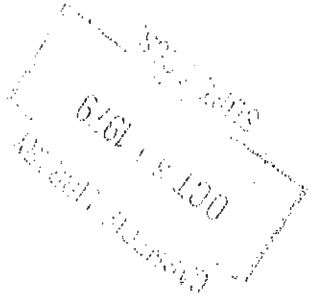

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Resources Administration
Bureau of Health Manpower

DHEW Publication No. (HRA) 79-112

PROGRAMMED INSTRUCTION

ELECTRIC TAIL FUZES

CNTT-N414 (Rev. 4-76) PAT

Naval Technical Training Command

For Training Purposes Only

Information Concerning Programmed Instruction

This programmed lesson may be different from any instruction that you have received in the past. It is a self-training text and is designed to give you instruction at the speed at which you can master it best. The material taught in this programmed lesson is essential material only. If you want to go deeper into the subject and broaden your knowledge, you can do so on your own.

Do not rush through this book. There is a time limit for the programmed lesson; but in most cases, you will finish in the allotted time. If not, you will be required to complete it for home study.

An instructor will be present to answer any questions which you may have. Do not hesitate to let him know if you become confused, need help, or desire additional information. This type of instruction allows your instructor to give you individual assistance, while the rest of the class continues the lesson.

This is not a test. It is a proven means of learning and requires that you respond as indicated throughout the book. Information will be given in small blocks, called frames. After each bit of information, you will be required to fill in the blank, to circle an answer, or to select the best of several choices given, and so forth.

Do not guess at answers. If you are not sure, review the lesson material. The correct answer will follow your response to let you know how you are doing.

Remember: if the answer that you write down does not correspond with the correct answer given, make sure it is straightened out in your mind before continuing.

One final word on this program: some of the material contained herein could mean life or death--for you or for your shipmates.

GOOD LUCK!

ELECTRIC TAIL FUZES

Introduction

In general, bomb fuzes may be divided into two general classes--mechanical and electrical. Electrical fuzes have many of the same characteristics of mechanical fuzes, but differ in that an electric pulse is required in order to initiate the fuze rather than the mechanical action of arming vane rotation, as required in a mechanical fuze. This electric pulse is delivered to the fuze as the weapon falls clear of the bomb rack.

Electric tail fuzes were developed to provide an increased operational capability. Their primary advantages lie in their flexibility of in-flight selection of the desired functioning mode and their ready adaptability for use with variable-time (proximity) nose elements.

An Aviation Ordnanceman working on modern jet aircraft will be required to work with electric tail fuzes. Therefore, this programmed instruction is intended to provide the best possible information regarding the operation and the use of electric tail fuzes.

NOTES: (1) Limited quantities of the M990E series electric tail fuzes are still in the inventory and are authorized for use when the Mk 344 and Mk 376 electric tail fuzes are not available.

(2) For information regarding the M990E series and for additional information on electric tail (or bomb) fuzes in general, refer to (a) NAVAIR 11-5A-17: Aircraft Bombs, Fuzes, and Associated Components; (b) NAVAIR 11-1F-2: Airborne Bomb and Rocket Fuze Manual; and (c) OP 3347: United States Navy Ordnance Safety Precautions.

ELECTRIC TAIL FUZES

Objectives

Upon completion of this program, the student will:

1. List the electric tail fuzes presently being used with the Mk 80 series low-drag general-purpose (LDGP) bombs. (Frame 1)

2. State the two primary advantages of electric tail fuzes in comparison with mechanical fuzes. (Frame 2)

3. List two reasons why the Mk 344 and Mk 376 electric tail fuzes are preferred to the earlier electric tail fuzes. (Frame 5)

4. Complete the statements pertaining to (a) which electric tail fuzes are restricted to the unretarded delivery, and (b) why they cannot be used for the retarded delivery. (Frame 7)

5. State which electric tail fuze is used for the retarded delivery and also for the unretarded delivery. (Frame 8)

6. From a list of statements regarding the use of the Mk 344 Mod 0 and Mod 1 and Mk 376 Mod 0 electric tail fuzes in the retarded or the unretarded delivery, select the statements that are true. (Frame 10)

7. Fill in the blanks furnished for the arming delay time(s) and the delivery mode(s) of the Mk 344 and the Mk 376 electric tail fuze. (Frame 11)

8. List the four in-flight selectable functioning modes available with the Mk 344 and Mk 376 electric tail fuzes. (Frame 14)

9. State what is used so as to make an in-flight selection of any functioning mode of the Mk 344 and Mk 376 electric tail fuzes. (Frame 16)

10. Complete a statement pertaining to what may be used with the Mk 344 or the Mk 376 fuze in order to obtain an airburst capability. (Frame 20)

11. State which VT (proximity) nose element is restricted to the unretarded delivery and which may be used in either the retarded or the unretarded delivery. (Frame 21)

12. State the burst height above the target when using the Mk 43 Mod 0 target detecting device (TDD). (Frame 23)

13. Describe the method(s) for initiating the M20 or M20A1 proximity sensing element (PSE) and the Mk 43 Mod 0 target detecting device (TDD). (Frame 24)

14. Give the reasons why the Mk 43 Mod 0 TDD is preferred for use with the Mk 344 and Mk 376 electric tail fuzes. (Frame 27)

15. State the two purposes of the Mk 31 Mod 1 safety device. (Frame 30)

16. Complete a statement regarding the importance of aligning both sets of holes in the pop-out pin during installation. (Frame 31)

17. State what must be installed on all Mk 344 and Mk 376 electric tail fuzes in order to prevent the fuze from becoming unseated during flight. (Frame 33)

18. Complete a statement concerning the purpose of the support cup and the steel nose plug when using only an electric tail fuze. (Frame 35)

19. Give the primary function of the Mk 122 Mod 0 arming safety switch. (Frame 37)

20. From a list of safety precautions for electric tail fuzes and associated components, select the statements that are true. (Frame 39)

NOTE: The frame number listed after each objective refers to the first frame concerning that objective and provides a reference for review or home study.

SUGGESTED READING TIME: 75 MINUTES

1. In the majority of our naval bombing operations, the Mk 80 series low-drag general-purpose (LDGP) bombs are utilized. These bombs were designed to use either an electrical fuze or a mechanical fuze (and, at present, they still retain the mechanical nose or tail fuzing capability); but they were primarily designed for external carriage and electric fuzing.

   The Mk 344 Mod 0 and Mod 1 electric tail fuzes and the Mk 376 Mod 0 electric tail fuze are compatible and are presently being used with all Mk 80 series bombs, including the thermally protected bombs and the laser guided bombs (LGB), which use the conical fin assembly, the retarding (Snakeye) fin assembly, or the airfoil group (fin assembly). Other electric tail fuzes have been developed and are being used to a small extent, but this program discusses the Mk 344 and the Mk 376 only. (See figures 1 and 2, on pages 2 and 3.)

   The electric tail fuzes presently in use with the Mk 80 series low-drag general-purpose bombs using the conical fin assembly, the retarding fin assembly, or the airfoil group are the _____ Mod 0 and Mod 1 fuzes and the _____ Mod 0 fuze.

(Continued on page 4.)

1. (continued)

