Boeing 747 Drag vs Cab Configuration (Kuethe & Chow)

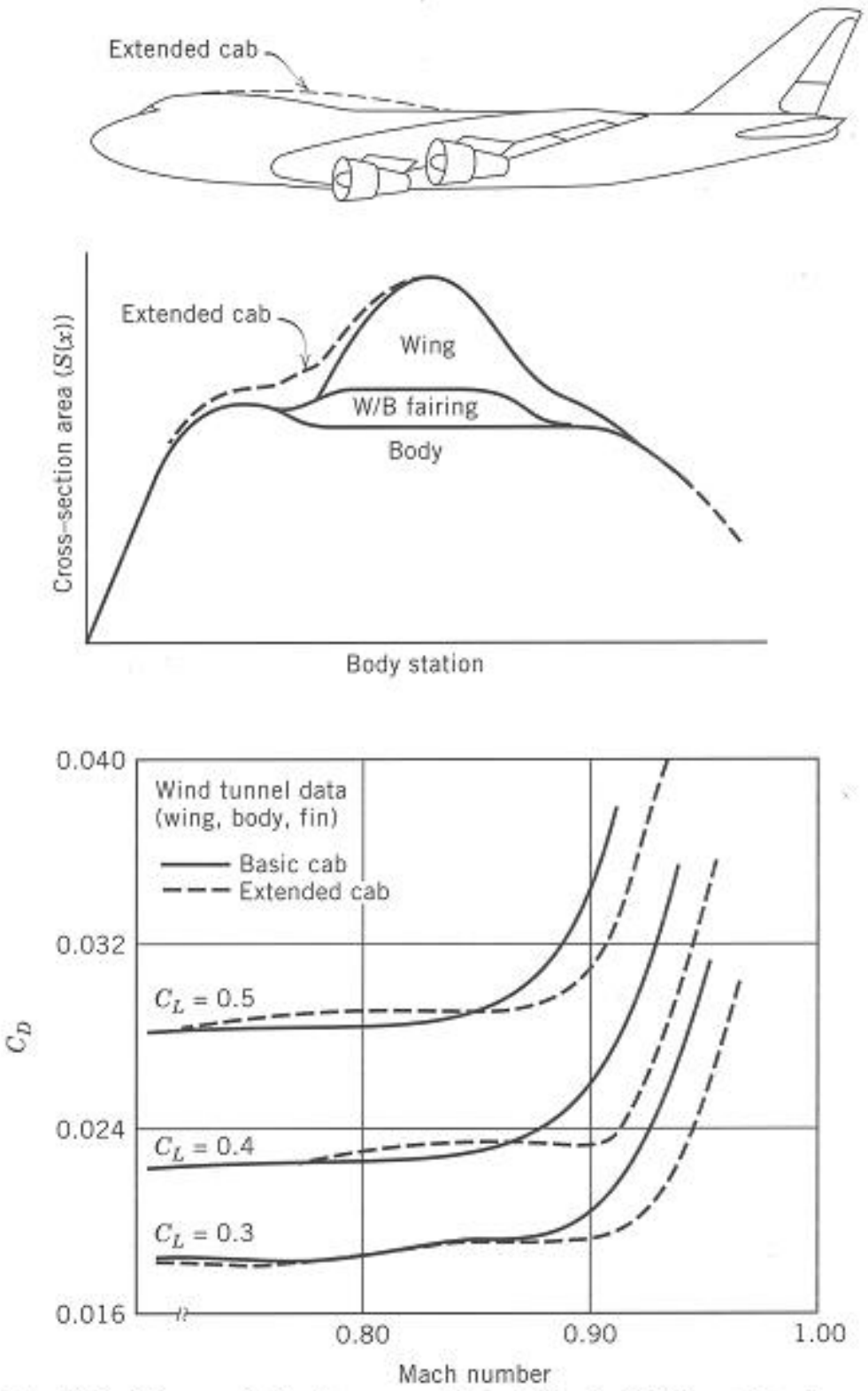
