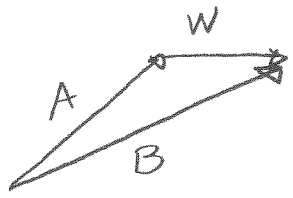
Wind Triangle



W → wind W_S & W_D

A = TAS & MH

B = GS & MC

Note: Wind Direction is reported 180° from its heading

$A + W = B$

① $TAS\cos(MH) + W_S\cos(W_D) = GS\cos(MC)$

② $TAS\sin(MH) + W_S\sin(W_D) = GS\sin(MC)$

$$GS = \frac{1}{\cos(MC)}\left[TAS\cos(MH) + W_S\cos(W_D)\right]$$

Sub into ②

$$\frac{TAS\sin(MH) + W_S\sin(WD)}{TAS\cos(MH) + W_S\cos(W_D)} = \frac{\sin(MC)}{\cos(MC)}$$

$$TAS\sin(MH)\cos(MC) + W_S\sin(W_D)\cos(MC) =$$

$$TAS\cos(MH)\sin(MC) + W_S\cos(W_D)\sin(MC)$$

$$\underbrace{W_S\sin(W_D)\cos(MC) - W_S\cos(W_D)\sin(MC)}_{A} =$$

$$TAS\left[\cos(MH)\sin(MC) - \sin(MH)\cos(MC)\right]$$

t s

$\sin(s-t) = \sin s\cos t - \cos s\sin t$

$$A = TAS\sin(MC - MH)$$

$$\sin(MC - MH) = \frac{A}{TAS} \rightarrow MC - MH = \sin^{-1}\left(\frac{A}{TAS}\right)$$

$$\rightarrow \boxed{MH = MC - \sin^{-1}\left(\frac{A}{TAS}\right)}$$