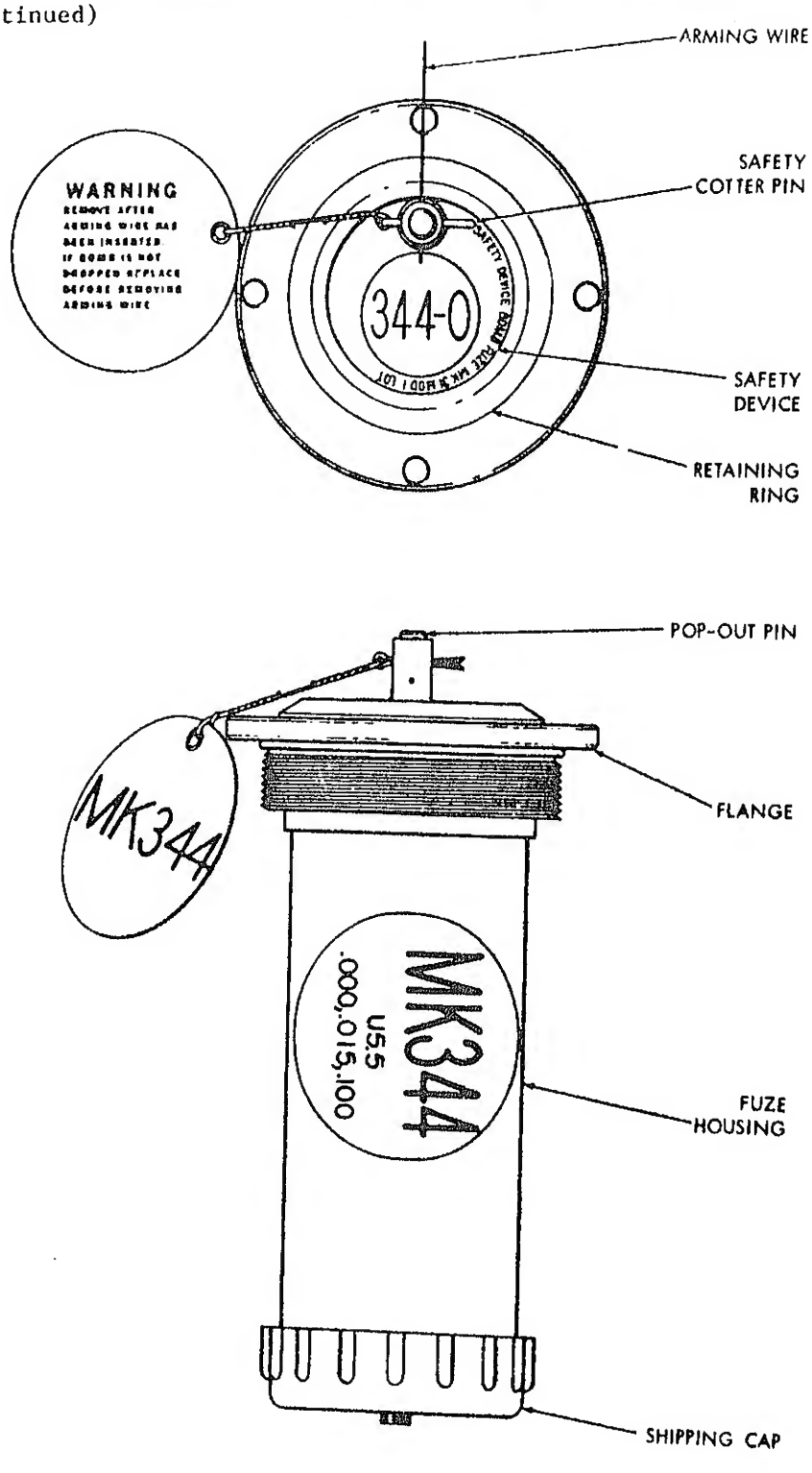

Figure 1.--Mk 344 Mod 0 electric tail fuze (external view).

1. (continued)

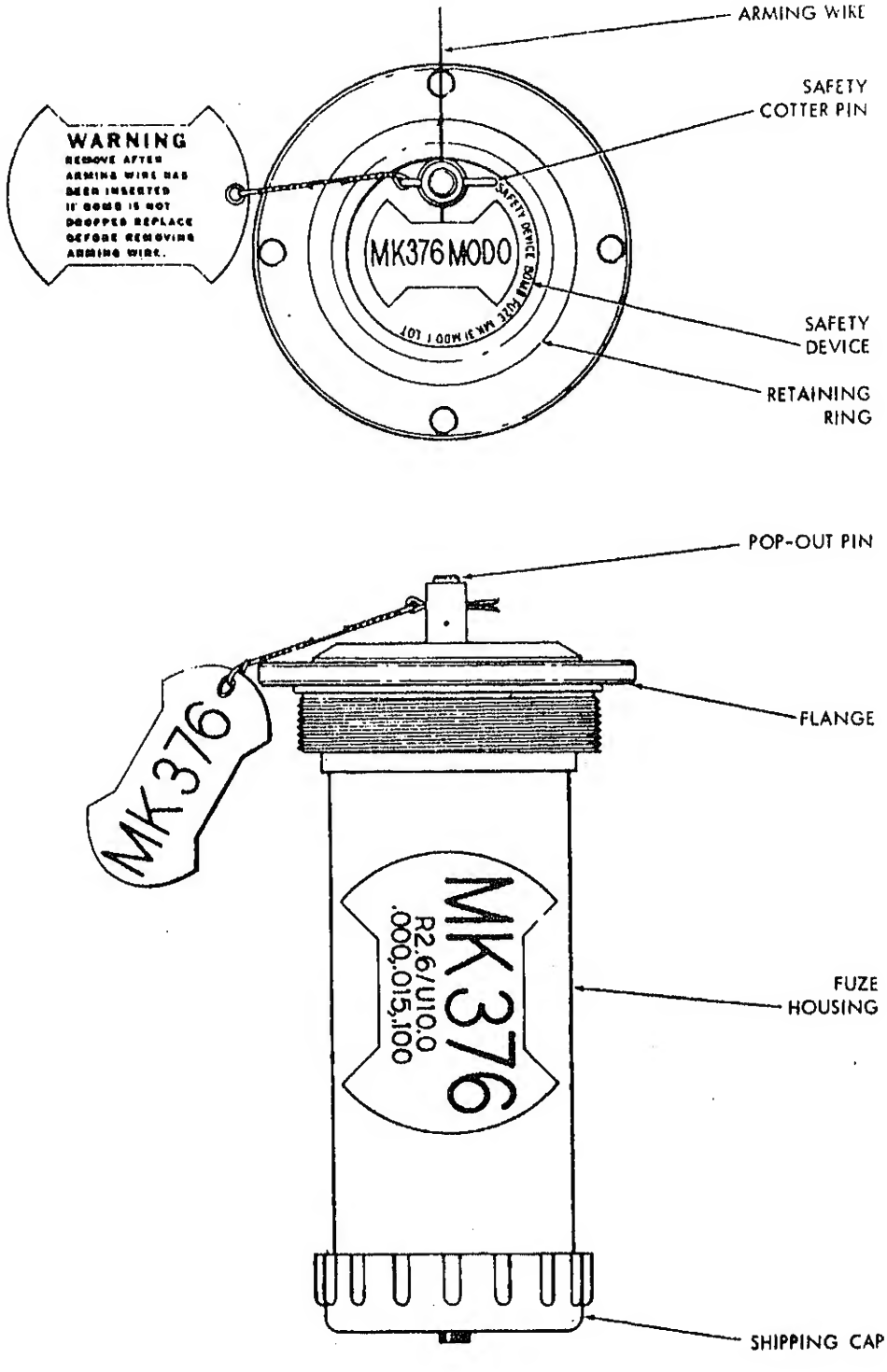

Figure 2.--Mk 376 Mod 0 electric tail fuze (external view).

Mk 344 Mk 376	2. In comparison with mechanical fuzes, electric tail fuzes afford an increased operational capability, having two primary advantages: (a) they provide in-flight selection of the desired functioning mode (option, or time); and (b) they provide adaptability for use with the VT (variable-time) (proximity) nose elements. The two primary advantages of electric tail fuzes, when compared with mechanical fuzes, are (a) _____- _____ _____ of the desired functioning mode and (b) _____ with VT (proximity) _____ _____.
(a) in-flight selection (b) adapt-ability nose elements	3. All electric fuzes act on a common principle: at release, the arming wire is pulled from the fuze pop-out pin; and the voltage, applied from the aircraft, provides power for fuze arming and functioning. This voltage is applied to the internal circuits of the fuze whose characteristics determine the arming time. At arming, a rotor rotates and completes the circuitry required for functioning and detonation. At impact, a trembler switch closes, and the voltage that was supplied from the aircraft and stored in the internal circuitry of the fuze is applied to the detonator <u>firing train</u>. (See figure 3, which is a simplified block diagram showing the electrical connections between the fuze function set and the bomb fuze.) (Continued on the next page.)

