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

The time from perigee to the intercept point is obtained from

$$t_{2f} = \frac{\tau_f}{2\pi} [E_{2f} - e_f \sin E_{2f}] \qquad (2.5\text{-}7)$$

$$E_{2f} = \cos^{-1} \left[\frac{e_f + \cos \theta_{2f}}{I + e_f \cos \theta_{2f}} \right]$$

$$= 2 \tan^{-1} \left[\sqrt{\frac{r_{pf}}{r_{af}}} \tan \frac{\theta_{2f}}{2} \right] \qquad (2.5\text{-}8)$$

$$\theta_{2f} = \theta_t - \Psi$$

Adding the correction for oblateness,

$$t_{2f} = t_{2f} + \Delta \tau_f \left(\frac{\theta_f}{360°} \right) \qquad (2.5\text{-}9)$$

Substituting these values into equation 2.5-1 gives t_{1f} or the time before perigee in the final orbit at the time of launch. This time is used to obtain the initial position of the target at the time of launch, θ_{1f}.

$$\theta_{1f} = 2 \tan^{-1} \left[\sqrt{\frac{r_{af}}{r_{pf}}} \tan \frac{E_{1f}}{2} \right] \qquad (2.5\text{-}10)$$

$$E_{1f} - e_f \sin E_{1f} = M_{1f} = \frac{2\pi}{\tau_f} t_{1f} \qquad (2.5\text{-}11)$$