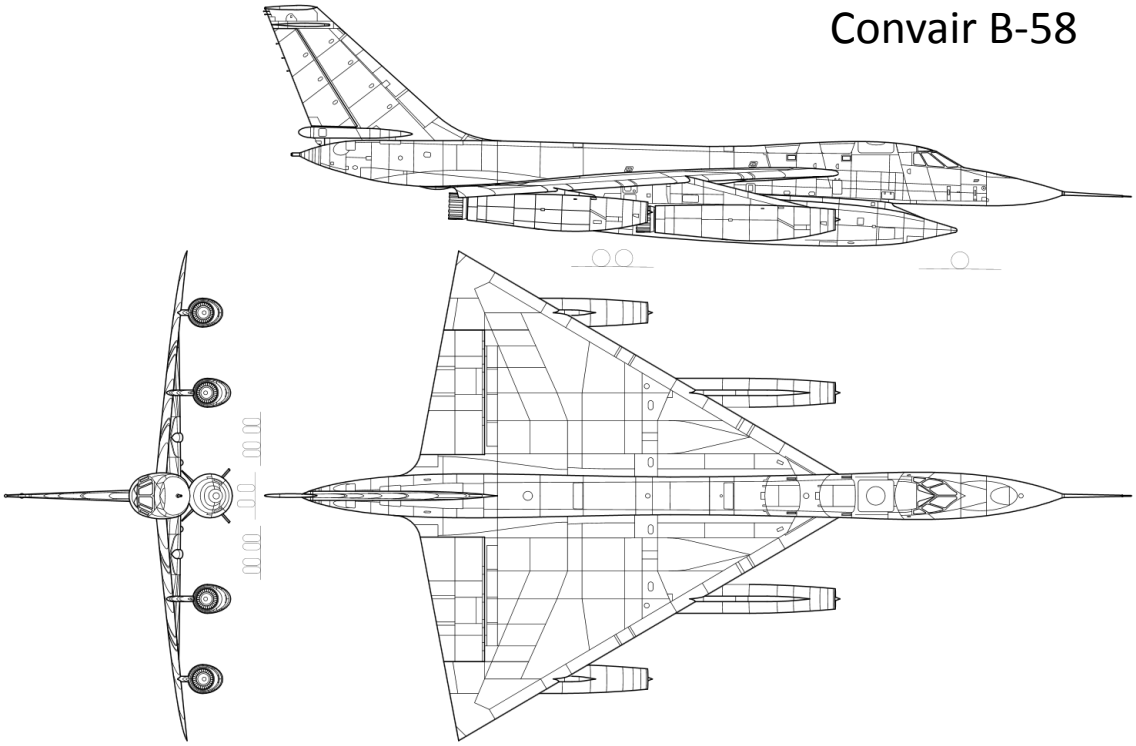
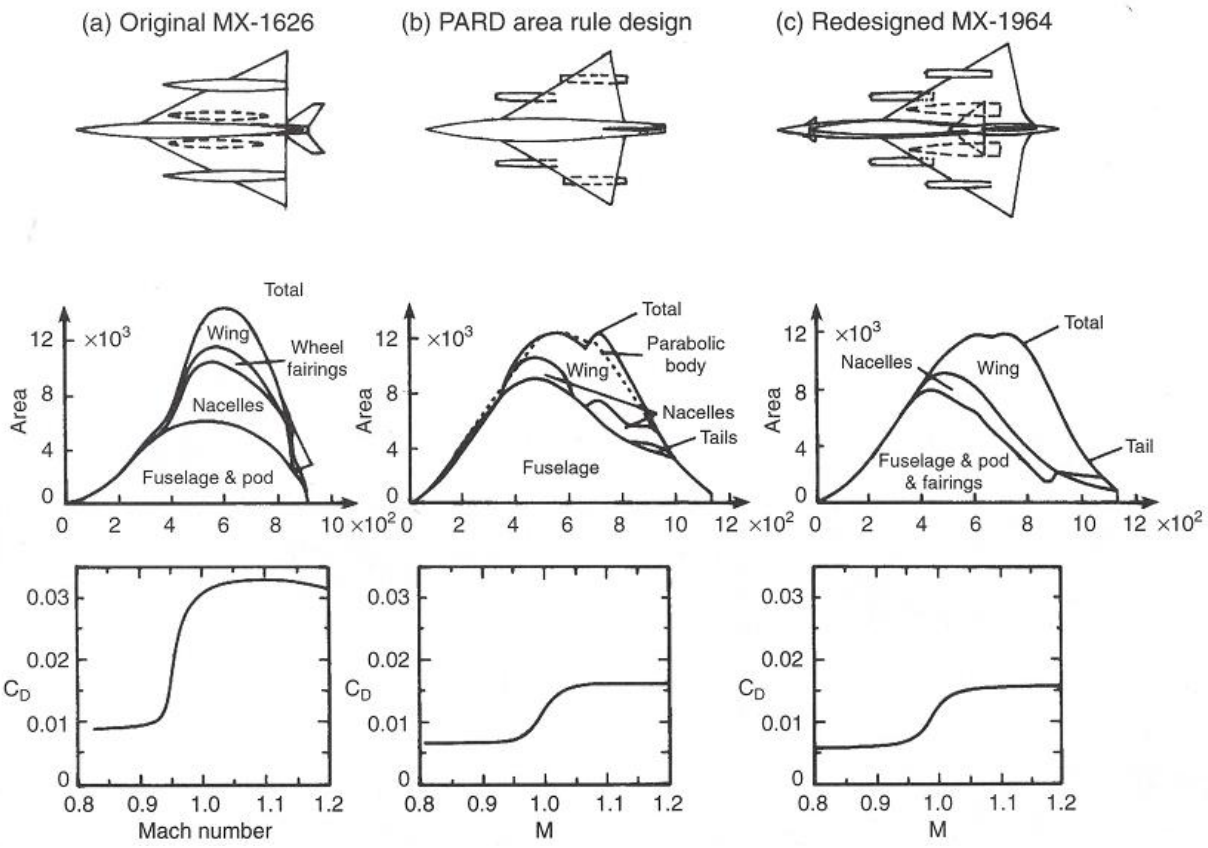