3. (continued)

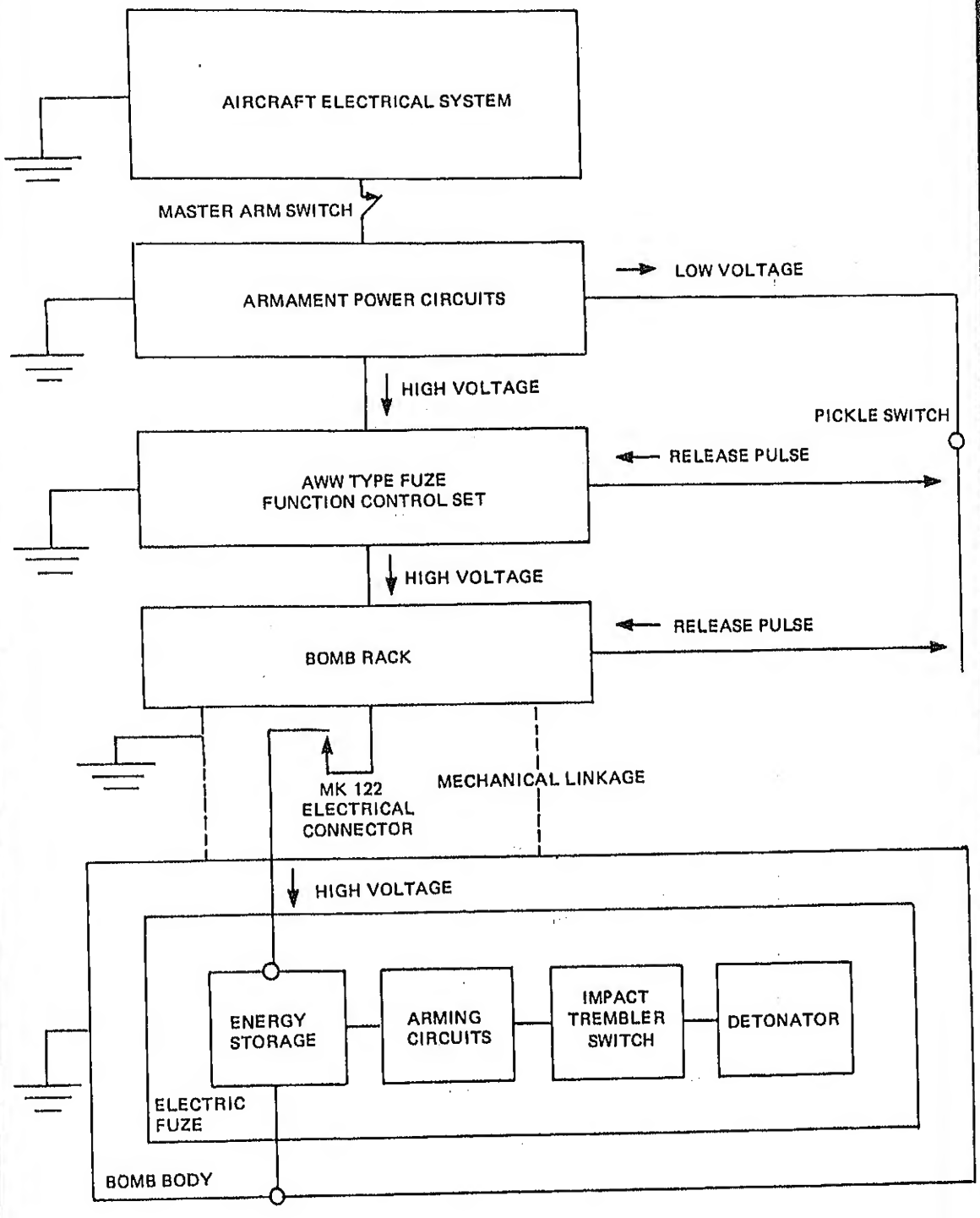

Figure 3.--Electric fuzing system (simplified functional block diagram).

No response required.	4. List the electric tail fuzes presently being used with the Mk 80 series LDGP bombs. a. _____ Mod 0 and Mod 1. b. _____ Mod 0.
a. Mk 344 b. Mk 376	5. The operation of any ordnance component is refined in order to provide better safety and reliability. The Mk 344 and Mk 376 electric tail fuzes are more recent developments and are preferred to the earlier electric tail fuzes for two reasons: <u>safety</u> and <u>reliability</u>. NOTE: The Mk 344 and Mk 376 fuzes are classified as HERO (hazardous electromagnetic radiation to ordnance) <u>safe</u> and no unusual RADHAZ (radiation-hazard) precautions are required under normal operating conditions. The two reasons for the Mk 344 and Mk 376 electric tail fuzes being preferred to the earlier electric tail fuzes are because of _____ and _____.
safety reliability	6. State the two primary advantages of electric tail fuzes in comparison with mechanical fuzes. a. _____ b. _____

a. In-flight selection of the desired functioning mode. b. Adaptability with VT (proximity) nose elements.	7. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are operationally restricted to the <u>unretarded</u> (fins-remain-closed) delivery. Therefore, the Mk 344 <u>is not</u> to be used for a retarded (fins-open) delivery; because, if the bomb failed to retard, it could detonate in close proximity to the delivery aircraft. This inadequate safety margin could result in damage to or destruction of the delivery aircraft. a. The electric tail fuzes that are restricted to the unretarded (fins-remain-closed) delivery are the _____ Mod 0 and _____. b. In the event that the Mk 344 Mod 0 or Mod 1 is used on a bomb for the retarded (fins-open) delivery, this could result in _____ to or _____ of the delivery aircraft.
a. Mk 344 Mod 1 b. damage destruction	8. Depending upon the operational circumstances, it may be necessary to use a retarded (fins-open) delivery. The <u>only</u> electric tail fuze in present use that is used for the <u>retarded</u> delivery and also for the unretarded delivery is the Mk 376 Mod 0; this is extremely important to remember. The only electric tail fuze that may be used both in a retarded delivery and in an unretarded delivery is the _____ Mod 0.
Mk 376	9. List two reasons why the Mk 344 and Mk 376 electric tail fuzes are preferred to the earlier electric tail fuzes. a. _____ b. _____

Safety. Reliability. (Any order.)	10. It is important that the ordnanceman be familiar with the restrictions on the delivery mode of the various electric tail fuzes. From the following statements regarding the use of the Mk 344 Mod 0 and Mod 1 and Mk 376 Mod 0 electric tail fuzes in the retarded or the unretarded delivery, write the word "True" to the left of each correct statement. _____ a. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are used in both the retarded delivery and the unretarded delivery. _____ b. The Mk 376 Mod 0 electric tail fuze is used for the retarded delivery and also for the unretarded delivery. _____ c. The Mk 376 Mod 0 electric tail fuze is unreliable for the retarded delivery, but it is used in the retarded delivery when initiated by mechanical nose fuzing. _____ d. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are restricted to the unretarded delivery. _____ e. The Mk 344 Mod 0 or Mod 1 electric tail fuze is not to be used for a retarded delivery; because, if the bomb failed to retard, it could cause damage to or destruction of the delivery aircraft.
True b. True d. True e.	11. In the Mk 344 Mod 0 or Mod 1 electric tail fuze, a single 5.5-second arming delay time is already provided by the Mk 31 Mod 1 safety device, which is an integral part of the Mk 344, for unretarded delivery. NOTE: Some Mk 344 Mod 0 fuzes contain a retard sensing device that automatically switches the fuze to a 2.6-second arming delay time when delivered in the retarded delivery. However, the Mk 344 Mod 0 is NOT to be used in the retarded delivery and should NEVER be rigged for this type of delivery. On the Mod 1, the retard sensor for the 2.6-second arming delay time has been removed; and, of course, the Mod 1 is NOT used in the retarded delivery.

11. (continued)

In the Mk 376 Mod 0 electric tail fuze, two arming delay times are used: (a) 2.6 seconds for retarded delivery and (b) 10 seconds for unretarded delivery. The appropriate arming delay time is automatically selected by the Mk 376 in accordance with the weapon's actual delivery mode; but, in reality, the arming delay time is selected by the Mk 31 Mod 1 safety device.

NOTE: The Mk 31 Mod 1 safety device will be discussed in greater detail later in this programmed instruction.

If the weapon does not retard, whether intentionally or unintentionally, the fuze automatically provides a 10-second arming delay time. See the table entitled "Arming Delay" below.

ARMING DELAY		
	Retarded	Unretarded
Mk 344 Mod 0 or 1	Not auth.	5.5 sec.
Mk 376	2.6 sec.	10.0 sec.

a. The Mk 344 Mod 0 or Mod 1 provides a _____-second arming delay time for _____ delivery.

b. The Mk 376 uses a _____-second arming delay time for retarded delivery and a _____-second arming delay time for _____ delivery.

(Continue to the next page.)

a. 5.5 unretarded b. 2.6 10 unretarded	12. Complete the following statements pertaining to (a) which electric tail fuzes are restricted to the unretarded delivery, and (b) why they cannot be used for the retarded delivery. a. The electric tail fuzes that are restricted to the unretarded delivery are the _____ Mod 0 and _____. b. If the Mk 344 Mod 0 or Mod 1 is used for the retarded delivery and the bomb fails to retard, this could result in _____ to or _____ of the delivery _____.
a. Mk 344 Mod 1 b. damage destruction aircraft	13. State which electric tail fuze is used for the retarded delivery and also for the unretarded delivery. _____
Mk 376.	14. The Mk 344 and Mk 376 electric tail fuzes each use four discrete dc (direct current) voltages so as to permit selection of the desired functioning mode by the pilot while in flight. CAUTION Mk 344 and Mk 376 fuzes must be used with dc voltages only. RF circuitry in the aircraft fuze function control set must be disabled when using these fuzes.

14. (continued)

Each fuze is equipped for four functioning modes (options, or times): (a) a proximity (VT) airburst, when used in conjunction with a VT element, (b) an instantaneous surface burst, (c) a short functioning delay time (0.015 second), and (d) a long functioning delay time (0.100 second) for target penetration.

