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SIGHTS FOR THE MODERN MILITARY RIFLE

THE MODERN RIFLE

The modern military rifle uses 5.56mm ammunition which has a reasonably flat trajectory. Shooting is expected to be out to 300 metres. The sight is well above the barrel axis as the latter is in line with the shoulder. The rifle may be used with a grenade launched from the muzzle or it may be fitted with a grenade launcher.

THE SIGHT REQUIREMENT

The sight for the rifle must provide effective aiming for deliberate shooting out to 300 metres and for quick shooting at opportunity or fleeting targets. It must be usable with the naked eye in daylight, low light and in the dark if the target can be seen (e.g. silhouetted against the sky or light from an illuminating round). It must also be usable with Night Vision Goggles when available.

THE AIMING PROCESS

The sight is used to aim the rifle so that the target is hit. With open sights four things have to be in line for effective shooting: the target, the foresight, the backsight and the eye. With a telescopic sight or a reflex collimator sight only two things, the target and the reticle, have to be lined up. So, for ease of shooting, a telescopic or reflex collimator sight should be chosen.

But aiming is a servo mechanism, the eye observes the error sight/target: the brain processes this to command the arms to move the rifle to eliminate the error: this process continues until the brain considers the aim is correct and the trigger can be pulled.

If magnification is used (as in most telescopic sights) the eye sees the error multiplied by the magnification. So, before the brain can tell the arms what to do, it has to divide the error by the magnification. The soldier has to learn to do this, but other weapons than the rifle have other magnification in their sights so this learning is not easy.

It is probably better not to have any magnification so that the view through the sight is the same as the view around it. Both eyes can be kept open giving better alertness and, also, the ability to see much better in low light and in the dark. Telescopic sights can be made without magnification but these are more expensive than reflex collimator sights.

The other difference between sight types is the ease of pick up of the aiming mark for quick shooting. This is hard with open sights, easier with telescopic sights and easiest with reflex collimator sights. With open sights the foresight and the target have to be seen through the backsight which takes time. Telescopic sights are designed with an exit pupil (the area at the eyepiece through which the eye must look) and the size of this matches the size of the pupil of the eye in the dark (usually 7mm). The eye must be in line with this for proper use. With reflex collimator sights the eye is not so constrained. The eye can see the reticle wherever it looks into the rear aperture of the optic - Ring Sights have apertures from 7 to 40mm - choose which you like (but the sight, in general, gets bigger with aperture).

THE RING SIGHTS

Types suitable for rifles (we have others) are solid glass and unit power (ie no magnification) They are militarily robust, cannot mist up inside and pass the drop test. When FN started development of the housing of the Ring Sight for their P90, they made one in aluminium and dropped it, on the gun, one and a half metres onto concrete. It broke - the optic didn't. They designed a plastic housing which we had made in England: it was dropped - the housing broke slightly - the optic didn't. A few strengthening modifications meant that the housing didn't break - the optic never did.

We have, in the main, two types:

Reflex Collimator sights

Telescopic sights

The optic dimensions etc are given in the Annex.

REFLEX COLLIMATOR SIGHTS

These have white reticles superimposed on the target. The reticles are lit by light from the target area or artificially. The target scene is made dimmer so that the reticle can be seen.

The reticle pattern can be chosen by the customer to suit his particular requirements.

One pattern can be used by day and by night (single reticle) or there can be one pattern for day and another for night (dual reticle).

The aperture conditions the overall size of the optic for a particular type. Some types of optic are inherently larger than others.

RING SIGHT LC-7-40

This is the smallest one, which we designed long ago for the M16 rifle

But experience has shown that 7mm is probably too small for quick pick-up on a rifle.

The design, though ingenious and suitable for shooting, did not stand up to soldiers cleaning mud out with their bayonets!

It has a dual reticle, one for day and one for night lit by a tritium light source.

It is used by Shorts on the STARSTREAK missile system.

RING SIGHT LC-8-40

The LC-7-40 optic, made a little larger, became the basis for our EPC sight.

It has a single dot reticle lit by a bright LED, so it needs a battery, and this probably rules it out as a military rifle sight.

It is fitted to pistols and sub-machine guns. With it on a pistol you can hit a man reliably at 100 metres by day and, with Night Vision Goggles, by night.

Police forces use it on SMGs. The Channel Tunnel police have it on their H&K MP5s.

RING SIGHT HC-14-62

FN chose our HC type with a circular aperture of 14mm diameter for their P90 sight. The HC design has a dual reticle - rings and a dot for day, open T for night. The open T does not obscure the target which may be difficult to discern if the reticle overlays it.

Its height is greater, for a given aperture, than the LC type but this can easily be fitted into the space between the barrel axis and the sight line.

On the P90 the optic housing is plastic and the interface of the housing with the gun is by two zeroing screws.

The optic can be put into other housings such as one with a laser pointer beneath it, complete with the laser battery, on a zeroing mount with range settings, the whole on a dovetail interface for the British 5.56mm rifle.

RING SIGHT LC-14-46

The same width of aperture can be done in a LC format.

It has a single reticle lit for the dark by LED or tritium light source.

The optic is more compact than the HC-14-62 but this is of little significance for rifle applications.

It has been put in an experimental housing for the British 5.56mm rifle as an update for the open sights. It fits as a retrofit on the handle carrying the rear sight. It has integral zeroing. This one is lit for the dark by a LED whose brightness is controlled by a push button but it could be lit by a tritium light source.

We have designed a special variant of this sight for Heckler & Koch to fit in the handle of the G36 rifle.

