

## PART 1

## SECTION 7—WEAPONS

## CHAPTER 3—GUNS

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**Introduction**

1. The gun installation which may be carried as secondary armament on the Lightning F Mk. 6 consists of two electrically-fired and controlled 30 mm Aden guns which are mounted in a gun/fuel pack contoured to the shape of the ventral pack forward section, which it replaces.

**30 mm Aden Gun**

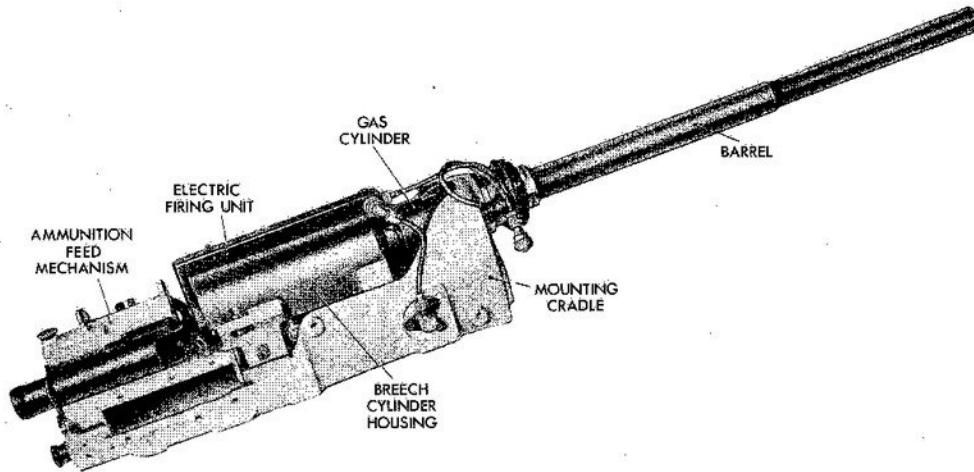
2. The 30 mm Aden gun (Fig. 1) is designed for use in fixed gun installations. The functioning is similar in principle to that of a revolver but, unlike the revolver, once the Aden has been loaded and the first round fired, it continues to fire for as long as the firing trigger is pulled and the ammunition lasts.

3. The main components of the Aden gun are a barrel, a mounting cradle, a breech cylinder housing and an ammunition feed mechanism. The gun is electrically fired, pneumatically cocked and is manufactured for either a left-hand or right-hand ammunition feed. Leading particulars are:

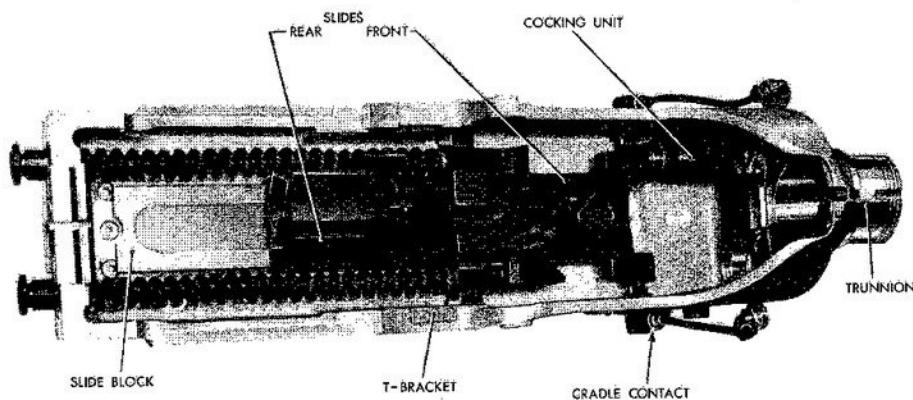
a. Length overall	64.5 inches
b. Maximum width	9.5 inches
c. Maximum height	10.5 inches
d. Weight (including barrel)	192 lb.
e. Length of barrel	42.5 inches
f. Calibre	30mm (1.183 inches)
g. Rifling	Right-hand
h. Rate of fire	1200 to 1400 rounds per minute
j. Muzzle velocity	2600ft./sec. (hv)

4. *The Barrel.* The gun is fitted with a Mk. 2 barrel for use with high velocity ammunition.

