

RECOMMENDED EXPERIMENTAL DESIGN FOR TESTING

The HexSite™ Sighting System

The most powerful and least biased design for testing performance of three sight designs simultaneously would be to use an analysis of variance, treatments by levels design. "Treatments" would be constituted by the three sight designs of standard, ghost ring, and HexSite™ sight. Skill levels, determined to give the most information about performance of the designs at differing skill levels would constitute "Levels". Three skill levels are suggested below only for demonstration purposes. If skill levels is not deemed to be important, then a simple three-treatment analysis of variance design would demonstrate differences between the three sight designs.

To control for bias, a completely randomized design should be employed with 30 or more subjects randomly selected for each of the nine cells of the design, for a total of 270 subjects. Thirty randomly selected subjects per cell are generally accepted as the minimum number to assure sufficient variance for comparison. One hundred subjects per cell would virtually guarantee sufficient comparison, but is probably impractical, unless performed in a military experiment with large numbers of military subjects available.

A treatments by levels design would appear:

	Standard	Ghost Ring	HexSite™
Expert	30 subjects	30 subjects	30 subjects
Knowledgeable	30 subjects	30 subjects	30 subjects
Beginner	30 subjects	30 subjects	30 subjects

Distance from center of target and time required making the shot are both measurements, which satisfy assumptions, needed for ratio data.

Using this design, an overall significant "F" value must be found before legitimate and more meaningful comparisons can be made between the nine categories. This design would answer the question as to whether differences exist between the three sight designs, and if differences exist, are these differences the same for all three-sight designs at different skill levels.

A simpler three-treatment design for the three sight designs with no skill levels would appear:

Standard	Ghost Ring	HexSite™
30 subjects	30 subjects	30 subjects

This design requires only 90 subjects. Again an overall significant "F" value must be found before legitimate comparisons can be made between the three groups using standard "t" tests between groups.

To assure unbiased results, testing by an independent laboratory or by the military is recommended. It would seem, for example, that the military (or perhaps a small arms

manufacturer) would be sufficiently interested in improved sight design for small arms to bear the cost of experimentation.

In the experimental data already collected using a single subject, the differences are obviously significant at the .01 level of confidence. It is recommended that actual confidence levels be calculated and cited for the data. To say that differences are significant at the .05 level means that in one chance in 20, such a difference can occur by chance. The data appears to support a significance level of .01 or higher.

Sam Ward
MS Industrial Psychology
North Carolina State University