RING SIGHT LC-9-46

This optic can be turned on its side to give a grenade sight. The optic gets a little longer to allow for lighting the reticle which gives elevations for the grenade out to 150 metres .
It has been put into a housing to be fitted onto the SUSAT telescopic sight on the British 5.56 rifle for aiming the Israeli muzzle launched grenade. The sight clamps onto the barrel of the telescopic sight and has adjusting screws to allow the LC-9-46 to be zeroed to the rifle.

The sight is positioned to the left so that the muzzle of the rifle does not get in the way of aiming.

The British Infantry is now being equipped with this sight. The British were asking for 8-% hits on a 1.2 metre square at 50 metres. This sight enables a trained man to get practically 100% hits at 150 metres. You can shoot through a window of a room where there is an invisible sniper and kill him.

The sight has a boresight mark so you can use the sight to aim the rifle. So, for quick shooting, you can use the LC-9-46 instead of the x 4 telescopic sight.

If you want to shoot the grenade further away the sight can go out to 250 metres but the boresight mark has to be given up. Such a sight is being evaluated by Heckler & Koch.

RING SIGHT YC-10

You may want more elevation still and be able to aim the rifle.

We have the YC-10 under development. It will provide elevations from 0 degrees to 30 degrees.

SHOOTING IN LOW LIGHT AND IN THE DARK

In low light both eyes are kept open (this improves night vision) and aiming is as before. But when it gets dark you need image intensification. Armies have been buying special night sights. These have to be fitted to the rifle and zeroed to it. A rifleman on watch wants to use his own rifle zeroed to him so when he comes on watch there is difficulty putting the night sight on his own rifle. And, as he watches the target scene, he has to have the rifle above the parapet moving it to and fro.

Those days are gone. Now you should use a Ring Sight and Night Vision Goggles.

NIGHT VISION GOGGLES

While, of course, these can be worn for acquiring targets, they look straight out from the head and cannot, with a rifle, be got round to look along the sight line.

So one goggle should be put on the rifle on the sight line looking through the Ring Sight which injects the reticle into the goggle. Shooting is as usual.

The Delft Sensor Systems MUNOS NVG is well suited to this. It has been mounted on the FN P90 in line with the sight and with the battery box underneath having a dovetail to carry the MUNOS.

When the soldier aims, his head is in the same position as by day.

When he wants to acquire targets from under cover he can unplug the MUNOS from the gun and plug it back onto his helmet so reducing his exposure to the enemy.

And, of course, the NVG can be used with other weapons and suitable sights - P90, pistols, Light Anti-armour Weapons, machine guns, cannon, MANPADS.

TELESCOPIC SIGHTS

Ordinary telescopic sights are not very suitable for use with NVG as they reduce the amount of light available to the NVG. But Ring Sights have developed solid glass telescopic sights with a black reticle for day and a lit open T for night which does not do this.

Ring Sight MC-10-80

This is a unit power solid glass telescopic sight(optic dimensions at Annex G).

FN has been doing trials with it; in the existing P90 housing.

You can use it with NVG just like the reflex collimators.

RING SIGHT TC-12

Some people like the C 1.5 telescopic sight on the Steyr AUG. This has suffered from misting up inside. So we have designed and made, specially for Diemaco to suit their C7 rifle, a X 1.5 solid glass telescopic sight (optic dimensions at Annex H)

SPOT ON

Another Ring Sight is the simplest. A small pure collimator which replaces the foresight (optic dimensions at Annex J). It is just as accurate as the other sights and can be used with NVG but, because it is so small it is slower in use. A backsight is used to pick up the aiming mark but, once the aiming mark is picked up, it is easy to use. For emergency shooting it can be used as a foresight. You would have to use it to appreciate what it can do for you.

HOUSINGS

All these optics are mounted in a housing with Dow corning 3145 RTV. We have used this system for over fifteen years now so it has been shown to be satisfactory all over the world. The housing is specially designed to suit a particular rifle. It can be metal, as for the M16, or plastic, as for the P90. If NVG are to be used, the housing must be designed to accept them.

ZEROING

The sight has to be zeroed to the rifle. The method depends on the rifle layout and on the user requirement. It is best done by the rifle manufacturer as he has to provide the interface with the rifle. We can advise on this if required. The zeroing can be part of the rifle, as it is with the P90.

DECISIONS

Aperture - anything from 9 to 14mm will be all right.
Sight type - reflex collimator: telescopic (x 1 or x 1.5): pure collimator.
Reticle type - single or dual.
Reticle night illumination: tritium or LED.
Rifle only or rifle and grenade.
Use with NVG.

Annex

Sights for the Modern Military Rifle

Optic Dimensions

Optic	Apperture	Length	Width	Height	Weight	Reticle
LC-7-40	7mm dia	40mm	7mm	14mm	7g	Single or dual
EPC	7 x 7mm	40mm	7mm	10mm	7g	Single
HC-14-62	14mm dia	66mm	14mm	30mm	60g	Single
LC-14-46	14 x 9mm	46mm	14mm	15mm	30g	Single
LC-9-46	9 x 14mm	56mm	16mm	16mm	30g	Single
YC-10	19 x 12mm	60mm	17mm	36mm	125g	Single
MC-10-80	10mm dia	80mm	10mm	20mm	40g	Dual
TC-12	12mm dia	105mm	20mm	38mm	50g	Dual
SPOT ON	4 x 5mm	32mm	4mm	5mm	2½g	Single

All sizes are liable to change as development proceeds.

These parameters can be adapted to suit particular rifle requirements.