Fig. 13.9. Effect on $S(x)$ and measured drag of Boeing 747 due to fuselage modification. (Goodmanson and Gratzer, 1973. Courtesy of the Boeing Company.)

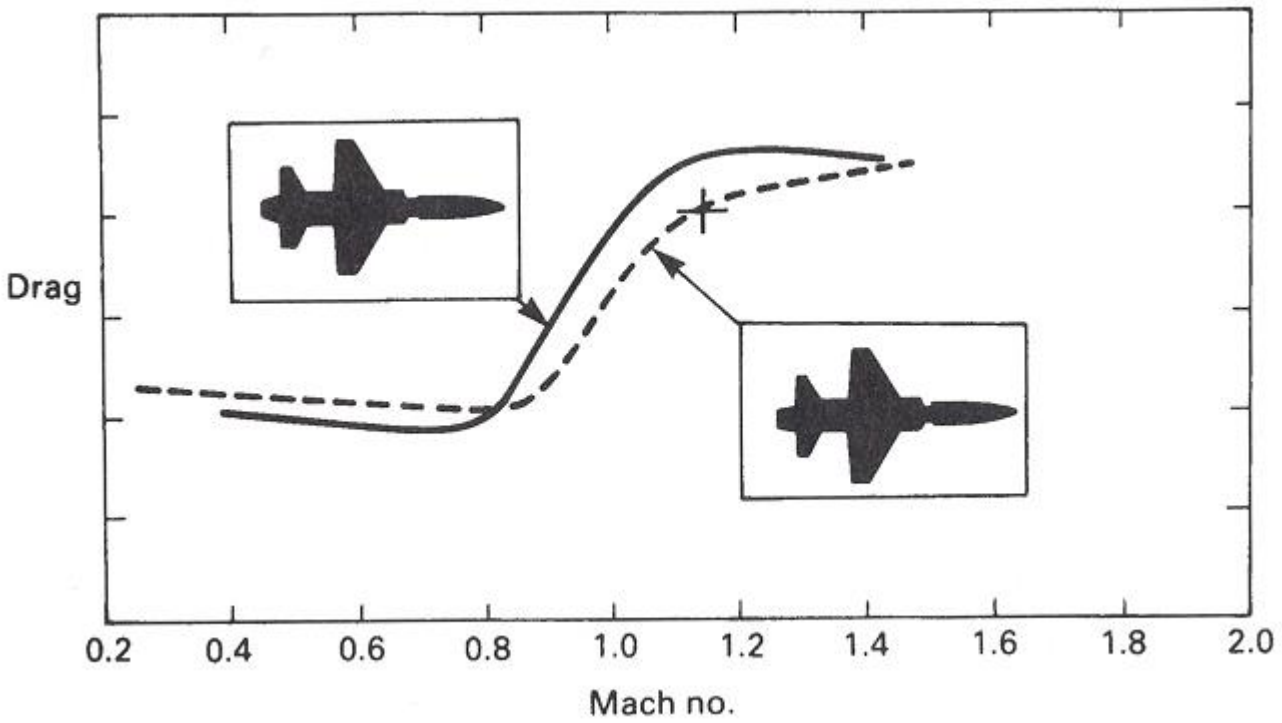
Convair B-58

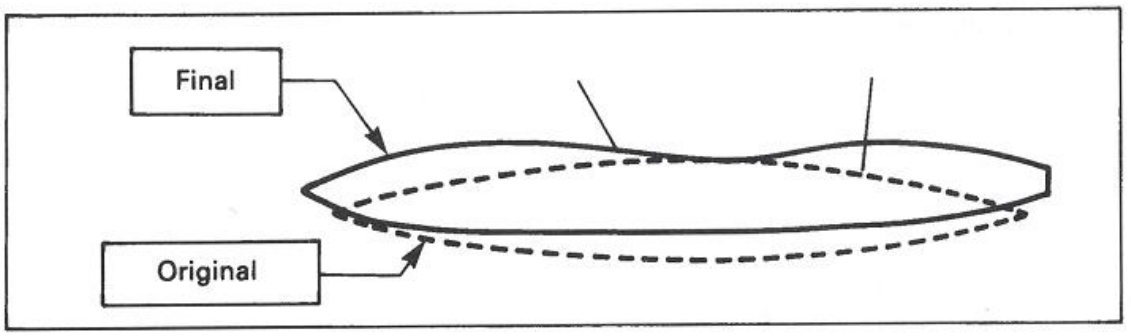


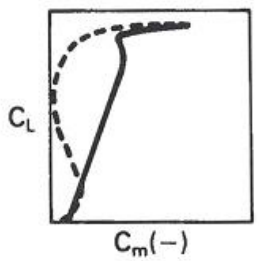


Notice: the total drag is reduced by approximately half.