The four in-flight selectable functioning modes available with the Mk 344 and Mk 376 electric tail fuzes are (a) proximity (VT) _____, (b) _____, (c) _____ _____ _____ (_____ second), and (d) _____ _____ (_____ second).

airburst

instantaneous

short functioning delay 0.015

long functioning delay 0.100

15. Using the table entitled "Electric Fuze Operational Characteristics" and the list of numbers 1 through 9, which are below the table, fill in the blanks provided for each fuze with the appropriate delay times.

(Continued on the next page.)

15. (continued)

ELECTRIC FUZE OPERATIONAL CHARACTERISTICS				
Fuze	Arming Delay (Sec.)	Functioning Delay (Sec.)	Initiating Voltage	Identifying Decal Shape
Mk 344 Mod 0 or Mod 1	5.5 unretarded only	VT INST 0.015 0.100	+300 +195 -195 -300	
Mk 376	2.6 retarded or 10 unretarded	VT INST 0.015 0.100	+300 +195 -195 -300	

1. VT
2. 0.015 second
3. 0.100 second
4. Instantaneous
5. All of the above.
6. 2.6 seconds
7. Not authorized.
8. 5.5 seconds
9. 10 seconds

Fuze	Arming Delay Unretarded	Arming Delay Retarded	Functioning Delay Unretarded	Functioning Delay Retarded
Mk 344	a. ___	b. ___	c. ___	d. ___
Mk 376	e. ___	f. ___	g. ___	h. ___

Answers to frame 15:

Mk 344 a. 8 b. 7 c. 5 d. 7

Mk 376 e. 9 f. 6 g. 5 h. 5

16. The pilot may select one of four functioning modes--proximity (VT) airburst, instantaneous, short functioning delay, or long functioning delay--while in flight by using the control switch settings on the control box.

	16. (continued) With the Mk 344 or the Mk 376 electric tail fuze, the pilot is able to select one of four functioning modes by using the _____ _____ _____ on the control box.
control switch settings	17. Fill in the blanks below for the arming delay time(s) and the delivery mode(s) of the Mk 344 and the Mk 376 electric tail fuze. a. Mk 344 Mod 0 or Mod 1: (1) Arming delay time: _____ _____ for _____ delivery. b. Mk 376: (1) Arming delay time: _____ _____ for _____ delivery. (2) Arming delay time: _____ _____ for _____ delivery.
a(1) 5.5 seconds unretarded b(1) 2.6 seconds retarded b(2) 10 seconds unretarded	18. List the four in-flight selectable functioning modes available with the Mk 344 and Mk 376 electric tail fuzes. a. _____ _____ _____ b. _____ c. _____ _____ _____ (0.015 sec.). d. _____ _____ _____ (0.100 sec.).

a. Proximity (VT) airburst. b. Instantaneous. c. Short functioning delay d. Long functioning delay	19. State what is used so as to make an in-flight selection of any functioning mode of the Mk 344 and Mk 376 electric tail fuzes. _____ _____ _____
Control switch settings.	20. So far in this program, we have learned (a) the names of the electric tail fuzes presently being used with the Mk 80 series LDGP bombs; (b) the two primary advantages of electric tail fuzes when compared with mechanical fuzes; (c) the two reasons why the Mk 344 and Mk 376 fuzes are preferred; (d) which electric tail fuzes are restricted to the unretarded delivery; (e) which electric tail fuze is used for the retarded delivery and also for the unretarded delivery; (f) the arming delay time(s) and the delivery mode(s) of the Mk 344 and the Mk 376 fuze; (g) the four in-flight selectable functioning modes of the Mk 344 and Mk 376 fuzes; and (h) what is used by the pilot for the purpose of making a selection of any functioning mode. Now, let us discuss some of the characteristics of the VT (proximity) nose elements. Two VT (proximity) nose elements are available for use in conjunction with Mk 344 and Mk 376 electric tail fuzes, in the electric-fuzed Mk 80 series bombs, in order to obtain an airburst capability. They are (a) the M20 or M20A1 proximity sensing element (PSE) and (b) the Mk 43 Mod 0 target detecting device (TDD). (See figures 4 and 5.) (Continued on the next page.)

20. (continued)

NOTES: (1) The nose cone of the M20 is neutral tan (light colored under red-light conditions), but the M20A1 is brick red (light colored under red-light conditions).

(2) The nose cone of the Mk 43 is dark green (black under red-light conditions).

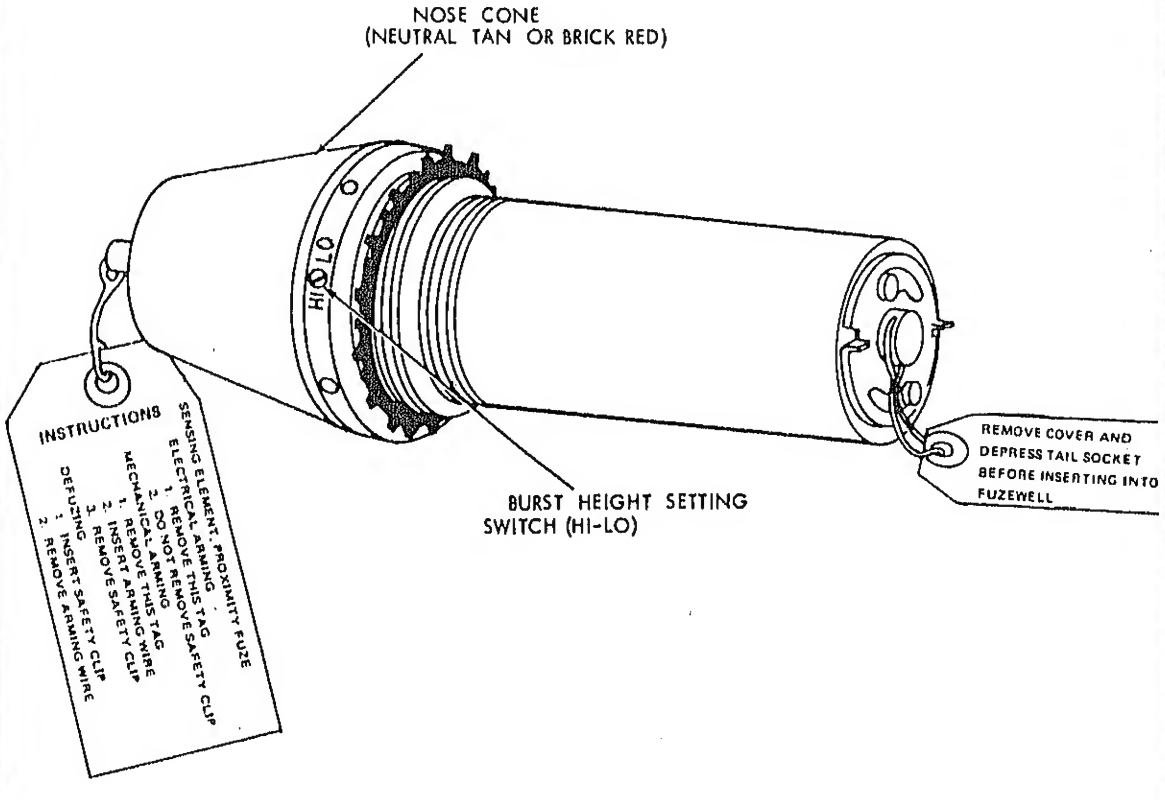

Figure 4.--M20/M20A1 proximity sensing element (external view).

20. (continued)

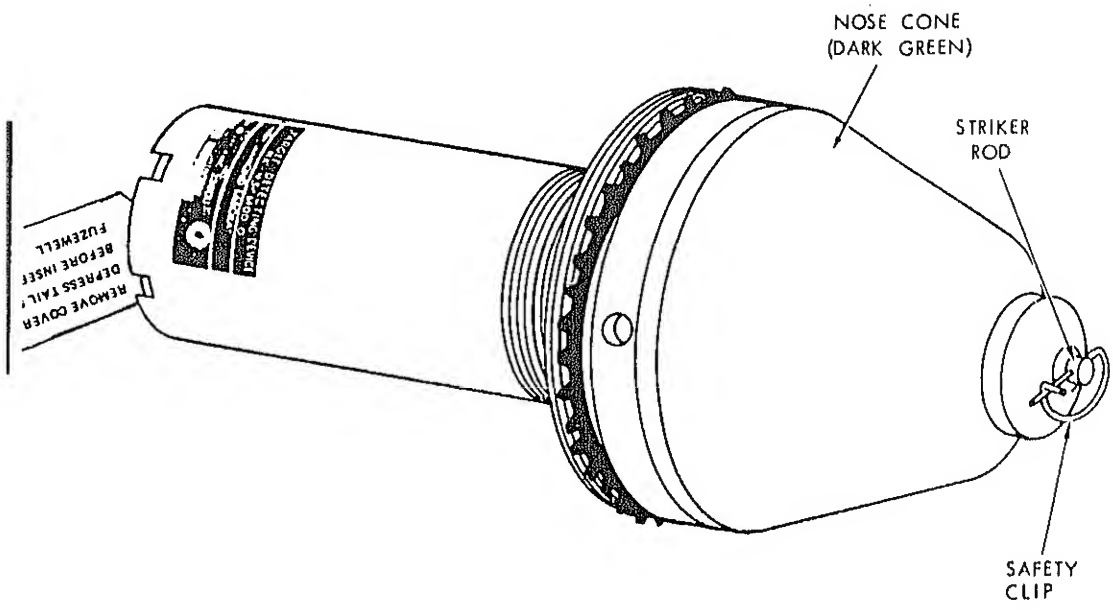

Figure 5.--Mk 43 Mod 0 target detecting device (external view).

