2.9 Solve for Maneuver Positions and Launch Azimuth (Continued)

$A_S - \Omega = \tan^{-1} [\cos i_t \tan(\omega_t + \theta_t)]$"

A_S = right ascension of the satellite at the point of injection into the final orbit.

L_S = latitude of the point of injection

$L_S = \sin^{-1} (\sin i_t \sin (\omega_t + \theta_t))$

(b) Injection Into Transfer Orbit

(Assuming injection occurs at perigee of transfer orbit)

$A_p - \Omega = \tan^{-1} [\cos i_t \tan \omega_t]$

$L_p = \sin^{-1} [\sin i_t \sin \omega_t]$

($\theta_t = 0$ at perigee)

(c) Injection Into Intermediate Orbit

$A_{BO} - \Omega = \tan^{-1} [\cos i_t \tan(\omega_t - \phi)]$

$L_{BO} = \sin^{-1} [\sin i_t \sin(\omega_t - \phi)]$

ϕ = central angle in waiting orbit, $\phi = \omega + \theta$.

(d) Position of Launch Site

$$A_L - \Omega = \tan^{-1} [\cos i_t \tan(\omega_t + \phi - \frac{x}{Re})]$$

$$L_L = \sin^{-1} [\sin i_t \sin (\omega_t - \phi - \frac{x}{Re})]$$

x = ground range attained in ascent to the waiting orbit over a non-rotating earth and is obtained from the launch vehicle data.

(e) Launch Azimuth

From spherical trigonometry, the uncorrected launch azimuth is given by: