PERISCOPE CONTACT OBSTRUCTION BY SEA STATE

(U) Recent observations during PCO operations indicated that a surface warship could approach unacceptably close without being observed visually through the periscope until the surface warship was within 2,000 yards. Upon review of the data, we believe this occurred due to the ship taking periodic observations from the troughs of prevailing seas that coincided with the periodicity of the waves.

(U) Reviewing from Bowditch, the length from peak to peak of a trough is related to the period of the wave and described by the following equation $L = 5.12P^2$, where L is the length in feet and P is the period in seconds. The angle below which a visual observation can be obscured by the wave height can be approximated as $TAN\ \theta = (H - e)/2L$, where H is the wave height, and e is the amount of exposed periscope in feet. This is shown graphically in Figure 5.

(U) Consider a typical condition of an observation made from the trough of a 12-foot sea with an 8-second periodicity and 3 feet of scope exposed. The angle of obstruction is about 3°. Under this condition a ship with a 100-foot masthead height could go unobserved until within 700 yards even though our rules of thumb would predict a visual range of greater than 20,000 yards.

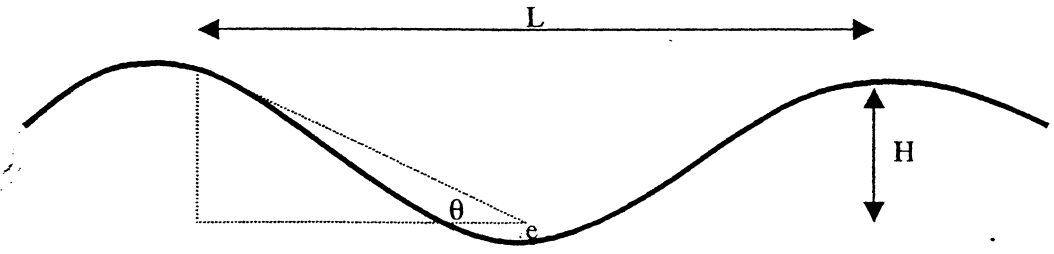

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Figure 5. (U) Wave Visual Obstruction

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