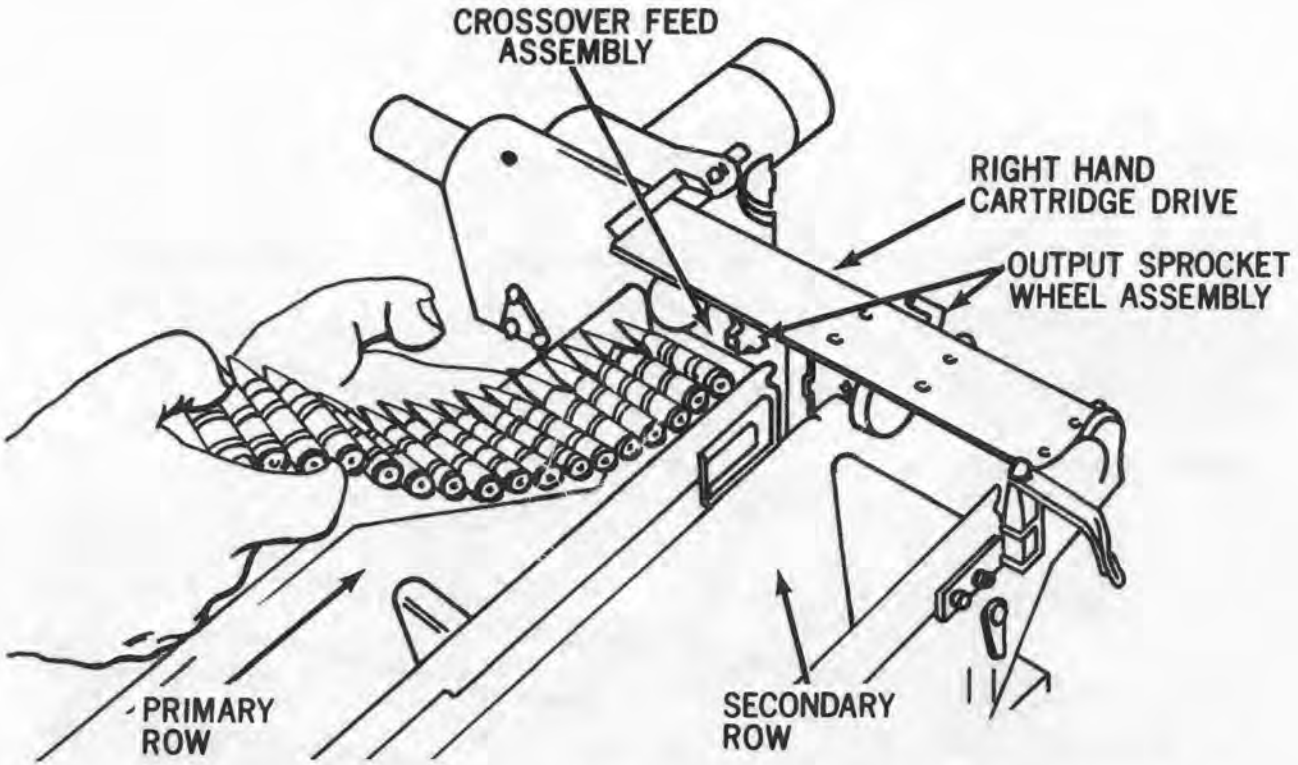
B - JOINING LINKED CARTRIDGES FROM PRIMARY AND SECONDARY ROWS OF AMMUNITION BOX ASSEMBLIES.

FIGURE 14.2 - LOADING CROSSOVER FEED ASSY



A - CROSSOVER FEED ASSEMBLY PREPARED FOR CARTRIDGE LOADING.

1. OPEN ACCESS DOOR.
2. PUSH DOWN ON CLUTCH RELEASE CATCH UNTIL CLUTCH RELEASE DETENT ENGAGES.



1. START LINKED CARTRIDGES INTO CROSSOVER OF RIGHT HAND CARTRIDGE DRIVE WITH LINK DOUBLE LOOP END FIRST, BULLETS TO FRONT, AND CLOSED SIDE OF LINK UP. FEED IN CARTRIDGES UNTIL FOUR OR FIVE PASS UNDER LOWER ROLLER AND LAY ON ACCESS COVER.
2. FOLD LINKED CARTRIDGES BACK AND FORTH TO FILL OUTBOARD AMMUNITION BOX ASSEMBLY, THEN FILL CENTER AND INBOARD AMMUNITION BOX ASSEMBLIES.
3. RUN REMAINING LINKED CARTRIDGES, OPEN SIDE UP, OVER OUTPUT SPROCKET WHEEL ASSEMBLY.