In order to obtain an airburst capability when using electric tail fuzing, the M20 or _____ _____ _____ _____ (PSE) or the _____ _____ _____ _____ _____ (TDD) may be used.

---ximity sensing element is restricted
nretarded weapon delivery. Mk 43
:ting device may be used in either
very or the unretarded delivery.
ty) nose elements are physically
they differ, however, in their
ons.

	21. (continued) a. The VT (proximity) nose element that is for use with an unretarded weapon delivery only is the _____ or _____ PSE. b. The VT (proximity) nose element that may be used for a retarded or an unretarded delivery is the _____ TDD.
a. M20 M20A1 b. Mk 43	22. From the following statements concerning the use of the Mk 344 Mod 0 and Mod 1 and Mk 376 Mod 0 electric tail fuzes in the retarded or the unretarded delivery, write the word "True" to the left of each correct statement. _____ a. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are restricted to the unretarded delivery. _____ b. The Mk 376 Mod 0 electric tail fuze is unreliable for the retarded delivery, but it is used in the retarded delivery when initiated by mechanical nose fuzing. _____ c. The Mk 344 Mod 0 or Mod 1 electric tail fuze is not to be used for a retarded delivery; because, if the bomb failed to retard, it could cause damage to or destruction of the delivery aircraft. _____ d. The Mk 376 Mod 0 electric tail fuze is used for the retarded delivery and also for the unretarded delivery. _____ e. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are used in both the retarded delivery and the unretarded delivery.

True a.

True c.

True d.

23. The M20 or M20A1 PSE has a fore-and-aft (forward-looking) lobe pattern. Each utilizes a HI-LO switch that is not found on the Mk 43 Mod 0 TDD. (Look again at figure 4.) This switch provides an option of two burst heights, which must be preflight selected: (a) a burst-height range of 100 to 160 feet for the high range, and (b) 20 to 60 feet for the low range.

The Mk 43 TDD has a side-looking lobe pattern. Its burst height is a nominal 16 feet above the target. (See figures 6 and 7, for the lobe pattern of each nose element.)

a. In the HI setting, the burst height of the M20 or M20A1 PSE is from _____ to _____ feet; and in the LO setting, the burst height is from _____ to _____ feet.

b. When using the Mk 43 TDD, the burst height above the target is a nominal _____ feet.

(Continued on page 20.)

23. (continued)

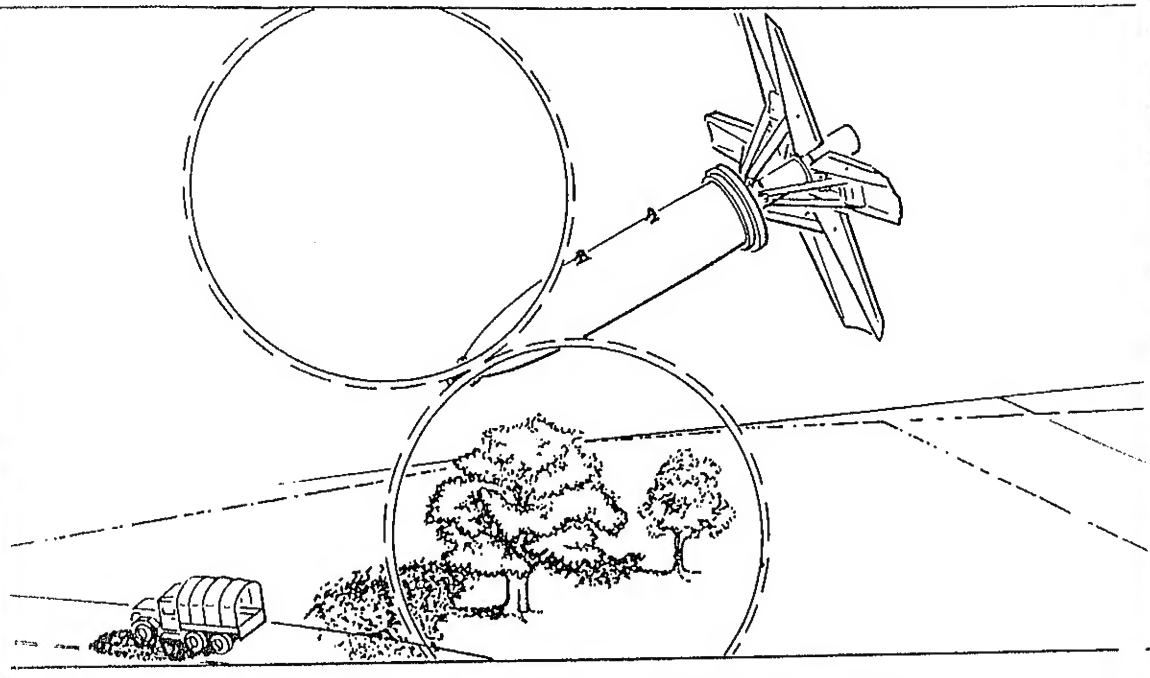

Figure 6.--Lobe pattern of Mk 43 Mod 0 TDD.

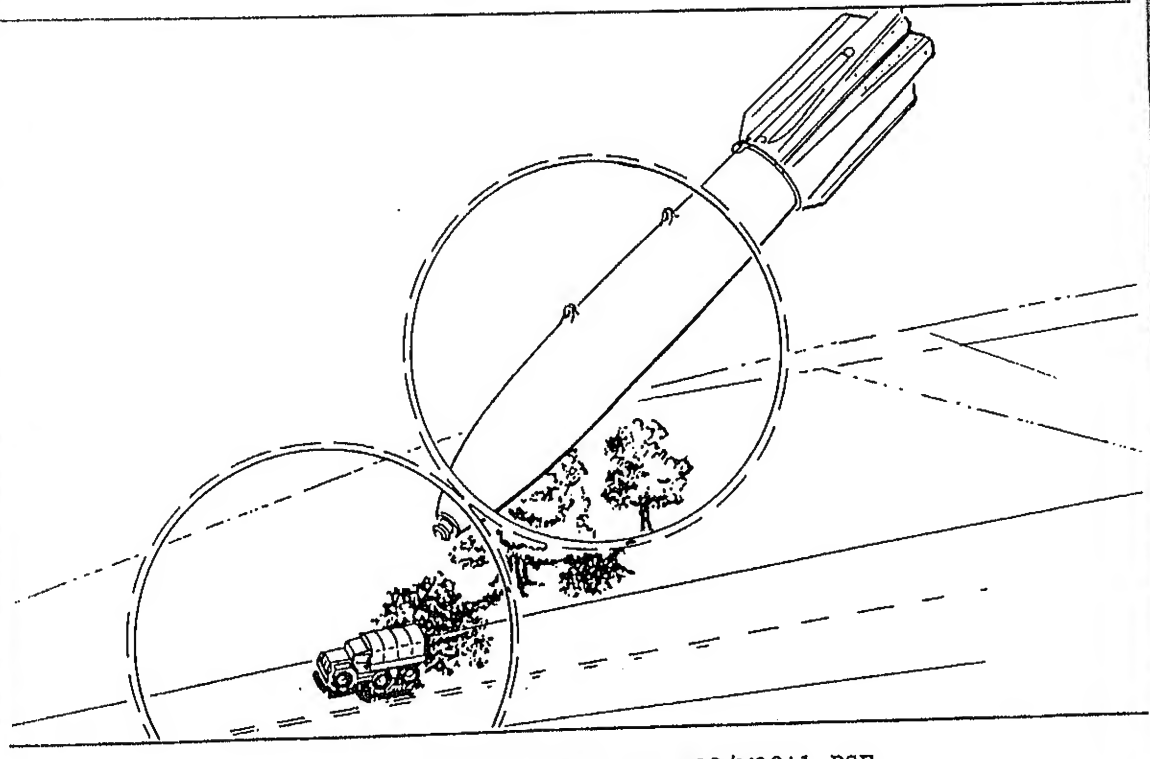

Figure 7.--Lobe pattern of M20/M20A1 PSE.

a. 100 to 160

20 to 60

b. 16

24. There is only one method for initiating the M20 or M20A1 proximity sensing element (PSE); whereas there are two methods for initiating the Mk 43 Mod 0 target detecting device (TDD). Both the M20 or M20A1 PSE and the Mk 43 TDD are powered by a thermal battery, which supplies operating voltage to the circuit components of the VT (proximity) nose elements.

