Co-ordinate transformations of this type do not maintain shape across the procee-dure. There are three independant scale factors.

Transforming (x, y, z) into (X, Y, Z) by:

ω	=	Rotation around the x axis.
ϕ	=	Rotation around the y axis.
κ	=	Rotation around the z axis.
h	=	Scaling in x.
k	=	Scaling in y.
n	=	Scaling in z.
X_S	=	Shift in X.
Y_S	=	Shift in Y.
Y_S	=	Shift in Z.
x_S	=	Shift in x.
y_S	=	Shift in x.
z_S	=	Shift in x.

Then:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = R \begin{bmatrix} hx \\ ky \\ nz \end{bmatrix} + \begin{bmatrix} X_S \\ Y_S \\ Z_S \end{bmatrix} \quad (1)$$

$$= R \begin{bmatrix} h(x+x_S) \\ k(y+y_S) \\ (nz+z_S) \end{bmatrix} \quad (2)$$

Where R, the rotation matrix, is defined to be:

$$R = \begin{bmatrix} \cos\phi\cos\kappa & -\cos\phi\sin\kappa & \sin\phi \\ \sin\omega\sin\phi\cos\kappa+\cos\omega\sin\kappa & -\sin\omega\sin\phi\sin\kappa+\cos\omega\cos\kappa & -\sin\omega\cos\kappa \\ -\cos\omega\sin\phi\cos\kappa+\sin\omega\sin\kappa & \cos\omega\sin\phi\sin\kappa+\sin\omega\cos\kappa & \cos\omega\cos\phi \end{bmatrix} \quad (3)$$

$$R^T = \begin{bmatrix} \cos\phi\cos\kappa & \sin\omega\sin\phi\cos\kappa+\cos\omega\sin\kappa & -\cos\omega\sin\phi\cos\kappa+\sin\omega\sin\kappa \\ -\cos\phi\sin\kappa & -\sin\omega\sin\phi\sin\kappa+\cos\omega\cos\kappa & -\sin\omega\sin\phi\sin\kappa+\cos\omega\cos\kappa \\ \sin\phi & -\sin\omega\cos\kappa & \cos\omega\cos\phi \end{bmatrix} \quad (4)$$

`$Id$`