F-5 Area ruling
and tip tanks







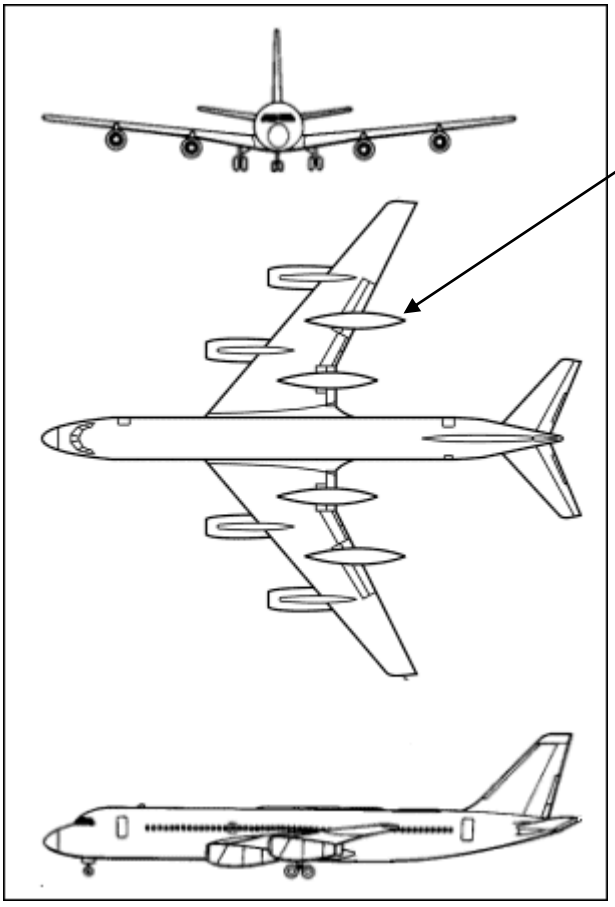
$\Delta C_{D_{CRUISE}} = -0.0023$

NASA Dryden Flight Research Center Photo Collection
http://www.dfrc.nasa.gov/gallery/photo/index.html
NASA Photo: EC92-05275-30 Date: 1992

CV-990 LSRA

Convair 990
Mcruise = 0.89

USP was “fast”

