

~~CONFIDENTIAL~~

THE EFFECT OF SHAPE PARAMETERS
ON THE MAXIMUM POINT

by

F. Barton Brown

~~CONFIDENTIAL~~

THE EFFECT OF SHAPE PARAMETERS
ON THE MAXIMUM POINT

by F. Barton Brown

The accompanying chart is a supplement to Report No. N-55.1, "Optimum Slenderness Ratio of a Stable Low-Drag Body," Hydrodynamics Laboratories, CIT.

The purpose of the chart is to show the interrelation of the volume and surface area of a body of a particular shape and the effect of the corresponding parameters on the determination of the optimum slenderness ratio. This chart is not a means of determining the residual drag, therefore a value for any particular body shape must be either known or assumed. The residual drag scale shown on the chart is useful for bodies of the size and speed range of a submarine, and is calculated for a volume Reynolds number of 10^8 .

Let us assume that the volume parameter, B, is - 2.45, and the surface parameter, Q, is - 1.0, and the residual drag is .014. To use the chart, select the volume parameter, move vertically to the surface parameter and horizontally to the parabolic curves. Follow along the nearest parabolic curve to the residual drag curve; move vertically downward to the slenderness ratio scale reading a value of 12.5. It is possible for two entirely different body shapes (as illustrated) to have the same slenderness ratio.

A large, absolute value of the volume parameter indicates a slender body. A small, absolute value of the surface parameter indicates a body of large surface area. Thus, from inspection of the chart, we see that a stable, low-drag body will have a higher optimum slenderness ratio than an unstable, blunt body.

The following is a tabulation of the parameters for several body shapes:

	B	Q
Lyon Form "A" (without fins)	- 2.11	- 1.46
Mk 13-1 Torpedo	- 1.79	- 0.81
Mk 14-1 Torpedo	- 2.53	- 0.98
12.75 in. Anti-submarine Rocket	- 3.99	- 0.99
Submarine Odax (bare hull)	- 4.15	- 2.22
Submarine Odax (with fins but less conning tower)	- 4.15	- 1.81
Submarine Odax (with fins and conning tower)	- 4.97	- 2.39

EFFECT OF SHAPE PARAMETERS ON THE MAXIMUM POINT

