There is no objective method of comparing the prior probabilities as to which of these three hypotheses (A, B, or C) is correct. The assumption is that one of the three is correct, which makes the formulation of the problem different from the classical one (which allows the possibility of N being any number at all). Instead, it can now be assumed that the true number of weapons N must be 200, 250, or 300, with no other possibilities. The problem is to use statistical analysis of recent observations to indicate which of these is most likely to be true.

To apply Bayes' method, it is necessary to attach "prior probabilities" to the three hypotheses. One could make them equal (i.e. each 1/3), but this is equivalent to making a judgment.

For example, suppose that the "expert opinion" favours hypothesis A (i.e. that there has been no violation, and that N = 200), and is very skeptical regarding hypothesis B (that N = 250). Prior probabilities are assigned, established before any of the recent observations have been taken into account, as follows:

Hypothesis A, that N = 200, has a prior probability of 0.6. For the other hypotheses (B : N=250 and C : N=300) the prior probabilities are 0.1 and 0.3, respectively.

After an estimate of N based on new observations collected during the past 100 days has been made, the statistician is asked to infer which of the three hypotheses is most probably correct.

To take a specific example, suppose that the observations produce the estimate that the true number of missiles is $N_E = 230$. Then the calculations will be as indicated in Table 3.

The first two columns indicate the hypotheses established prior to the observations. The third column, labelled "Conditional Probability", or "Likelihood", represents the probability that the observations would result in an estimate N_E of 230, if the estimates follow the normal distribution associated with the indicated hypothesis.

If hypothesis A is true (and N = 200), the probability of the observation producing the estimate $N_E = 230$ would be 0.000443. The usual notation for this (conditional) probability is Pr ($N_E = 230 \mid A$). But what we want is the reverse of this:

Pr ($A \mid N_E = 230$), the probability that A is true, given that the estimate is $N_E = 230$.

The fourth column is the product of the second and third column, and represents the joint probability that the hypothesis is true and that

Table 3

Prior Intelligence		Subsequent Observation	Combinations	
Hyp.	Prior Prob.	Conditional Probability (Likelihood)	Prior Prob. x Likelihood	Posterior Prob.
A	0.6	Pr ($N_E = 230 \mid A$) = 0.000443	0.000266	0.27
B	0.1	Pr ($N_E = 230 \mid B$) = 0.00720	0.000720	0.73
C	0.3	Pr ($N_E = 230 \mid C$) = 0.00000	0.000000	0.00