5. *The Mounting Cradle.* The gun mounting cradle (Fig. 2) forms the base on which the gun mechanism is mounted. A hollow trunnion at the front of the cradle serves as a mounting and a bearing for the breech cylinder housing.



1-7-3 Fig. 1 30 mm Aden Gun



1-7-3 Fig. 2 Interior View of Gun Cradle

6. In the bottom of the cradle are two slides which are free to move to and fro, and two springs. The front slide bears against a gas piston which forces the slide to the rear, causing the breech cylinder to rotate every time the gun fires. The rear slide is secured to the front slide and has two ammunition rammers attached to it. The two springs return the slides to their forward position where the slide/cradle electric contacts complete the firing circuit.

7. *The Breech Cylinder Housing.* The breech cylinder housing (Fig. 3) forms the mounting for a revolver-type cylindrical breech. The housing is secured to the cradle by a front spigot, which fits into the cradle trunnion and supports the barrel, and two T-shaped grooves which accept brackets on the side of the cradle; both mountings allow about 0.5 inch recoil movement. Beneath the front spigot are two recoil units which absorb the recoil force and a gas operated piston which forces the slide to the rear when the gun fires. A fixed firing pin is fitted in the rear of the assembly in line with the barrel and a cartridge ejector lever is mounted on the rear side. There are three plungers on the top of the housing. The foremost of these is the barrel contact switch plunger which breaks the electric contact to the firing pin if the barrel is incorrectly fitted. The centre plunger is covered and projects downwards into the housing to prevent contra-rotation of the breech cylinder. The rearmost plunger is the gun-loaded indicator and projects into the breech cylinder chamber in line with the firing pin; if the plunger can be depressed, it indicates that the chamber is empty.

8. *The Breech Cylinder.* Inside the housing there is a five-chambered cylinder which rotates each time the gun is fired to bring a new round into line with the barrel and firing pin. The cylinder is rotated by the action of the front cradle slide on five equally spaced rollers around the cylinder. It rotates 36° during the rearward movement of the slides and 36° during the forward movement; a groove on the front slide stops the rotation of the cylinder during firing and ejection.

9. *The Feed Mechanism.* The ammunition feed mechanism is mounted on the left or right hand side of the cradle behind the breech cylinder housing. The mechanism is composed of sprockets which are lined up with the breech cylinder chambers. To ensure correct timing and to eliminate the possibility of the gun racing the feed, the feed mechanism shaft is coupled, and driven, by the breech cylinder shaft.

10. *Firing Mechanism.* The guns are fired electrically, through the relays and a transformer in a box in the pack and controlled by the MAS, the ARM/

SAFE switch (pre-Mod. 4463) and the trigger. The firing trigger and safety catch are on the control column handle. While the aircraft is on the ground, all armament circuits are made safe by disconnecting the armament safety break in the starboard wheel bay.

