THE BIMODAL SIZE DISTRIBUTION OF NEAR-EARTH ASTEROIDS; D.H. Speidel, Dept. Geology, Queens Coll., CUNY, Flushing, NY 11367

Probability graph analysis of 153 near-Earth asteroids identified through May 1993 supports the contention that the size distribution of such asteroids can be well described as two populations with diameters that display a log normal distribution. The larger has a mean diameter of 1.2 km and is well defined. The smaller has a mean diameter of 0.013 km and is not as well constrained. These findings are consistent with multiple-sized populations of fragments previously noted in impact experiments.

The diameters of the 153 NEAs were taken from the appendix in *The Spaceguard Survey* [1] with more recent additions as reported by Rabinowitz *et al* [2]. The asteroids are rank-ordered by decreasing diameter and plotted on probability graphs as cumulative percent larger. This technique is well-known in exploration geochemistry [3] and has recently been applied to size distributions of asteroids [4], impact craters [5], and even earthquake magnitudes [6]. The curve that is produced is a composite of, in this case, two populations present in the ratio 90:10. Clearly this ratio will change with concomitant change in the appearance of the curve as more small NEAs are identified.

The NEA diameter populations that can be deaggregated from the composite are [1.2; 2.8/0.5] and [0.013; 0.023/0.007] given in the form [mean; $+1\sigma/-1\sigma$]. The boundary between the bottom of the larger population and the top of the smaller population is distinct because limited overlap occurs at less than the 3σ values for each population. There have been ample discoveries at both larger and smaller diameters so the "gap" can not be explained as an artifact of the measurement/discovery process.

Recent impact experiments provide support for two populations of product fragments. Nakamura and Fujiwara [7] stated that "fragments could be divided into ... the core, fine fragments .. and larger fragments other than the core." Probability graph analysis indicates that the normalized fragment mass of their fractured basalt target is normally distributed. Evans *et al* [8] report on an experiment where the results are a normal distribution of main fragments coupled with additional much smaller fragments. Probability graphs of her raw data (graciously shared) confirm the normal distribution of the larger fragments and support the argument for a normal distribution of the finer fragments as well.

References: [1] Morrison, D.,ed. (1992) *The Spaceguard Survey, Report of the NASA International Near-Earth-Object Detection Workshop* NASA-TM-107979. [2] Rabinowitz, D.L. *et al*, (1993) *Nature*, 704-706. [3] Sinclair, A. J. (1976) *Application of Probability Graphs in Mineral Exploration*, Assoc. Exploration Geochemists. [4] Speidel, D.H. (1991) *GSA Abstracts with Programs Annual Meeting*, A474-475. [5] Speidel, D.H. (1993) *Lunar Planetary Sci. XXIV*, 1333-1334. [6] Speidel, D.H. and Mattson, P.H. (1993) *Bull. Seismo. Soc. Am.* **83**, 1893-1901. [7] Nakamura, A. and Fujiwara, A. (1991) *Icarus* **92**, 132-146. [8] Evans, N.J. *et al* (1993) *Lunar Planetary Sci. XXIV*, 457-458