

Hint on Prob. 7.6-15 (Corrected)

Angle  $2\alpha'$  subtended at the satellite B  
for any two points on the earth  
(say the East and the West Coasts  
of the U.S.)

Take distance DE along the surface of  
the earth to be say, 6000 km

$$\begin{aligned} \text{angle } \delta' &= \frac{\text{Arc AE}}{\text{radius of the earth} = 6400 \text{ km}} \\ &= \frac{3000}{6400} \text{ rad.} \\ &= 0.468 \text{ rad} = 26.86^\circ \end{aligned}$$

$$\begin{aligned} \text{distance EF} &= CE \sin \delta' \\ &= 6400 \times \sin 26.86^\circ = 2891.6 \text{ km} \end{aligned}$$

$$\text{distance AB} = \text{distance of the satellite from the earth} = CB - CA = 42000 - 6400$$

$$\begin{aligned} \text{distance FA} &= CA - CF = CA(1 - \cos \delta') = 6400(1 - \cos \delta') \\ &= 690.5 \text{ km} \end{aligned}$$

$$\tan \alpha' = \frac{EF}{FB} = \frac{2891.6}{FA + AB} = \frac{2891.6}{690.5 + 35,600} = \frac{2891.6}{36,290.5}$$

$$\alpha' = 4.555^\circ$$

$$\text{HP} = 2\alpha' = 9.11^\circ$$