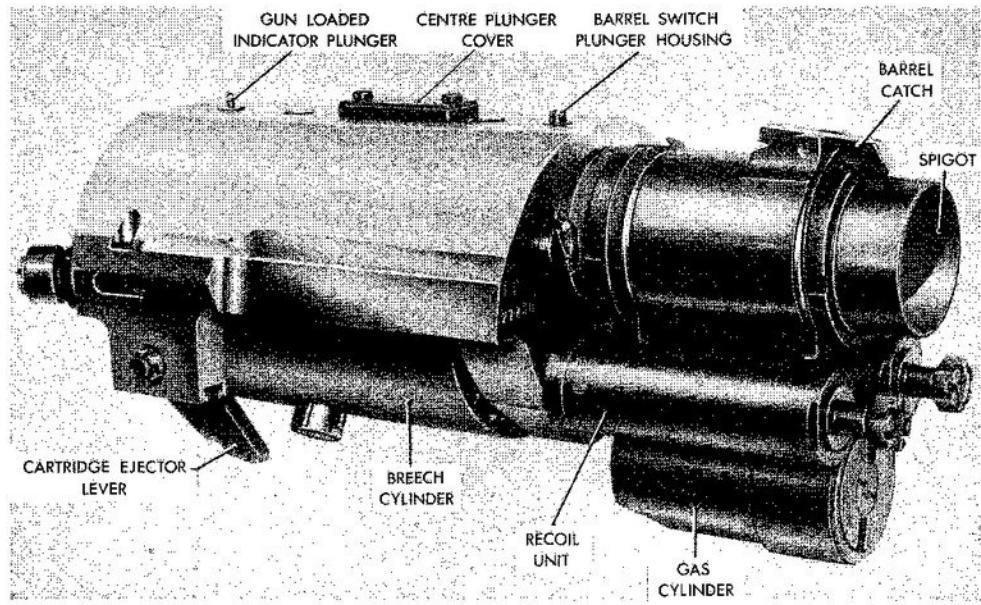
11. *The Pneumatic System.* The gun cannot be cocked in the air, therefore a round must be moved into line with the barrel by means of a pneumatic cocking unit housed in the front of the mounting cradle. The cocking unit is basically a cylinder with a piston which operates the slides in the same way as the gas piston (para. 7); it is operated by an air supply at 3,500 psi reduced to 1,200 psi by a detachable hand operated cocking valve. The cocking unit must be operated three times to load a round into the firing position. The first stroke of the piston causes the first round to be free from the ammunition belt and partly rammed. The second stroke effects the complete ramming of the first round and partial ramming of the second round. The third stroke brings the first round into the firing position, rams the second round fully home and partially rams the third round. The gun is now ready for firing. When the first round leaves the chamber its gases operate the gas piston and this stroke moves the second round into the firing position, the third round is fully rammed, the fourth round is partially rammed and the cartridge case from the first round is ejected. This sequence continues automatically as long as the trigger is pressed or the ammunition lasts.

#### Aircraft Installation

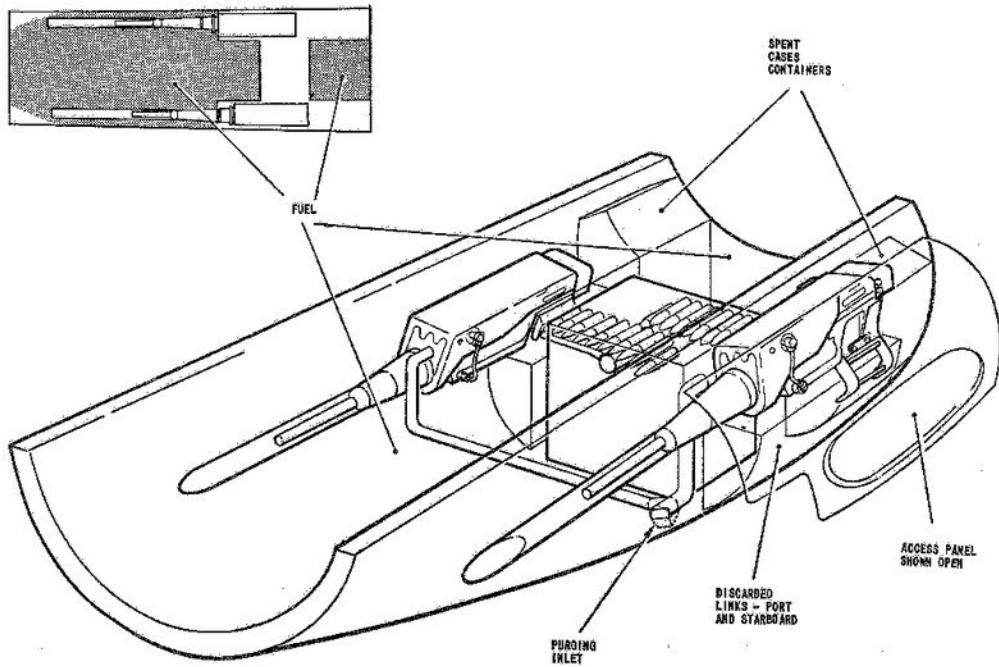
12. *Ventral Gun Pack.* The two guns are fitted upside down (Fig. 4), one on either side of the ammunition box and staggered to allow direct transverse feed of the rounds. Each gun has a blast tube, front and rear mountings, empty case and link collection compartments and a purging system. Fuel is contained in two compartments, one forward and one to the rear of the ammunition box. The reduction in overall fuel capacity is approximately 98 gallons when the gun/fuel pack replaces the hatch tank. The guns are reloaded by replacing the ammunition box via a centre panel using the two built-in winches operated by detachable hand braces. A harmonisation unit on the rear mounting of each gun allows vertical and horizontal adjustment. Spent cartridge cases are ejected into compartments behind each gun and the empty links drop into a container below each gun.