B - LOADING PRIMARY ROW OF AMMUNITION BOX ASSEMBLIES.

FIGURE 14.1 - LOADING CROSSOVER FEED ASSY

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STUDENT OUTLINE

M16/XM21 INTRODUCTION

Period one of two periods.

1. Components.

2. Gun mount assemblies.

   a.

   b. Attaching hardware.

   c. Mounting of guns.

   d. Charger.

   e. Gun mount axis.

3. Ammo feed system.

a. Cartridge drive.

b. Ammo boxes.

c. Box tray and tiedown straps.

d. Ammo chutes.

4. Automatic gun.

a. Gun mounts.

b. Mounting of guns.

c. Delinker feeder.

d. Electric drive motor.

e. Gun mount axis.

f. Ammo feed system

(1) Crossover drives.

(2) Ammo boxes.

5. Rack assembly.

a.

b.

c.

d.

e.

f.

g.

6. Launcher pod.

a.

b.

c.

d.

e.

f.

g.

7. Fire control system.

a. Circuit control box M16.

(1)

(2)

(3)

(4)

b. Circuit control box XM21.

(1)

(2)

(3)

(4)

c. Intervalometer control panel.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

Period two of two periods.

1. Sighting station.

    a. Suspension linkage.

        (1)

        (2)

        (3)

        (4)

    b. Controller

        (1)

        (2)

        (3)

        (4)

    c. Control handle.

        (1)

        (2)

        (3)

2. XM60 reflex infinity sight.

a.

b.

c.

d.

e.

f.

3. Characteristics and capabilities.

   a. M-60C machineguns.

      (1) General - parts removed.

      (2) Parts added.

      (3) Tabulated data

         (a) Type

         (b) Weight (4 guns)

         (c) Length.

         (d) Feed

         (e) Rate of fire.

         (f) Range (maximum)

         (g) Max effective range.

(h) Operation

(4) Ammo capacity.

b. GAU - 2B/A Automatic guns.

Tabulated data.

(1) General

(2) Tabulated data.

(a) Type

(b) Weight (w/feeder & drive)

(c) Length

(d) Feed

(e) Rate of fire.

(f) Range (maximum)

(g) Max effective range.

(h) Operation

(3) Ammo capacity

c. 2.75" rockets.

(1)

(2)

(3)

d. Flex limits.

(1) M16

(a) Elevation

(b) Depression

(c) Inboard

(d) Outboard

(2) XM21

(a) Elevation

(b) Depression

(c) Inboard

(d) Outboard

4. Limitations and effect on aircraft

a. Machineguns.

(1)

(2)

(3)

(4)

b. Automatic guns.

(1)

(2)

(3)

(4)

(5)

(6)

c. Rockets.

(1)

(2)

(3)

(4)

d. Aircraft.

(1)

(2)

(3)

(4)

(5)

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PERFORMANCE CHECK

M16/XM21 INTRODUCTION

1. List 2 of the three major components of the M16/XM21.

   a.

   b.

   c.

2. List the purpose of the crossover drive.

3. List the purpose of the cartridge drive.

4. List 2 switches on the circuit control box and give a purpose for each:

   a. _____ purpose:

   b. _____ purpose:

5. What is the maximum effective range of the gun systems?

6. What is the constant rate of fire of the automatic gun system?

7. What is the combined rate of fire of the machinegun system?

8. Match the correct flex limits:

a. M-16	1. Up 10, Down 85, Out 70, In 12
b. XM-21	2. Up 10, Down 85, Out 60, In 15
	3. Up 15, Down 60, Out 70, In 10
	4. Up 10, Down 70, Out 60, In 10
	5. Up 15, Down 60, Out 70, In 12

9. What effect does installation have on the autorotational characteristics?

10. What is the longest burst of fire that can be used with the XM21?

11. What is the burst radius of the 10 lb. warhead, 2.75" rocket, the 6 lb. warhead?