Surface Course Error Analysis

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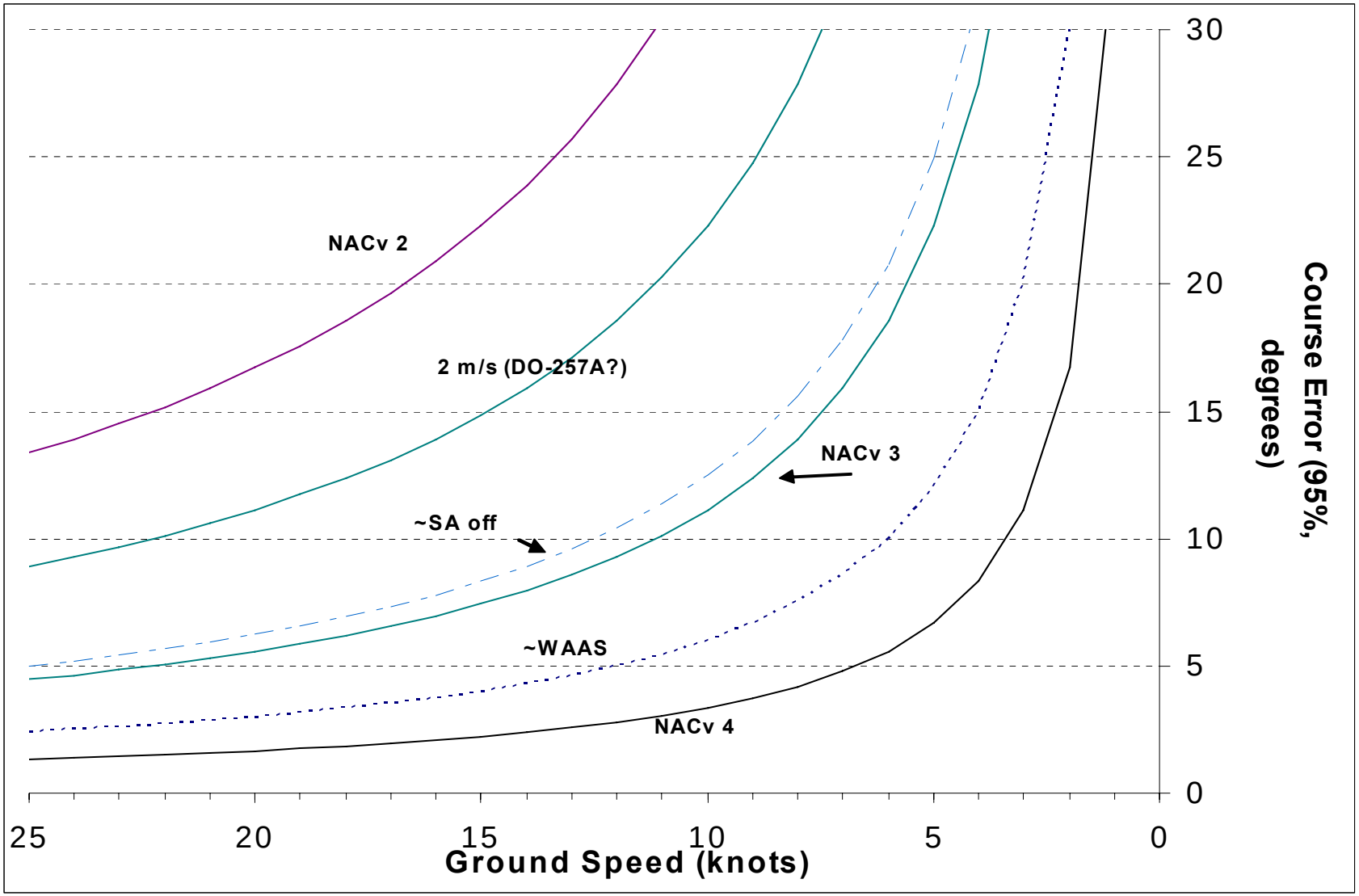
Velocity Error to Course Error Math

- $C = \tan^{-1}(X_d/Y_d)$
- First order linearization (Taylor Series):
  - $\sigma^2_c = HPH^t$ where
  - $H = [\ \partial H/\partial X_d \quad \partial H/\partial Y_d]$
  - $\partial H/\partial X_d = Y_d / S^2$
  - $\partial H/\partial Y_d = -X_d / S^2$
  - Where $S = \text{speed} = (X_d^2 + Y_d^2)^{1/2}$
  - $P = \begin{matrix} \sigma^2_{xd} & \sigma_{xdyd} \\ \sigma_{xdyd} & \sigma^2_{yd} \end{matrix}$
- Assume circular covariance, P (i.e., off diagonals = 0)
- Result: $\sigma_c = \sigma_v / S$ where σ_v is the velocity error (in one dimension)

Course Error vs. Ground Speed (Random Case, assume all error is Gaussian)



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Course Error Vs. Ground Speed (Fixed Error Case, assume all velocity error is bias)