13. *Gun Purging.* Spent gases are removed by ram air admitted through an electrically operated scoop on the port side. The scoop opens when the trigger is pressed, with the ARM/SAFE switch to ARM

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1—7—3 Fig. 3 Breech Cylinder Housing



1—7—3 Fig. 4 Ventral Gun Pack

(pre-Mod. 4463) and GUNS selected on the MAS, and closes a microswitch 0.25 seconds later which completes the circuit and fires the guns. The guns cannot fire if the scoop fails to open. Once the scoop has started to open, it opens fully even if the trigger is released immediately; from fully open, the scoop retracts automatically whenever the trigger is released.

### **Ammunition**

14. A maximum of 120 rounds per gun may be carried in the ammunition box (approximately 6 seconds firing time).

15. The Aden gun cartridge is approximately 8 inches long and weighs just under 1 lb.; it consists of a solid drawn brass case containing the propellant charge, the contents of which vary according to the type of round. A copper driving band fits round the projectile just above the mouth of the case.

16. 30 mm cartridges contain approximately 1.6 oz. of propellant charge and are referred to as 'high velocity' (hv) cartridges. The propellant is fired by means of an electric cap in the base of the shell and initiated by an electric current from the firing pin. The projectile can be either practice or high explosive, the former being inert (painted turquoise blue) and the latter having a high explosive filling and fuse (painted deep bronze green). The following types of 30 mm cartridges are in current use:

a. *Mk. 1Z Practice.* The Mk. 1Z Practice is the only low velocity cartridge that may be encountered; it has an inert projectile weighing about 10 oz.

b. *Mk. 2Z Practice.* The Mk. 2Z Practice has an inert projectile weighing about 8 oz. and is ballistically similar to the Mk. 3Z HE cartridge.

c. *Mk. 3Z HE.* The Mk. 3Z HE has an explosive shell weighing about 8 oz. and containing 1.9 oz. of Torpex 5; it uses a No. 933 fuze.

d. *Mk. 3Z Practice.* The Mk. 3Z Practice round

has an inert projectile weighing about 10 oz. which is ballistically similar to the Mk. 5Z HE.

e. *Mk. 5Z HE.* The Mk. 5Z HE cartridge has an explosive shell weighing about 10 oz. and containing 1.6 oz. of Torpex 5 with a No. 944 fuze.

17. In addition to the above cartridges, all of which can be fired, a drill cartridge and a ballast cartridge are available. The drill cartridge is made of steel, contains no explosive and is used only for ground training. The ballast cartridge is made of zinc alloy, contains no explosive and is used as ballast in the ammunition boxes of aircraft which require ballast. Neither of these cartridges has a driving band and the ballast cartridge has no extractor groove around the base of the shell.

18. *Fuzes.* The 933 Mk. 1 fuze is fitted to the Mk. 3Z HE cartridge and the 944 Mk. 1 fuze is fitted to the Mk. 5Z HE. Both are direct-action percussion fuzes and are fitted with spherical shutters which prevent arming until after firing. Premature arming of the 944 fuze is also prevented by two centrifugal bolts holding the striker away from the detonator. The 933 fuze functions on impact while the 944 contains a composition which delays fuze functioning for a few milliseconds after impact.

19. *Belts and Links.* Aden gun ammunition is made up into belts which consist of a number of links hooked together and each containing a round of ammunition. The end of each link is U-shaped which grips the cartridge, whilst on either side of the link is an eye and a hook. Belts are made up with the eyes of the links on the right hand side for the right hand feed gun on the port side of the pack and vice versa for the left hand feed gun on the starboard side. A belt does not disintegrate when the rounds are removed as the links are hooked together and not joined by the rounds as is the case with the other types of ammunition belts. During firing, the links are unhooked by a disintegrating device in the link chute before passing into the link container.

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