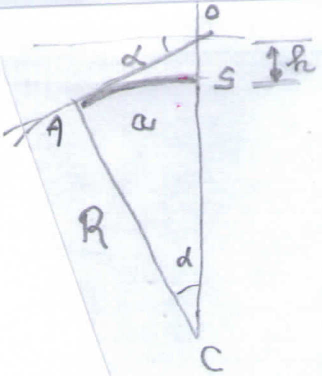

$$\operatorname{tg}\alpha - \alpha = \frac{\alpha^3}{3}\left[+\frac{2}{15}\alpha^5+\dots\right]$$

$$\cos\alpha - 1 = -\frac{\alpha^2}{2}\left[+\frac{\alpha^4}{24}-\dots\right]$$

$$\cos\alpha = \frac{R}{R+h} = \frac{1}{1+h/R} \simeq (1-h/R)$$

$$\cos\alpha - 1 = -\frac{\alpha^2}{2} = -\frac{h}{R} \qquad \alpha^2 = 2h/R$$

(1) $\boxed{\alpha = \sqrt{2h/R}}$ with α in radians

with α in arc minutes: $\alpha = \frac{60\times 180}{\pi}\sqrt{\frac{2}{R}}\sqrt{h}$

$R = 6378137$ m $= 20\,925\,646.33^{FT}$

We are to keep FULL FLEDGED geometrical values.

Hence, with h in meters $\boxed{\alpha' = 1.92\sqrt{h_m}}$ (vs. $1.77\sqrt{h_m}$ Ephémérides Nautiques)

with h in Feet $\boxed{\alpha' = 1.06\sqrt{h_{ft}}}$ (vs. $0.97\sqrt{h'}$ Nautical Almanac

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$OA = R\operatorname{tg}\alpha$, $\overset{\frown}{AS} = R\alpha$, $\Delta = OA - AS = R(\operatorname{tg}\alpha - \alpha) = R\frac{\alpha^3}{3}$

Known quantities: Δ & R

$$\alpha^3 = \frac{3\Delta}{R} \qquad \alpha^6 = \left(3\frac{\Delta}{R}\right)^2 \qquad \text{From (1)}: 8\left(h/R\right)^3 = 9\left(\frac{\Delta}{R}\right)^2$$

$$(h/R)^3 = \frac{9}{8}\left(\frac{\Delta}{R}\right)^2 \qquad \boxed{h/R = \frac{1}{2}\left[9\left(\frac{\Delta}{R}\right)^2\right]^{1/3}}$$

with $\Delta = 1.5^{FT}$ $R = 20925646.33^{FT}$

Get: $h = 375.55^{FT} = 125.18$ Y

Last check: α must be small

here $\alpha' = 1.06\sqrt{375.55} = 20.5' = 0.34°$

KERMIT  19 octobre 2023 OK