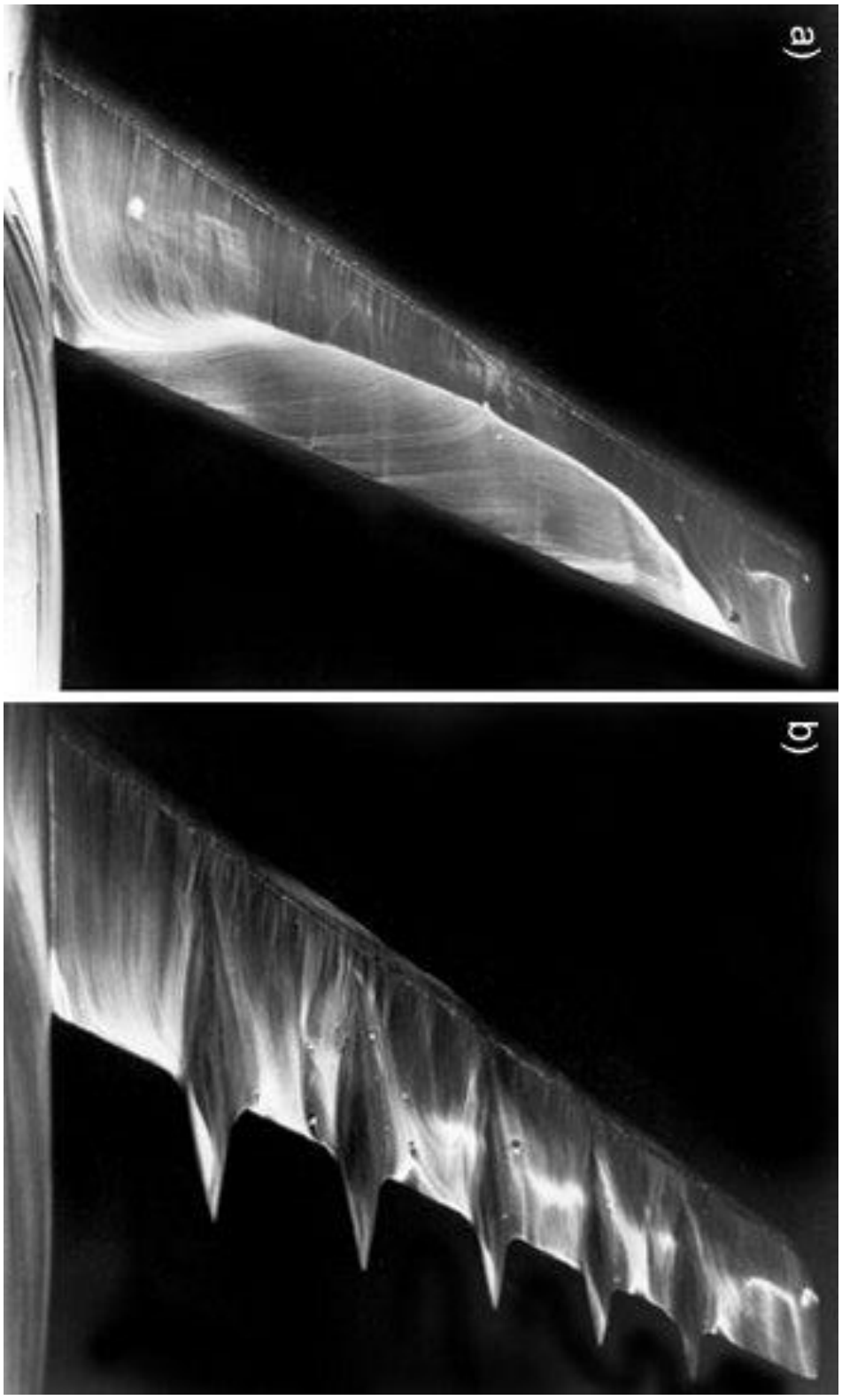


US: Whitcomb “Anti-Shock” Bodies

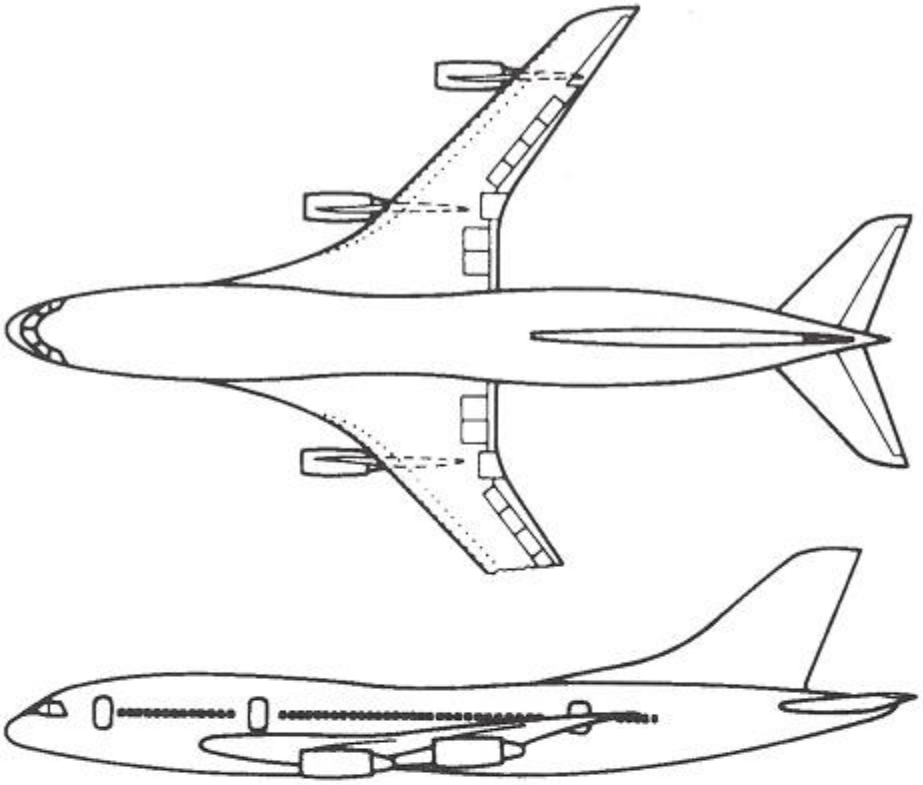
