Chapter 2
Guns

Abstract In China around AD 1000, the tubular bamboo stick was used to launch spikes by burning gun-powder. The combustion generates compressed gas at high pressure which was used in ejecting spikes at high speed. The gun powder is a mixture fuel and oxidizer. Generally, the sulphur and charcoal are used as fuel and potassium nitrate as oxidizer. This chapter briefly reviews the use of fixed and flexible guns mounted on the aircraft.

Keywords Aircraft gun · Anti-aircraft gun · Gatling gun · Cannon calibre · Fixed gun · Flexible gun

A gun is an air-to-air, tubular weapon used to discharge projectiles and other materials with high velocity. It is by far the most widely used weapon ever devised. Aircraft guns are generally classified as either *Fixed* or *Flexible*.

Fixed guns are installed in a stationary position and are not movable in other directions unrelated to the aircraft. They are usually forward firing and the entire aircraft (fighter) must change its direction to move the weapon and aim it. Fixed, forward firing guns usually need a single operator to aim and steer and have lighter installations, produce less drag and hence have less negative impact on their performance. This makes them most the favorable weapons for small, maneuverable fighters [1].

Flexible guns on the other hand are fixed to a platform on the aircraft but can be rotatable to cover a certain field of fire and can be aimed up and down, side to side directions and at certain elevations by the operator irrelative to the direction of the vehicle. Such guns are installed and manually operated in power turrets. In addition to the pilot, flexible guns require another dedicated operator for aiming the weapon, thus adding to the size and weight of the aircraft. When the opponent can be kept in front of the attacker, maneuvering relative to another aircraft which essentially requires a forward field of fire becomes much simpler. For these reasons, flexible guns are generally preferred for the defense of larger, less maneuverable aircrafts whereas the fixed forward-firing guns have been found to be more advantageous for small, offensive aircrafts (fighters).

M. Kaushik and P.R. Hanmaiahgari, *Essentials of Aircraft Armaments*,
SpringerBriefs in Applied Sciences and Technology,
DOI 10.1007/978-981-10-2377-4_2

In World War I, the fighter armaments such as personal side arms and weaponry were improvised and progressed to flexible machine guns and eventually to fixed machine guns using innovative technology. The standard fighters were usually equipped with synchronizers to allow fire through the propeller disc. But by the end of this conflict, they were improvised to two 0.30 calibre class fixed forward-firing machine guns.

A Cannon is essentially a kind of gun in the form of tube which uses explosive materials to launch a projectile. It varies in mobility, range, angle of firing, size etc. The development of aircraft cannons was based on the search for more destructive projectiles. Generally these explosive charges on contacting the target explode as they are armed by the firing acceleration of the shell. In World War I, single-shot cannons were used to some extent but the true, effective automatic cannons were developed between the wars. These cannons were generally 20–40 mm weapons and have greater destructive power than the machine guns. They were larger and heavier in size which lead to the further tradeoffs in usable aircraft space and in performance. With the correspondingly lower rates of fire, these cannons had projectiles significantly larger than those of the 0.30 and 0.50 calibre class, commonly used machine guns.

After World War II, a new significant technological breakthrough has appeared in air-to-air guns. A cannon with new design known as the '*M39*' was built in the United States. It's built around a rotating cylinder similar to a "revolver" handgun and modeled from an experimental German gun which resulted in a greater increase in the rate of fire (Fig. 2.1).

'*Gatling gun*' cannons were introduced in the later 1950's with greater performance capabilities [2]. It was designated as '*M61*' in the United States. This gun could develop a tremendous rate of fire with less barrel overheating and erosion and it was employed with a multiple rotating barrels rather than a revolving cylinder.

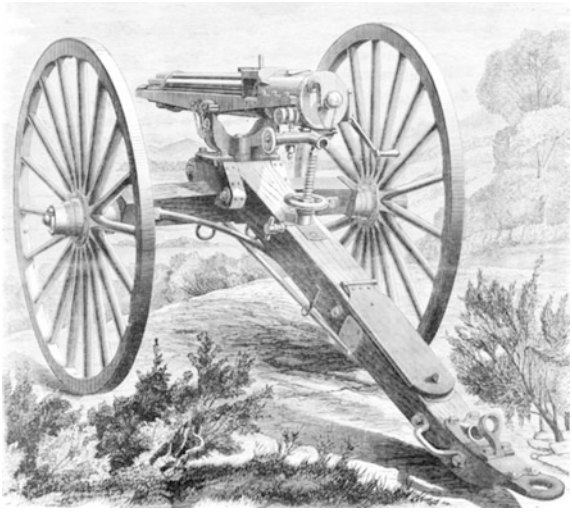

Fig. 2.1 Gatling gun used in American war

In addition to it, this gun was usually propelled electrically, hydraulically or pneumatically. Also problems associated with duds were eliminated as it was not dependent on the residual energy of the expended round.

The trend of the gun being the fighter's primary armament saw a definite change in the 1950's and the 1960's. Many of the fighters were not equipped with guns at all during this period. It's because of the feeling that the high speeds of jet fighters and the heavy armament of new bombers, particularly suitable for the night and all-weather missions has made the gun obsolete. The package of air-to-air weapons consisted entirely of guided missiles and unguided rockets. But later on, the importance and usage of guns has become prevalent once again due to the limitations of some of the more exotic weapons. Further combat experiences had once again demonstrated the value of the gun thus reversing the trend in the 1970's.

References

1. Bruce JM (1965) Warplanes of the First World War—fighters, vol 1. MacDonald & Co., London
2. Needham J (1986) Military technology: the Gunpowder Epic. Cambridge University Press, Cambridge, pp 180–181

http://www.springer.com/978-981-10-2376-7

Essentials of Aircraft Armaments
Kaushik, M.; Hanmaiahgari, P.R.
2017, XIII, 63 p. 12 illus., Softcover
ISBN: 978-981-10-2376-7