Hull Parameterization Overview

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The following table defines the scheme to create parametric ship hulls with the Ship-D code.

Hull Section	Variable	Name	Units/Scaling Measure	Value Range in Dataset
Principle Dimensions	LOA	Length Overall	Primary measure of ship's scale in meters	LOA = 10
	Lb	Length of Bow Taper	Fraction of LOA	0.05 < Lb < 0.9
	Ls	Length of Stern Taper	Fraction of LOA	0.0 < Ls < 0.9
	Bd	Beam at Midship Deck	Fraction of LOA	0.0833 < Bd < 0.333
	Dd	Depth of Hull	Fraction of LOA	0.05 < Dd < 0.25
	Bs	Beam at Stern Deck	Fraction of Bd	0.0 < Bs < 1.0
	WL	Design Draft	Fraction of Dd, used for bulb design	0.0 < WL < 1
Midship Cross Section	Bc	Beam at Chine	Fraction of LOA	0.05 < Bc < 0.5
	Beta	Deadrise angle	Degrees	0.0 < Beta < 45.0
	Rc	Radius of Chine	Fraction of Bc (strictly positive)	0.0 < Rc < 1.0
	Rk	Radius of Keel	Fraction of Dd (can be positive or negative)	-1.0 < Rk < 1.0
Bow Geometry	BOW(A)	Constants for Parabolic Bow Shape	BOW(z) = Az^2+Bz + C, where C is solved so that min(Bow(z)) = 0, A,B,and C are scaled by Lbb and Dd	-4.0 < BOW(A) < 4.0
	BOW(B)			-4.0 < BOW(B) < 4.0
	BK	Bow-Keel Intersect	Fraction of Dd where Bow curve and keelrise curve intersect	0.0 < BK < 1.0
	Kappa_BOW	Start of keelrise – Bow	Fraction of Lb, where keel-rises from Z =0 towards bow	0.0 < Kappa_Bow < 1.0
	DELTA_BOW(A)	Constants to define curve for midship width	DELTA_BOW(z) = Az^2+Bz+C, where C is solved algebraically. Defines x position where midship beam for given z is achieved along bow taper	-4.0 < DELTA_BOW(A) < 4.0
	DELTA_BOW(B)			-4.0 < DELTA_BOW(B) < 4.0
	DRIFT(A)	Constants for curve that define drift angle along BOW(z)	DRIFT(z) = Az^2+Bz+C, defines the drift angle in degrees from the bow as a function of height.	-4.0 < DRIFT(A) < 4.0
	DRIFT(B)			-4.0 < DRIFT(B) < 4.0
	DRIFT(C)			0 < DRIFT(C) < 60
Stern Geometry	bit_EP_S	Lower stern taper bit	Defines if stern taper is (1) Ellipse or (0) Parabola below transom	1 or 0
	bit_EP_T	Upper stern taper bit	Defines if stern taper is (1) Ellipse of (0) Parabola for the transom	1 or 0
	TRANS(A)	Transom Slope	Transom(z) = Az + B, defines the transom position between Dd and SK	-3.0 < TRANS(A) < 5.0
	SK	Stern-Keel Intersect	Defines intersection of Transom and the keelrise for the stern, fraction of Dd	0.0 < SK < 1.0
	Kappa_STERN	Start of keelrise – stern	Fraction of Ls where keel rises from z = 0 towards transom	0.0 < Kappa_STERN < 1.0
	DELTA_STERN(A)	Constants to define curve for midship width	DELTA_STERN(z) = Az^2+Bz+C, where C is solved algebraically. Defines x position where midship beam for given z is achieved along stern taper	-4.0 < DELTA_STERN(A) < 4.0
	DELTA_STERN(B)			-4.0 < DELTA_STERN(B) < 4.0
	Beta_trans	Deadrise angle for transom	Degrees	0 < Beta_trans < 60
	Bc_trans	Beam at Transom Chine	Fraction of LOA	0 < Bc_trans < 0.5
	Rc_trans	Transom Chine Radius	Fraction of Bc_trans	0 < Rc. Trans < 0.5
	Rk_trans	Transom Keel Radius	Fraction of Dd*(1-SK)	-1.0 < Rk_trans < 1.0
Bulb Geometries	bit_BB	Bulbous Bow Bit	Defines if (1) there is a bulbous bow or (0) not	1 or 0
	bit_SB	Bulbous Stern Bit	Defines if (1) there is a bulbous bow or (0) not	1 or 0
	Lbb	Length of Bulbous Bow	Fraction of LOA	0.0 < Lbb < 0.2
	Hbb	Height of BB Max Length	Fraction of WL*Dd	0.0 < Hbb < 1.0
	Bbb	Beam of BB	Fraction of Beam at z = Hbb	0.0 < Bbb < 1.0
	Lbbm	Length of Long. Bulb Curvature	Fraction of Lbb where Bulb curve begins	-1.0 < Lbbm < 1.0
	Rbb	Fillet Radius for BB	Defines fillet radius of BB-Bow intersect as a fraction of Lbb	0.05 < Rbb < 0.33
	Kappa_SB	Start Position of Stern Bulb	Defines x position of Stern Bulb as a fraction of Lb	0.0 < Kappa_SB < 1.0
	Lsb	Length of Stern Bulb	Fraction of LOA	0.0 < Lsb < 0.2
	HsbOA	Height overall of Stern Bulb	Fraction of WL*Dd	0.0 < HsbOA < 1.0
	Hsb	Height of SB Max Length	Fraction of HsbOA*WL*Dd	0.0 < Hsb < 1.0
	Bsb	Beam of SB	Fraction of Beam at z = Hsb	0.0 < Bsb < 1.0
	Lsbm	Length of Long. Bulb Curvature	Fraction of Lsb where Bulb curve begins	-1.0 < Lsbm < 1.0
	Rsb	Fillet Radius for SB	Defines fillet radius of SB-Stern Intersect as a fraction of Lsb	0.05 < Rsb < 0.33