2.3 Assume a Rendezvous Point (Continued)

The angle between the lines of apsides of the transfer and final orbits is labelled Ψ and must be specified for each mission. This constitutes selecting the position of the perigee of the transfer orbit, which is the point of injection into the transfer orbit. This position may be constrained for reasons of visibility of the satellite by a ground station, for ability of the control center to command the maneuver or for any other geographic restriction.

The intermediate or waiting orbit, subscripted w, is assumed to be circular. Its inclination is that of the final orbit due to launch into the plane of motion of the target satellite. The altitude of the waiting orbit is the primary trade parameter. An initial value is selected arbitrarily and is later iterated upon. Launch vehicle data is used to determine the time of ascent to this orbit (t_{ascent}) and the ground range (x) attained in ascent to the waiting orbit over a non-rotating earth. Typical trajectories for an Ariane launch are shown in Figures 2-4 and 2-5.

2.4 Predict the Transfer Orbit Parameters

The elements of the transfer orbit are predicted from the final orbit parameters. Since tracking is required to determine both orbits, it is assumed that good data is available on the target orbit and that the actual transfer orbit is very close to the predicted transfer orbit.

Transfer orbit elements are calculated from the point of intersection with the final orbit. The true anomalies, θ_t and θ_f, are set to establish the positions of the two vehicles at the radius of intersection, r. They are related by $\theta_t = \theta_f + \Psi$, and θ_t may be expressed as a function of the angle Ψ, which is known (chosen).

The radius of intersection is calculated by equating the orbital radii at this point.