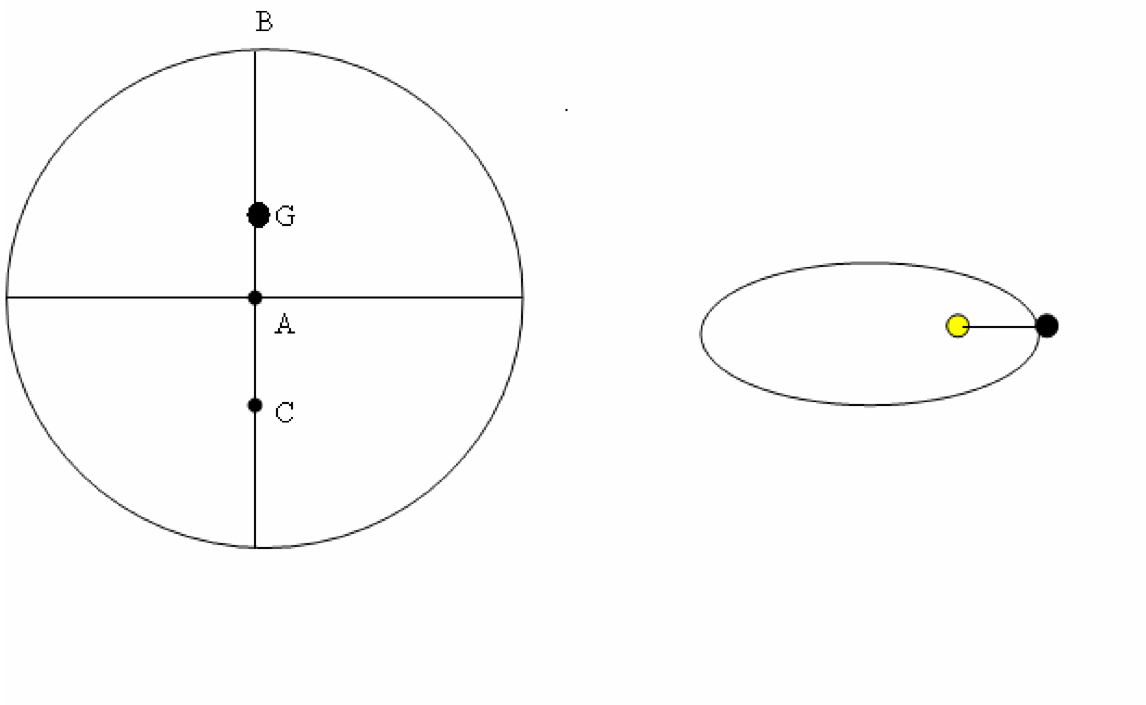
Hodograph Thetas and Perihelion

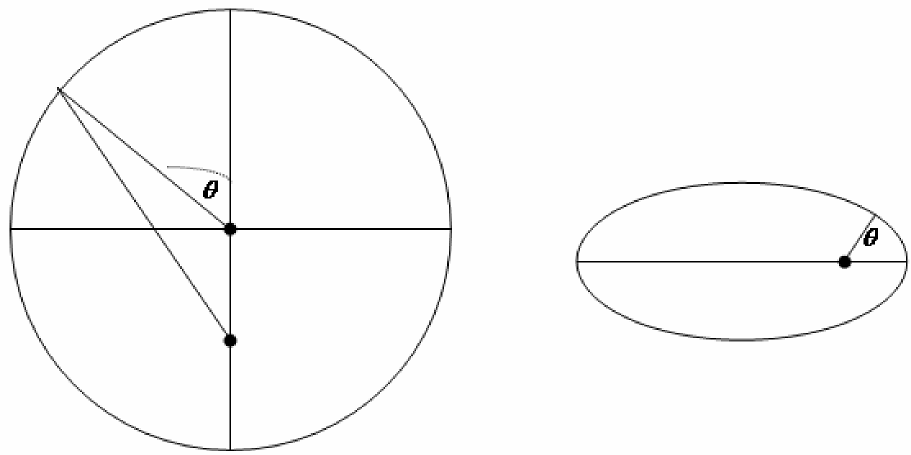
This is one of those checkpoints where we verify that we are speaking the same language. How can we discuss the position of a planet in its orbit? Let it be sufficient to say briefly that positions relate to key parts of the ellipse as well as to the focus of the ellipse that contains the Sun. A few illustrations will guarantee that we see things in the same way.

Let us pause to consider a way to describe the position of the planet when it is at G as G moves. Keep in mind the 90 degree convention between the radius drawn to the planet from the Sun and the true velocity direction. Note that the radius line of the planet could make an angle with the vertical diameter of the hodograph circle. In chapter 11 we saw that the hododyne rotates to produce an elliptical orbit. Using the same hododyne labels as in chapter 11, note that when the Inverse Proportion Machine is in the position so that the long segment $\overline{AB}$ is "in line" with the short segment of the machine, $\overline{CA}$, the radius of the planet to the Sun is the smallest possible:

The angle from perihelion position in the hodograph



In figure *a* above the hodograph for perihelion is drawn. The segments $\overline{AC}$ and $\overline{AB}$ are on a straight line . The perpendicular bisector of $\overline{CB}$ places the planet at point G .



As the machine spins the radius line to the planet makes an angle with the radius line to perihelion position. We call this angle θ. Note that this angle is relative to the Sun and relative to the major axis on the side of perihelion position. That is how we describe the position of the planet when it is at the position *G*.

In summary, in this short chapter we see the conventions for describing the position of the planet on its elliptical orbit.