NOTE: M20 or M20A1 PSE and Mk 43 TDD do not contain explosive components. Damaged or otherwise unserviceable VT nose elements shall be disposed of in accordance with current directives.

The M20 or M20A1 PSE can only be initiated mechanically by the withdrawal of an arming wire, at the time of weapon release, which releases a striker rod that retracts and ignites the battery, which, in turn, causes the electric fuze to function; this method is mechanical. The Mk 43 TDD is electrically initiated by +300 volts dc that is applied at the time of weapon release and that causes the electric fuze functioning to occur automatically and instantaneously upon receipt of a firing signal from the Mk 43 TDD; this method is electrical. The Mk 43 TDD may also be initiated mechanically, but only when a delayed airburst is desired, by the withdrawal of an arming wire, at the time of weapon release, which releases a striker rod; this method is, of course, mechanical. If an arming wire is used for proximity initiation, the fuze may be set for either of the two functioning delays (DLY 1 for 0.015-second delay or DLY 2 for 0.100-second delay). Because of the functioning delays in the firing circuit, detonation of the bomb will be in accordance with the functioning delay selected.

WARNING

M20 or M20A1 PSE must be installed or removed in a HERO-safe (a RADHAZ-free) area, which is below the main deck aboard an aircraft carrier; but the Mk 43 TDD is HERO safe.

24. (continued)

Look carefully at the table entitled "VT Element/ Electric Fuze Compatibility" below.

VT ELEMENT/ELECTRIC FUZE COMPATIBILITY

	M20/M20A1 PSE		Mk 43 TDD	
Fuze	Initiation (method)	Pilot VT Option	Initiation (method)	Pilot VT Option
Mk 344	Mechanical only	Yes	+300V dc or mechanical	Yes*
Mk 376	Mechanical only	Yes	+300V dc or mechanical	Yes*

* Pilot option available for either electrical initiation (by +300 volts dc) or mechanical initiation.

The method for initiating the M20 or M20A1 PSE is _____, and the two methods for initiating the Mk 43 TDD are _____ and _____.

mechanical

electrical

mechanical

25. In summary, the M20 or M20A1 PSE must be mechanically initiated by withdrawing an arming wire, which releases a striker rod; whereas the Mk 43 Mod 0 TDD may be electrically initiated by using +300 volts dc or mechanically initiated by withdrawing an arming wire, which releases a striker rod.

a. The M20 or M20A1 PSE must be _____ initiated by withdrawing an _____ _____, which releases a _____ rod.

b. The Mk 43 TDD may be _____ initiated by using _____ volts dc or _____ initiated.

a. mechanically arming wire striker b. electrically +300 mechanically	26. Complete the statement below that pertains to what may be used with the Mk 344 or the Mk 376 fuze in order to obtain an airburst capability. When used with electric tail fuzing, the _____ or _____ _____ _____ _____ (PSE) or the _____ _____ _____ _____ (TDD) provides an airburst capability.
M20 M20A1 proximity sensing element Mk 43 target detecting device	27. Mk 43 Mod 0 TDD is the primary VT (proximity) nose element used with the Mk 344 and Mk 376 electric tail fuzes. This nose element is preferred, because (a) it may be electrically initiated or mechanically initiated; (b) it may be used for retarded or unretarded deliveries; (c) its thermal battery commences the generation of operating voltage and the circuitry of the VT element becomes operational in 2 seconds, whereas 3.5 seconds is required for a warmup in the M20 or M20A1 PSE. The Mk 43 TDD is preferred because: a. It may be _____ or _____ initiated. b. It may be used for _____ or _____ deliveries. c. It becomes operational in _____ _____, whereas 3.5 seconds for the M20 or M20A1 PSE.

a. electrically mechanically b. retarded unretarded c. 2 seconds	28. State the burst height above the target when using the Mk 43 Mod 0 target detecting device (TDD). _____
Nominal 16 feet.	29. State (a) which VT (proximity) nose element is restricted to the unretarded delivery and (b) which may be used in either the retarded or the unretarded delivery. a. _____ b. _____
a. M20 or M20A1 PSE (unretarded delivery). b. Mk 43 TDD (retarded or unretarded delivery).	30. Each of the Mk 344 and Mk 376 electric tail fuzes is fitted with the Mk 31 Mod 1 safety device, which performs two functions: (a) this safety device contains a pop-out pin that locks the fuze in the <u>unarmed</u> condition by controlling a gag rod, which locks the detonator in place, thus physically (mechanically) preventing the fuze from becoming armed; (b) at weapon release, the Mk 31 is preset for a 5.5-second arming delay time (for Mk 344) or a 10-second arming delay time (for Mk 376); if the weapon decelerates (as in retarded delivery), the Mk 31 senses the deceleration and causes the retard switch to transfer voltage to the 2.6-second arming delay time (for Mk 376 only). NOTE: As previously stated in this program, the Mk 344 is <u>not</u> to be used in the retarded delivery and should <u>never</u> be rigged for this type of delivery. In summary, the two purposes of the Mk 31 safety device are (a) to provide mechanical safety by utilizing a pop-out pin, and (b) to sense any deceleration of the weapon.

30. (continued)

The two purposes of the Mk 31 safety device are to provide _____ _____ by utilizing a pop-out pin, and to _____ any _____ of the weapon.

mechanical safety

sense

deceleration

31. The pop-out pin (which is part of the Mk 31 Mod 1 safety device and is a spring-loaded pin) is held in the safe position by either a safety cotter pin or an arming wire. If the pop-out pin is accidentally released, the fuze will not arm; but all mechanical safety will have been removed, and the fuze can arm if the necessary voltage is applied. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously reduce the arming delay time. (See figure 1 or 2, for the arming wire, the safety cotter pin, and the pop-out pin.)

WARNING

If the pop-out pin is accidentally allowed to pop out, push the pin all the way back in so that both sets of holes align and reinstall the safety cotter pin. The buzz heard when the pop-out pin is released or is reset on the Mk 344 and Mk 376 fuzes is normal. If the pin binds or will not reset, the fuze may be armed. Notify EOD for disposition.

When installing the safety cotter pin or the arming wire, failure to align _____ _____ _____ _____ will dangerously reduce the _____ _____ _____.

both sets of holes arming delay time	32. Describe the method(s) for initiating the M20 or M20A1 proximity sensing element (PSE) and the Mk 43 Mod 0 target detecting device (TDD). a. _____ _____ _____ b. _____ _____ _____
a. M20 or M20A1 must be mechanically initiated by withdrawing an arming wire, which releases a striker rod. b. Mk 43 TDD may be electrically initiated by using +300 volts dc or mechanically initiated.	33. A fuze-restraining clip must be installed on each of the Mk 344 and Mk 376 fuzes, because it is essential to fuze reliability. This clip may be installed at the depot; if not, it must be installed prior to fuze installation in the bomb. For certain high-speed carriage and delivery conditions, the bomb fuze can become unseated in the bomb fuzewell and lose electrical continuity. This condition is suspected to be caused by a pressure buildup in the internal bomb cable tubes. The restraining clip ensures that the fuze cannot become unseated. (See figure 8.) In order to prevent the Mk 344 or the Mk 376 fuze from becoming unseated during flight, a _____ _____ must be installed. (Continue to the next page.)

