

AGG_TRANSFORM_NULL	$\mathbf{x}$	
AGG_TRANSFORM_REVERSE	$[-x, y]$	reverse direction of curve
AGG_TRANSFORM_PLANE_ROTATE	$\mathbf{x}_0 + (\mathbf{x} - \mathbf{x}_0)\mathbf{R}^T$	rotate about $\mathbf{x}_0$
AGG_TRANSFORM_SHRINK	$\mathbf{x}_0 + s(\mathbf{x} - \mathbf{x}_0)$	scale about $\mathbf{x}_0$
AGG_TRANSFORM_SHIFT	$\mathbf{x} + \Delta\mathbf{x}$	3D translation by $\Delta\mathbf{x}$
AGG_TRANSFORM_SCALE	$s\mathbf{x}$	global scale in plane

Table 1: Transforms in order of application to a shape

Closed curves (“shapes”) used to define cross-sections are parameterized using  $x$ ,  $-1 \leq x \leq 1$  with  $x < 0$  defining the lower portion of the curve and  $x > 0$  the upper. The variable runs continuously from the trailing edge along the lower surface to the leading edge and back to the trailing edge. Coordinates are calculated as

$$y_U = x^{n_1}(1 - x)^{n_2} \sum_{i=0}^n s_i^{(U)} S_{n,i}(x), \quad (1)$$

$$y_L = -|x|^{n_1}(1 - |x|)^{n_2} \sum_{i=0}^n s_i^{(L)} S_{n,i}(|x|). \quad (2)$$

“Aerofoils” are defined similarly but in terms of the thickness distribution, the trailing edge thickness, and the camber line.

Definition of a sphere of unit diameter centred at  $[0, 0, 1/2]$ :

$$x = 2u^{1/2}(1 - u)^{1/2}(|v| - 1/2); \quad (3a)$$

$$y = \text{sgn}(v)2u^{1/2}(1 - u)^{1/2}|v|^{1/2}(1 - |v|)^{1/2}; \quad (3b)$$

$$z = u, \quad (3c)$$

$$0 \leq u \leq 1, -1 \leq v \leq 1.$$

Cosine point spacing:

$$t = \begin{cases} (1 - \cos \theta)/2, & \theta < \pi; \\ -(1 - \cos \theta)/2, & \theta \geq \pi. \end{cases} \quad (4a)$$

$$\theta = \begin{cases} \cos^{-1}(2t - 1), & t > 0, \\ \cos^{-1}(2t + 1) + \pi, & t \leq 0. \end{cases} \quad (4b)$$