equipment/systems, the lognormal distribution is the most commonly used for equipment/system maintainability analysis. A number of studies have validated the lognormal as being the most appropriate for maintainability analysis (Ref. 25).

Although the lognormal has been the most commonly used in maintainability analysis, other distributions such as the Weibull and gamma are also possible, depending upon the analysis of the data and the use of "goodness of fit" tests.

Since the form and expressions for the more commonly used distributions were previously given in Section 5.2.2, this section will concentrate on the use of the normal, exponential, and lognormal distribution, and give examples of their use in maintainability analysis.

5.3.2.1 LOGNORMAL DISTRIBUTION

As was stated previously, this is the most commonly used distribution in maintainability analysis and is the distribution called out in most DoD maintainability specifications as best representing repair times. It applies to most maintenance tasks and repair actions comprised of several subsidiary tasks of unequal frequency and time duration.

The probability density function is given by:

$$g(t=M_{ct_i}) = \frac{1}{M_{ct_i} S_{\log_e M_{ct}} \sqrt{2\pi}} \exp\left[- \frac{\left(\log_e M_{ct_i} - \overline{\log_e M_{ct}} \right)^2}{2 \left(S_{\log_e M_{ct}} \right)^2} \right] \quad (5.67)$$

$$= \frac{1}{t \, \sigma_{t'} \sqrt{2\pi}} \; e^{-\frac{1}{2}\left(\frac{t' - \bar{t}'}{\sigma_{t'}} \right)^2} \quad (5.68)$$

where

$t = M_{ct_i}$ = repair time from each failure

$$\overline{\log_e M_{ct}} = \frac{\Sigma \log_e M_{ct_i}}{N}$$

$$S_{\log_e M_{ct}} = \sigma_{t'} = \sqrt{\frac{\Sigma (\log_e M_{ct_i})^2 - (\Sigma \log_e M_{ct_i})^2 / N}{N-1}} \quad (5.69)$$