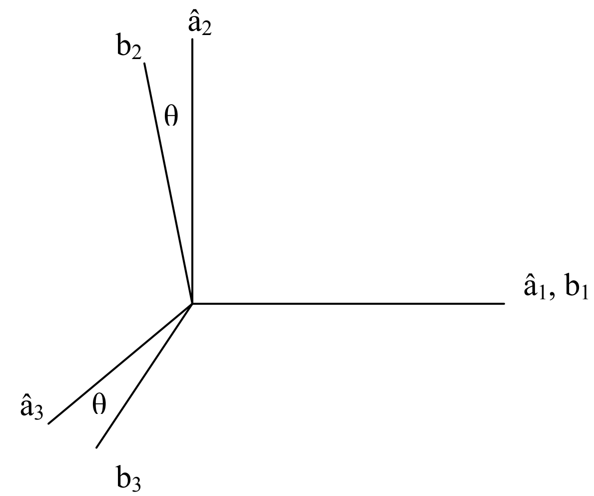
2/5/08
Day 7

AE 403

Galileo-Dual Spin Stabilization

$Rv = \lambda v \rightarrow R^{B/A} v_A = v_B$



$$\begin{bmatrix} \hat{b}_1 \\ \hat{b}_2 \\ \hat{b}_3 \end{bmatrix} = \begin{bmatrix} R_{11} & R_{12} & R_{13} \\ R_{21} & R_{22} & R_{23} \\ R_{31} & R_{32} & R_{33} \end{bmatrix} \begin{bmatrix} \hat{a}_1 \\ \hat{a}_2 \\ \hat{a}_3 \end{bmatrix}$$

$$\hat{a}_1 = R_{11}\hat{b}_1 + R_{21}\hat{b}_2 + R_{31}\hat{b}_3$$

$$\frac{{}^A d\hat{a}_1}{dt} = 0 = (\dot{R}_{11}\hat{b}_1 + {}^A\vec{\omega}^B \times R_{11}\hat{b}_1) + (\dot{R}_{21}\hat{b}_2 + {}^A\vec{\omega}^B \times R_{21}\hat{b}_2) + (\dot{R}_{31}\hat{b}_3 + {}^A\vec{\omega}^B \times R_{31}\hat{b}_3)$$

$${}^A\vec{\omega}^B = \omega_1\hat{b}_1 + \omega_2\hat{b}_2 + \omega_3\hat{b}_3$$

$$\Rightarrow 0 = (\dot{R}_{11}\hat{b}_1 + \dot{R}_{21}\hat{b}_2 + \dot{R}_{31}\hat{b}_3) + R_{11}(-\omega_2\hat{b}_3 + \omega_3\hat{b}_2) + R_{21}(\omega_1\hat{b}_3 - \omega_3\hat{b}_1) + R_{31}(-\omega_1\hat{b}_2 + \omega_2\hat{b}_1)$$

$$\Rightarrow 0 = \dot{R}_{11} - R_{21}\omega_3 + R_{31}\omega_2 \qquad \Rightarrow \dot{R}_{11} = R_{21}\omega_3 - R_{31}\omega_2$$

$$\dot{R}^{B/A} = S\left({}^A\vec{\omega}^B\right)R^{B/A} \quad \text{where} \quad S\left({}^A\vec{\omega}^B\right) = \begin{bmatrix} 0 & -\omega_3 & \omega_2 \\ \omega_3 & 0 & -\omega_1 \\ -\omega_2 & \omega_1 & 0 \end{bmatrix}$$

$${}^A\vec{\omega}^B \times \vec{v} \Rightarrow S\left({}^A\vec{\omega}^B\right)v$$

NOTE: in the above expression Rdot = S(.) R, there should be a negative sign before the S(.).

So it should read Rdot = -S(.) R