UK: Küchemann “carrots”

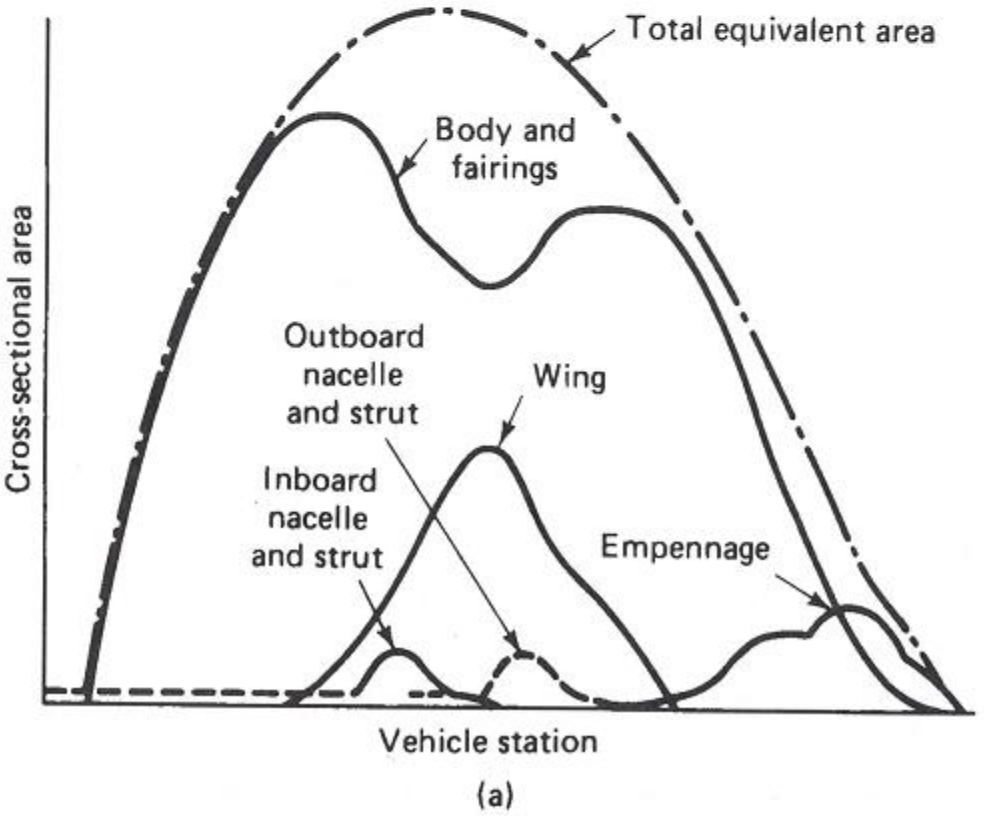
Area ruling reduces wave drag.

