3.0 SAMPLE CASE

As illustration for the rendezvous procedure, a launch from Kourou on Ariane is used to rendezvous with a low earth orbiting satellite. This launch site is at 5.24°N latitude, 52.77° W longitude, and requires launch in the north direction.

3.1 Determine Parameters of the Target Orbit

For illustration, the orbital parameters of a known satellite are used. This satellite is in a near polar circular orbit of radius 7385 km and inclination 99.52°. The nodal period is 6312 seconds and at epoch 90:12:21/16:41:23 the right ascension of the ascending node is 55.6°. Perigee is defined to be at the node.

$r_{af} = r_{pf} = a_f = P_f = 7385$ km (as $e = 0$)
$\tau_f = 6312$ sec.
$i_f = 99.52°$
$\omega_f = 0$
$\Omega = 55.6°$ at epoch

3.2 Assume a Rendezvous Point

This calls for selecting some parameters of the waiting and transfer orbits. The scheme of launching into the plane of motion of the target at the time the launch site is in this plane assures that the three orbits are coplanar : inclinations and nodes are equivalent for the three orbits. For rendezvous to occur the central angles of the final and transfer orbits must be equal at the rendezvous point : $\omega_f + \theta_f = \omega_t + \theta_t$. (See figure 2-3)

For simplicity assume that rendezvous occurs at tangency of the transfer and final orbits. (Any point could be selected) For visibility during a critical maneuver assume that this interception occurs at the latitude of the launch site. (Any such constraint could be selected.)

$L_R = L_L = 5.24°$N geodetic = 5.205° geocentric

The central angle $\theta_f + \omega_f$ may now be obtained from the spherical triangle below showing the retrograde target orbit.