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

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

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

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

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).

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

(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....)

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

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

COMPUTING POSITION BY DEAD RECKONING

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

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

Otherwise:

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

NOTE: The flightpath may not cross the North Pole