This is a draft of a report which is being circulated for information and comment. We hope to make it a chapter of a book titled *Military Planning In An Uncertain World*, and would appreciate any comments, criticism, ideas, and examples that readers may have. This draft began as a transcript of an informal talk and, despite some rewriting, it probably still suffers (like many such talks) from being "fashionable." We are aware that it has a number of other weaknesses and assume there are still others of which we are not aware. We hope to give it a thoughtful and leisurely review but are deferring this until we get some outside criticism.

A table of contents is given on the next page to show the relation of this chapter to the rest of the book. The chapter may not be quite self-contained as a paper, as it occasionally refers to other chapters; but we trust this will be understood or overlooked.

A more complete introduction and list of acknowledgements are given in EM-1829-1.
Analytical Approximation

Chi-Square Integral: To better than \(0.0018\) over \(0 \leq \chi^2 \leq m\) and \(2m < \alpha\), \(m\) being considered a continuous parameter,

\[
F_m(\chi^2) = \frac{1}{2\Gamma\left(\frac{m}{2}\right)} \int_0^{\chi^2} \left(\frac{t^2}{2}\right)^{\frac{m-1}{2}} e^{-\frac{t^2}{2}} d(t^2)
\]

\[
= \frac{A}{\left[1 + a_1 \eta + a_2 \eta^2 + a_3 \eta^3\right]^4}
\]

\[
\eta = \sqrt{\frac{2}{m}} \ln \left(\frac{m}{\chi^2}\right)
\]

\[
A = 0.5 + 0.135 \sqrt{\frac{2}{m}}
\]

\[
a_1 = 0.209 - \frac{1.33}{\sqrt{2m + 1}}
\]

\[
a_2 = 0.061 + 0.030 \sqrt{\frac{2}{m}} - 0.043 \left(\frac{2}{m}\right)
\]

\[
a_3 = 0.062 - \frac{1.73}{\sqrt{m + 6}}
\]

Cecil Hastings, Jr.
Elaine Hastings
RAND Corporation
Copyright 1957