# Technical Note on Cruising

Peter Wenhan Hsu

NQstar.com, Seattle, WA 98101

By assuming the weight W varies as a linear function of distance x, W=Ax+B, where A and B are expressed in terms of α, β, $W_F$, $W_0$, xc, and $x_d$, and by minimizing the thrust-to-velocity ratio, $T_R/V_\infty$, two approximate relations between $V_c$ and $V_d$ can be derived: one for very high-altitude flights (42000 ft-55000 ft), and one for medium-altitude flights (22000 ft– 40000 ft).

To determine the corresponding maximum range and the equilibrium velocity during the flight, the following equation must be satisfied:

$$\int_{Wc}^{Wd} -dW = \int_{xc}^{xd} Ct \{T_R/V_\infty\} \, dx$$

where $Ct$ is the fuel consumption rate.

Refs: J. D. Anderson, Jr., Introduction *to Flight,* 4th ed., McGraw-Hill Book Co.,2000.

J. J. Bertin/M. L. Smith, Aerodynamics for Engineers, Prentice-Hall, Inc.,1979