7.4.3 Conic Shape Parameter

It can easily be demonstrated that the value of ρ for a circular arc is 0.4142.

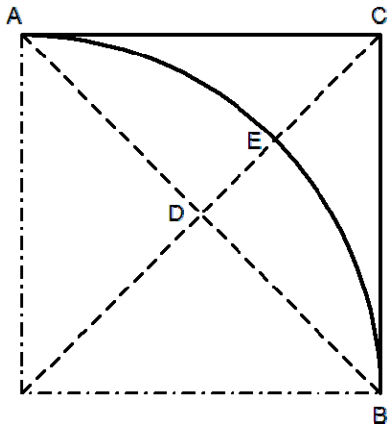

Fig 7.4.3.1 Control Lines for Circular Arc

If we assume that the circular arc in Fig. 7.4.3.1 has unit radius, then

$$|\overline{DE}| = 1 - \frac{\sqrt{2}}{2} \quad \text{and} \quad |\overline{DC}| = \frac{\sqrt{2}}{2}$$

By definition $$\rho = \frac{|\overline{DE}|}{|\overline{DC}|} = \frac{1 - \frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 0.4142$$

The sequence for developing the conic parameters for Raymer's Figs. 7.17 and 7.18 is

1. In Fig. 7.18, define the control points in the lower quadrant for Sections A and B that are required to accommodate the landing gear.
2. Calculate the values of ρ for the conics in the lower quadrant at Sections A and B using the definition of ρ in Eq. 7.2.
3. Spot these two points for Sections A and B on the control line plot as illustrated at the bottom of Fig. 7.17.
4. Draw a smooth control line for the lower quadrant starting at a value of ρ = 0.4142 (radome) at the nose, passing through the values of ρ = 0.595 at Section A and ρ = 0.610 at Section B, finishing with a value of ρ = 0.4142 (nozzle) at the tail.
5. Construct the conic sections for the lower quadrant using the values of ρ at any section from Step 4.