33. (continued)

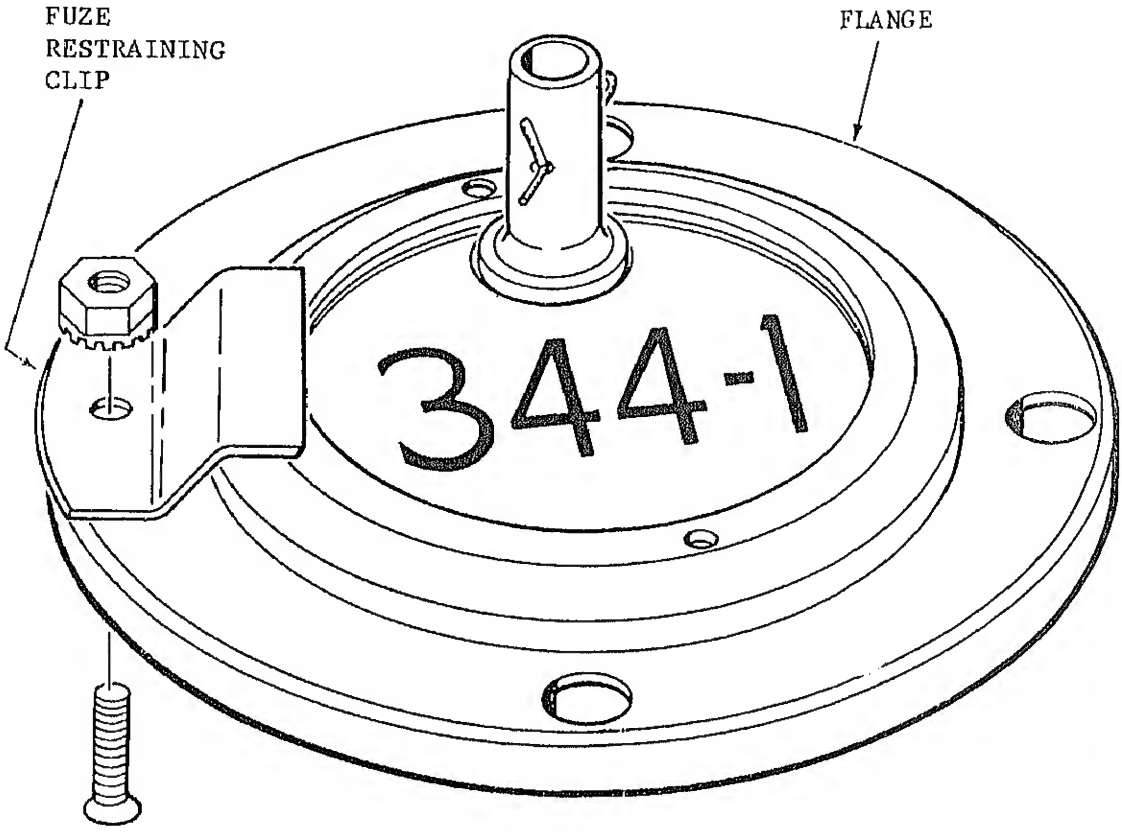

Figure 8.--Installation of the fuze-restraining clip.

fuze-restraining clip	34. Give the reasons why the Mk 43 Mod 0 TDD is preferred for use with the Mk 344 and Mk 376 electric tail fuzes. a. _____ b. _____ c. _____

a. May be electrically or mechanically initiated.

b. May be used for retarded or unretarded deliveries.

c. Becomes operational in 2 seconds.

35. In some cases, a mechanical nose fuze or a VT (proximity) nose element (Mk 43 TDD or M20/M20A1 PSE) may be used in the nose with an electric fuze in the tail. If only an electric tail fuze is used, a support cup should be inserted in the nose fuze cavity and a steel nose plug used in order to prevent collapse of the nose fuze cavity on heavy impact; in other words, to prevent the nose fuze cavity from shattering and breaking up upon impact with a hard target.

The purpose of the support cup and the steel nose plug when using only an electric tail fuze is to prevent _____ of the nose _____ _____ on heavy _____.

collapse

fuze cavity

impact

36. State the two purposes of the Mk 31 Mod 1 safety device.

a. _____

_____

b. _____

a. To provide mechanical safety by utilizing a pop-out pin.

b. To sense any deceleration of the weapon.

37. The Mk 122 Mod 0 arming safety switch connects the bomb-fuze control circuits in the aircraft to the electric fuze circuits in the bomb; this is its primary function. This switch can be used with all electric-fuzed bombs. It provides an open circuit and a RADHAZ shield in order to prevent electromagnetic radiation from entering the fuze circuits.

The primary function of the Mk 122 arming safety switch is to connect the _____-_____ _____ _____ in the aircraft to the _____ _____ _____ in the bomb.

bomb-fuze control circuits electric fuze circuits	38. The Mk 122 arming safety switch consists of a short lanyard and a length of shielded coaxial cable, both connected to a switching unit. If the lanyard breaks away from the switch, discard the entire Mk 122 so that it will not be used on a bomb. The Mk 122 must be installed in a RADHAZ-free environment when the M20 or M20A1 PSE is used. a. If the lanyard breaks away from the Mk 122 arming safety switch, _____ the entire _____. b. When the M20 or M20A1 PSE is utilized, the Mk 122 must be installed in a/an _____-free environment.
a. discard Mk 122 b. RADHAZ	39. Now, let us (a) review some of the safety precautions for electric tail fuzes and associated components that have been previously stated in this program and (b) learn additional precautions. a. If, during installation, the pop-out pin is accidentally allowed to pop out, push the pin all the way back in so that both sets of holes align and reinstall the safety cotter pin. b. If the pop-out pin binds or will not reset, the Mk 344 or the Mk 376 fuze may be armed. c. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously reduce the arming delay time. d. When the shipping cap has been removed from the Mk 344 or the Mk 376 fuze, the fuze must be used within 30 days. e. Mk 344 and Mk 376 fuzes that have been repacked for more than 30 days or exposed to excessive moisture for any length of time shall be disposed of in accordance with current directives.

39. (continued)

f. Never install a fuze if the safety cotter pin is missing from the pop-out pin when the fuze is removed from its container.

g. Do not attempt to rotate the Mk 344 or the Mk 376 fuze by the pop-out pin sleeve, because the sleeve may break off.

h. M20 or M20A1 PSE must be installed or removed in a HERO-safe (a RADHAZ-free) area; but the Mk 43 TDD is HERO safe.

i. If the arming wire and the safety cotter pin have both been removed other than during the assembly procedures, the fuze could be fully armed and should be treated as such. Do not attempt to remove the fuze from the well of the bomb. Notify EOD personnel immediately.

j. Handle the M20 or M20A1 PSE carefully; the case is very fragile. The VT (proximity) nose element contains complex electrical circuitry; therefore, do <u>not</u> drop or mishandle.

k. If the safety clip of a VT (proximity) nose element is accidentally removed and the striker rod retracts, deform the element so that no reuse will be possible

l. Mk 122 arming safety switch when used with the M20 or M20A1 PSE must be installed in the bomb in a RADHAZ-free environment.

m. Do not pull the lanyard of the Mk 122 arming safety switch during handling or loading. If the lanyard breaks away from the Mk 122, discard the entire switch.

n. Do not install a Mk 344 fuze if the delivery is to be in the retarded delivery.

o. M20 or M20A1 PSE must be used in the unretarded delivery only.

No response required.	40. From the following safety precautions for electric tail fuzes and associated components, select the statements that are true by circling the letter in front of each correct statement. a. Install a Mk 344 fuze if the delivery is to be in the retarded delivery. b. If, during installation, the pop-out pin is accidentally allowed to pop out, push the pin all the way back in so that both sets of holes will align and reinstall the safety cotter pin. c. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously reduce the arming delay time. d. If the pop-out pin binds or will not reset, the Mk 344 or the Mk 376 fuze may be armed. e. When the shipping cap has been removed from the Mk 344 or the Mk 376 fuze, the fuze must be used within 30 days. f. If the arming wire and the safety cotter pin have both been removed other than during the assembly procedures, the fuze could be fully armed and should be treated as such. Do not attempt to remove the fuze from the well of the bomb. Notify EOD personnel immediately. g. Mk 344 and Mk 376 fuzes that have been repacked for more than 30 days or exposed to excessive moisture for any length of time shall be disposed of in accordance with current directives. h. Do not attempt to rotate the Mk 344 or the Mk 376 fuze by the pop-out pin sleeve, because the sleeve may break off. i. Never install a fuze if the safety cotter pin is missing from the pop-out pin when the fuze is removed from its container. j. M20 or M20A1 PSE must be installed or removed in a HERO-safe (a RADHAZ-free) area. k. M20 or M20A1 PSE may be used in the retarded or the unretarded delivery.

