GREAT CIRCLE PLANNING

Given:

★ L_1 = Departure Latitude N and W= +

★ L_2 = Destination Latitude S and E= −

λ_1 = Departure Longitude

λ_2 = Destination Longitude Δt = time between positions

Li = Intermediate Latitude

λi = Intermediate Longitude

Hi = Initial True Heading

D = Distance in Nautical Miles

H = Heading Angle

$$D = 60 \text{ COS}^{-1} [\text{SIN } L_1 \text{ SIN } L_2 + \text{COS } L_1 \text{ COS } L_2 \text{ COS } (\lambda_2 - \lambda_1)]$$

$$H = \text{COS}^{1} \left[\frac{\text{SIN } L_2 - \text{SIN } L_1 \text{ COS } (D/60)}{\text{SIN } (D/60) \text{COS } L_1} \right]$$

$$\text{Hi} = \text{H if SIN } (\lambda_2 - \lambda_1) < 0$$
$$= 360 - \text{H if SIN } (\lambda_2 - \lambda_1) \geq 0$$

Given $(L_1 \lambda_1)$, $(L_2 \lambda_2)$ and λ_i—the following formula computes the latitude of L_i where λ_1 intersects the great circle defined by $(L_1\lambda_1)$ and (L_2, λ_2).

$$L_i = \text{TAN}^{-1} \left[\frac{\text{TAN } L_2 \text{ SIN} (\lambda_i - \lambda_1) - \text{TAN } L_1 \text{ SIN} (\lambda_i - \lambda_2)}{\text{SIN } (\lambda_2 - \lambda_1)} \right]$$

(This formula can be very useful when matching charts of different projections or scales.)

RHUMB LINE PLANNING

Given:

Δt = time between positions

L_1 Dept Lat

L_2 Dest Lat

λ_1 Dept Long

λ_2 Dest Long

C = Rhumb line True Course

D = Rhumb line Distance

π = Pi (3.14159....)

$$C = \text{TAN}^{-1} \left[\frac{\pi (\lambda_1 - \lambda_2)}{180 \text{ Ln TAN } (45 + 1/2 L_2) - \text{Ln TAN } (45 + 1/2 L_1)} \right]$$

$$D = 60 (\lambda_2 - \lambda_1) \text{ COS } L_1; \text{ if } C=0$$
$$\frac{60 (L_2 - L_1);}{\text{COS C}} \quad \text{otherwise}$$

COMPUTING POSITION BY DEAD RECKONING

$$L_2 = \left(\frac{\Delta t \times GS \times \text{COS(TC)}}{60} \right) + L_1$$

$$\text{If TC} = 90°, 270° \quad \lambda_2 = \lambda_1 - \left(\frac{\Delta t \times GS \times \text{SIN(TC)}}{60 \text{ COS } L_1} \right)$$

Otherwise:

$$\lambda_2 = \lambda_1 - \frac{180}{\pi} [\text{TAN(TC)} \times (\text{Ln TAN}(45 + 1/2 L_2) - \text{Ln TAN}(45° + 1/2 L_1))]$$

NOTE: The flightpath may not cross the North Pole