



RESEARCH NOTE

(EyeImp)

21 Dec 93

IMPROVEMENT IN THE USE OF THE SOLDIER'S EYES FOR TARGET ACQUISITION, IDENTIFICATION AND ENGAGEMENT BY DAY AND NIGHT

Reference: European Small Arms Symposium 1993
Sights for Night Vision Goggles - Fraser Scott

INTRODUCTION

1. Present military thinking is that hand held and shoulder fired direct weapons are fitted with sights specially designed for a task (it is harder and harder in the current situation to define the tasks).
2. An example is the infantry version of the SA 80 rifle with its x 4 telescopic sight; at night this sight is removed and is replaced with an image intensifier sight. Magnification is required to acquire and identify the target; it also improves deliberate shooting but makes opportunity shooting more difficult.
3. The LAW 80 has a unit power sight (Ring Sight RC-12) and a dovetail for an image intensifier (II) sight. If the latter is fitted it should, for an effective engagement, be reasonably aligned to the weapon. Nevertheless, since the II sight is not dedicated to LAW 80, it does not have a range and elevation graticule so the initial spotting rifle round is not likely to be close to the target and there is no graticule frame against which the tracer can be observed. It would be better to use Night Vision Goggles (NVG) with LAW 80 than to put an II sight on it.
4. What we are proposing is that such man portable weapons should all have unit power sights which are useable with the naked eye, with Head Mounted Binoculars (HMB) and with NVG.

THE NAKED EYE

5. The naked eye, with a unit power sight, is remarkably good at aiming (shooting with open sights at 1000 yards at Bisley). It is also good at noticing movement without undue exposure of the soldier. But against targets with poor contrast against the background, in low light and in darkness it needs help. Interposing a telescopic sight in front of one eye cuts down the field of view of that eye in proportion to the magnification; the soldier has to scan the target scene with the sight and, if the sight is on his rifle, he is liable to expose himself unduly to the enemy.

HEAD MOUNTED BINOCULARS (HMB)

6. Ring Sights Ltd is studying novel designs of these using modern materials and techniques. We expect to be able to design and make HMB (say x 4) which will be light enough to wear on the head without any support by the hands. They will be sufficiently close to the head to permit aiming the weapon sight through them.
7. Man portable weapons would be fitted with unit power sights usable with the naked eye or with HMB.

So the soldier can scan the target scene with HMB, find the target, identify it and engage it with the most suitable weapon with or without HMB. For sub-sonic weapons which need application of elevation or lead he uses the graticule in the weapon sight as with the naked eye.

8. In low light magnification helps the soldier to find, identify and aim at the target. HMB give the soldier a wider spectrum of performance and can, provided that the weapon sights are suitable, enable him to engage targets in low light which he could not do with the naked eye.

NIGHT VISION GOGGLES (NVG)

9. Modern NVG like the Simrad GN1 or the OIP HNV-1 are slim enough to fit between the eyes and a sight and light enough to wear on the head. So they can replace the HMB at night giving much more capability (the soldier will be needing this; any future enemy can be expected to have such night capability).

10. Ring Sights Ltd have been doing trials with NVG and sights. Many combinations of NVG and sights are quite unusable; others militarily unsatisfactory. But we have found that Ring Sights are usable with the right NVG (we demonstrated this in our night shoot at RNBAEE 93: the RAF have demonstrated it shooting sideways from helicopters (Boscombe Down trial report CCTO/72/253/Trials (Trial BISTRE) Jun 93 refers).

SIGHTS

11. The basic task of a sight is to provide an aiming mark superimposed on the target scene. Provided that the NVG and the sight are mutually compatible, this aiming mark can be seen through the NVG and the NVG (or other head mounted device) do not need a graticule. This makes the NVG etc independent of the weapon system and NVG are therefore transferable from weapon to weapon (provided that the weapons have compatible sights). The advantage of using the weapon sight to provide the aiming mark is that the graticule is designed for that weapon (lead, elevation etc) and is zeroed to the weapon already.

12. Open sights are not compatible with NVG as they are too close and will be out of focus. Conventional telescopic sights with magnification are not compatible with NVG. The NVG aperture is about 20 mm; telescopic sights are matched to the pupil of the eye - say 7 mm - so they limit the light reaching the NVG. The eye position may not suit the NVG and the body of the sight makes injection of the graticule through part of the aperture of the NVG unrewarding. Ring Sights Ltd has designed a solid glass unit power telescopic sight with a black graticule which can be lit with a LED. This is the MC-10-90 which, because of the solid glass construction, only needs a thin surround and can be used to inject the graticule into either the HMB or the NVG.

13. Alternatively one of the Ring Sights with white graticules can be used. These are solid glass reflex collimator sights. There is a whole range of them with apertures from 7 mm to 40 mm (see brochure pack). The larger apertures enable the HMB or the NVG to look through them: those with smaller apertures can inject the graticule into the HMB or NVG without spoiling the optical performance. Eye relief is not critical with these sights so they can be mounted on the weapon so that the naked eye or a head mounted system can be used. We have a variety of ways by which the graticule is lit by betalight or LED; these are compatible with HMB and NVG.

COMPATIBILITY

14. Looking at the present position, the sights and the NVG have not been designed to be used together.

Often the NVG are too long to fit between the head and the weapon sight. Often the NVG objective cannot be put in line with the weapon sight. The sight design may not suit the unavoidable features of the NVG. If progress is to be made in equipping forces with effective night fighting equipment the operational requirement to do so must be stated.

HEAD MOUNTING

15. Besides the HMB and NVG being compatible with the weapon sights, they have to be compatible with the soldier's head. Currently there does not seem to be a standard system for head mounting; each contractor designs his own system. The ones we have tried are not fully satisfactory. Clearly the soldier must be able to change from the naked eye to HMB to NVG, and vice versa, easily and quickly.

SUMMARY

16. a. The present mix of naked eye sights, II sights and NVG appears to have happened in an uncoordinated manner.

b. Future conflicts are very likely to be with enemy equipped with night vision kit so we, in turn, must be effective.

c. Magnification is actually needed for finding and identifying the target; it is not really needed to hit with man portable direct fire weapons. It does not seem sensible to provide weapon sights with magnification to perform these tasks especially since the use of magnifying sights on the weapon increases exposure.

d. Provision of Head Mounted Binoculars would enable the soldier to find and identify the target (exposing himself as little as possible) and, with compatible sights, to engage it with magnification if so desired.

e. Provision of Night Vision Goggles would enable the soldier to find and identify the target at night and, with compatible sights, to engage it.

f. Compatible sights are reflex collimator sights, like the Ring Sights range, the particular design being chosen to suit the application.

g. When the different weapon types have compatible sights the soldier can use any weapon without the need for a magnifying or II sight special to the weapon.

h. The outcome of this system is greater flexibility and economy. The expensive part of the system, the image intensifier, is common to the man portable weapon systems. It is easily issued on a scale commensurate with the operations being conducted. There is no transfer of II sight from weapon to weapon. The graticule being used is that designed for the weapon, used by day for training and unchanged for night. Head Mounted Binoculars can also be issued as required and, like the NVG, are easily transferred from man to man as their duties demand (the HMB will improve the soldier's performance in low light so, since they will be cheaper than NVG, can be issued on a wider scale).

i. It is necessary to design the head mounting so that the soldier can use HMB, NVG and other head mounted devices efficiently.