UNCERTAINTY IN DEAD RECKONING POSITION (first quadrant only)

Item	Value	Uncertainty
Boat Speed	$S_B := 6.578313 \cdot kts$	$U_{SB} := 2 \cdot kts$
Boat Course	$C_B := 15 \cdot deg$	$U_{CB} := 5 \cdot deg$
Time Run	$T_B := 1 \cdot hr$	$U_{TB} := \frac{10}{3600} \cdot hr$

$kts \equiv 6076 \cdot \frac{ft}{hr}$

$mi \equiv 6076 \cdot ft$

Equations

In the direction of longitude

$$f(S_B, T_B, C_B) := S_B \cdot T_B \cdot \sin(C_B) \qquad D_{Bx} := f(S_B, T_B, C_B)$$

$$U_{DBx} := \sqrt{\left(U_{SB} \cdot \frac{\partial}{\partial S_B} f(S_B, T_B, C_B)\right)^2 + \left(U_{TB} \cdot \frac{\partial}{\partial T_B} f(S_B, T_B, C_B)\right)^2 + \left(U_{CB} \cdot \frac{\pi}{180 \cdot deg} \cdot \frac{\partial}{\partial C_B} f(S_B, T_B, C_B)\right)^2}$$

In the direction of latitude

$$f(S_B, T_B, C_B) := S_B \cdot T_B \cdot \cos(C_B) \qquad D_{By} := f(S_B, T_B, C_B)$$

$$U_{DBy} := \sqrt{\left(U_{SB} \cdot \frac{\partial}{\partial S_B} f(S_B, T_B, C_B)\right)^2 + \left(U_{TB} \cdot \frac{\partial}{\partial T_B} f(S_B, T_B, C_B)\right)^2 + \left(U_{CB} \cdot \frac{\pi}{180 \cdot deg} \cdot \frac{\partial}{\partial C_B} f(S_B, T_B, C_B)\right)^2}$$

Distance run

$$f(D_{Bx}, D_{By}) := \sqrt{(D_{Bx})^2 + (D_{By})^2} \qquad D_B := f(D_{Bx}, D_{By})$$

Equations

Distance Run	$D_B = 6.58\,mi$	
Direction of Longitude	$D_{Bx} = 1.70\,mi$	$U_{DBx} = 0.76\,mi$
Direction of Latitude	$D_{By} = 6.35\,mi$	$U_{DBy} = 1.94\,mi$