	40. (continued) l. Handle the M20 or M20A1 PSE carefully; the case is very fragile. The VT (proximity) nose element contains complex electrical circuitry; therefore, do <u>not</u> drop or mishandle. m. If the safety clip of the VT (proximity) nose element is accidentally removed and the striker rod retracts, reset the striker rod and reinstall the safety clip. n. Mk 43 TDD must be installed or removed in a HERO-safe (a RADHAZ-free) area. o. Mk 122 arming safety switch when used with the M20 or M20A1 PSE must be installed in the bomb in a RADHAZ-free environment. p. Do not pull the lanyard of the Mk 122 arming safety switch during handling or loading. If the lanyard breaks away from the Mk 122, discard the entire switch.
b., c., d., e., f., g., h., i., j., l., o., p.	41. Complete the statement below regarding the importance of aligning both sets of holes in the pop-out pin during installation. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously _____ the _____ _____ _____.
reduce arming delay time	42. State what must be installed on all Mk 344 and Mk 376 electric tail fuzes in order to prevent the fuze from becoming unseated during flight. _____

Fuze-restraining clip.	43. Complete the following statement concerning the purpose of the support cup and the steel nose plug when using only an electric tail fuze. When using only an electric tail fuze, a support cup and a steel nose plug should be installed so as to _____ _____ of the _____ fuze _____ on heavy impact.
prevent collapse nose cavity	44. State the primary function of the Mk 122 Mod 0 arming safety switch. _____ _____ _____
To connect the bomb-fuze control circuits in the aircraft to the electric fuze circuits in the bomb.	45. From the following safety precautions for electric tail fuzes and associated components, select each statement that is true by circling the letter in front of the statement. a. Mk 344 and Mk 376 fuzes that have been repacked for more than 30 days or exposed to excessive moisture for any length of time shall be disposed of in accordance with current directives. b. When the shipping cap has been removed from the Mk 344 or the Mk 376 fuze, the fuze must be used within 30 days. c. Install a Mk 344 fuze if the delivery is to be in the retarded delivery. d. If, during installation, the pop-out pin is accidentally allowed to pop out, push the pin all the way back in so that both sets of holes will align and reinstall the safety cotter pin.

45. (continued)

e. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously reduce the arming delay time.

f. If the pop-out pin binds or will not reset, the Mk 344 or the Mk 376 fuze may be armed.

g. Never install a fuze if the safety cotter pin is missing from the pop-out pin when the fuze is removed from its container.

h. M20 or M20A1 PSE must be installed or removed in a HERO-safe (a RADHAZ-free) area.

i. Do not attempt to rotate the Mk 344 or the Mk 376 fuze by the pop-out pin sleeve, because the sleeve may break off.

j. If the arming wire and the safety cotter pin have both been removed other than during the assembly procedures, the fuze could be fully armed and should be treated as such. Do not attempt to remove the fuze from the well of the bomb. Notify EOD personnel immediately.

k. Handle the M20 or M20A1 PSE carefully; the case is very fragile. The VT (proximity) nose element contains complex electrical circuitry; therefore, do not drop or mishandle.

l. If the safety clip of the VT (proximity) nose element is accidentally removed and the striker rod retracts, reset the striker rod and reinstall the safety clip.

m. Mk 122 arming safety switch when used with the M20 or M20A1 PSE must be installed in the bomb in a RADHAZ-free environment.

n. Do not pull the lanyard of the Mk 122 arming safety switch during handling or loading. If the lanyard breaks away from the Mk 122, discard the entire switch.

o. M20 or M20A1 PSE may be used in the retarded or the unretarded delivery.

6. From the following statements regarding the use of the Mk 344 Mod 0 and Mod 1 and Mk 376 Mod 0 electric tail fuzes in the retarded or the unretarded delivery, write the word "True" to the left of each correct statement.

_____ a. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are restricted to the unretarded delivery.

_____ b. The Mk 376 Mod 0 electric tail fuze is unreliable for the retarded delivery, but it is used in the retarded delivery when initiated by mechanical nose fuzing.

_____ c. The Mk 344 Mod 0 or Mod 1 electric tail fuze is not to be used for a retarded delivery; because, if the bomb failed to retard, it could cause damage to or destruction of the delivery aircraft.

_____ d. The Mk 376 Mod 0 electric tail fuze is used for the retarded delivery and also for the unretarded delivery.

_____ e. The Mk 344 Mod 0 and Mod 1 electric tail fuzes are used in both the retarded delivery and the unretarded delivery.

7. Fill in the blanks below for the arming delay time(s) and the delivery mode(s) of the Mk 344 and the Mk 376 electric tail fuze.

a. Mk 344 Mod 0 or Mod 1:

(1) Arming delay time: _____ _____ for _____ delivery.

b. Mk 376:

(1) Arming delay time: _____ _____ for _____ delivery.

(2) Arming delay time: _____ _____ for _____ delivery.

8. List the four in-flight selectable functioning modes available with the Mk 344 and Mk 376 electric tail fuzes.

(Continued on the next page.)

8. (continued)

a. _____ _____ _____

b. _____

c. _____ _____ _____

d. _____ _____ _____

9. State what is used so as to make an in-flight selection of any functioning mode of the Mk 344 and Mk 376 electric tail fuzes.

_____ _____ _____

10. Complete the statement below that pertains to what may be used with the Mk 344 or the Mk 376 fuze in order to obtain an airburst capability.

When used with electric tail fuzing, the _____ or _____

_____ _____ _____ (PSE) or the _____

_____ _____ _____ (TDD) provides an airburst capability.

11. State (a) which VT (proximity) nose element is restricted to the unretarded delivery and (b) which may be used in either the retarded or the unretarded delivery.

a. _____

b. _____

12. State the burst height above the target when using the Mk 43 Mod 0 target detecting device (TDD).

_____ _____ _____

13. Describe the method(s) for initiating the M20 or M20A1 proximity sensing element (PSE) and the Mk 43 Mod 0 target detecting device (TDD).

(Continued on the next page.)

13. (continued)

a. _____

_____

b. _____

_____

14. Give the reasons why the Mk 43 Mod 0 TDD is preferred for use with the Mk 344 and Mk 376 electric tail fuzes.

a. _____

b. _____

c. _____

15. State the two purposes of the Mk 31 Mod 1 safety device.

a. _____

b. _____

16. Complete the statement below regarding the importance of aligning both sets of holes in the pop-out pin during installation.

When installing the safety cotter pin or the arming wire, failure to align _____ _____ _____ _____ _____ in the pop-out pin will dangerously reduce the _____ _____ _____.

17. State what must be installed on all Mk 344 and Mk 376 electric tail fuzes in order to prevent the fuze from becoming unseated during flight.

_____ _____ _____

18. Complete the statement concerning the purpose of the support cup and the steel nose plug when using only an electric tail fuze.

(Continued on the next page.)

18. (continued)

When using only an electric tail fuze, a support cup and a steel nose plug should be installed so as to _____ _____ of the nose fuze _____ on heavy impact.

19. Give the primary function of the Mk 122 Mod 0 arming safety switch.

_____

_____

20. From the following safety precautions for electric tail fuzes and associated components, select the statements that are true by circling the letter in front of each correct statement.

a. Install a Mk 344 fuze if the delivery is to be in the retarded delivery.

b. If, during installation, the pop-out pin is accidentally allowed to pop out, push the pin all the way back in so that both sets of holes will align and reinstall the safety cotter pin.

c. Failure to align both sets of holes when installing the safety cotter pin or the arming wire in the pop-out pin will dangerously reduce the arming delay time.

d. If the pop-out pin binds or will not reset, the Mk 344 or the Mk 376 fuze may be armed.

e. When the shipping cap has been removed from the Mk 344 or the Mk 376 fuze, the fuze must be used within 30 days.

f. If the arming wire and the safety cotter pin have both been removed other than during the assembly procedures, the fuze could be fully armed and should be treated as such. Do not attempt to remove the fuze from the well of the bomb. Notify EOD personnel immediately.

g. Mk 344 and Mk 376 fuzes that have been repacked for more than 30 days or exposed to excessive moisture for any length of time shall be disposed of in accordance with current directives.

20. (continued)

h. Do not attempt to rotate the Mk 344 or the Mk 376 fuze by the pop-out pin sleeve, because the sleeve may break off.

i. Never install a fuze if the safety cotter pin is missing from the pop-out pin when the fuze is removed from its container.

j. M20 or M20A1 PSE must be installed or removed in a HERO-safe (a RADHAZ-free) area.

k. M20 or M20A1 PSE may be used in the retarded or the unretarded delivery.

l. Handle the M20 or M20A1 PSE carefully; the case is very fragile. The VT (proximity) nose element contains complex electrical circuitry; therefore, do not drop or mishandle.

m. If the safety clip of the VT (proximity) nose element is accidentally removed and the striker rod retracts, reset the striker rod and reinstall the safety clip.

n. Mk 43 TDD must be installed or removed in a HERO-safe (a RADHAZ-free) area.

o. Mk 122 arming safety switch when used with the M20 or M20A1 PSE must be installed in the bomb in a RADHAZ-free environment.

p. Do not pull the lanyard of the Mk 122 arming safety switch during handling or loading. If the lanyard breaks away from the Mk 122, discard the entire switch.

*U. S. GOVERNMENT PRINTING OFFICE: 1984-544-442/16564