2.5 Establish Position of Target at Time of Launch (Continued)

Time in the transfer orbit is given by Kepler's equation,

$$M = n(t-T) = E - e \sin E \qquad (2.5\text{-}4)$$

$M \equiv$ mean anomaly

$n \equiv$ mean motion $\equiv \sqrt{\mu/a^3} = 2\pi/\tau$

$T =$ time of periapsis passage

$$\cos E = \frac{e + \cos \theta}{1 + e \cos \theta}$$

Time from periapsis passage

$$\equiv t - T = \frac{\tau}{2\pi} (E - e \sin E)$$

$$t_t = \frac{\tau_t}{2\pi} (E_t - e_t \sin E_t), \text{ with} \qquad (2.5\text{-}5)$$

$$E_t = \cos^{-1} \left[\frac{e_t + \cos \theta_t}{1 + e_t \cos \theta_t} \right]$$

Adding the correction for oblateness,

$$t_t = t_t + \Delta \tau_t \left(\frac{\theta_t}{360°}\right) \qquad (2.5\text{-}6)$$