Sufficient area ruling can eliminate shocks (in transonic range)



Conceptual high speed transport (Source Bertin & Smith)





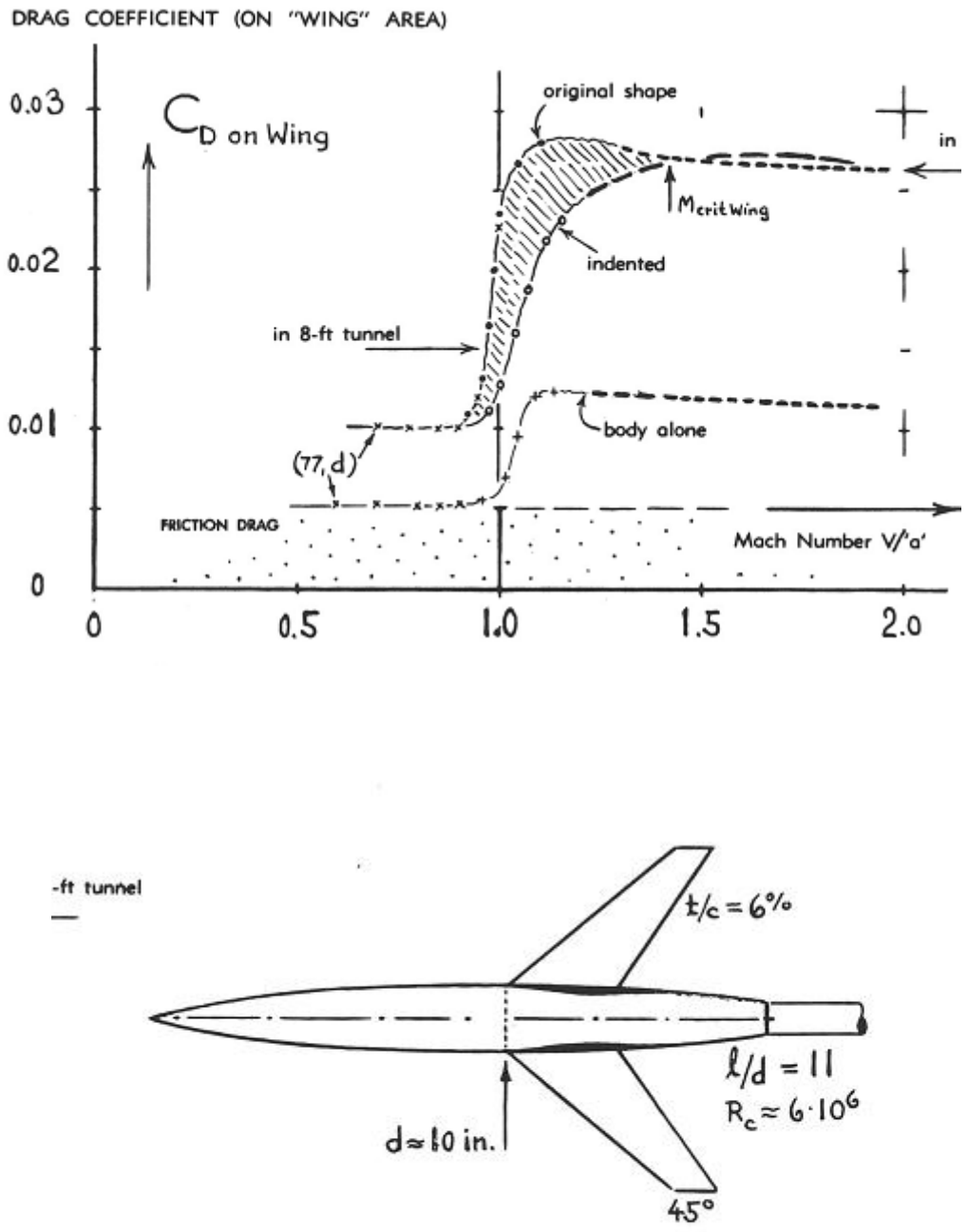


Figure 48. Drag of a wing-body configuration (77,a) in the transonic Mach-number range, demonstrating the area rule.