APPENDIX II

STATISTICAL ANALYSIS OF THE LUR DATA

Measurements of instrument segment lengths (y) and tube diameters (x) were subjected to analysis in order to obtain an indication of the inter—relationship between these. From simple graphical analysis it was apparent that a simple function of the form $y = mx + c$ represented this relationship quite closely. In order to investigate this more fully, the data was subjected regression analysis to obtain an equation for the "best-fit" line and a value for the correlation coefficient 'r'. A standard calculator program was used which minimised $(mx + c - y)^2$ to find the slope and zero intercept of the line. The correlation coefficient 'r', was calculated, again using a standard calculator program which gave a value of

$$r = \frac{\sum xy - \sum x \sum y\, n^{-1}}{\sqrt{}\left(\left(\sum x^2 - \left(\sum x\right)^2\, n^{-1}\right)\left(\sum y^2 - \left(\sum y\right)^2 n^{-1}\right)\right.}$$

Standard errors (syx) of the data from the best straight line were calculated using the equation

$$r = \frac{\sqrt{(y - yest)^2}}{N}$$

This analysis is based on direct use of the data as measured. However, the data itself is subjected to errors in collection, mainly arising from operation of the measuring devices used. In addition, given error-free measurement, variation from uniform straight-lines would be apparent, having arisen during manufacture. If the two sources of error are designated E_m (modern error) and E_a (ancient error) the equation defining the tube form would become:

$$y = mx + c + E_m + E_a$$

The ancient error itself could be sub-divided in

E_{a1} = error in evaluation of the mathematical function

$$y = mx + c$$

E_{a2} = error in ability to assess the attained dimensional accuracy

E_{a3} = error arising from the limitation in manipulative ability of the manufacturer.