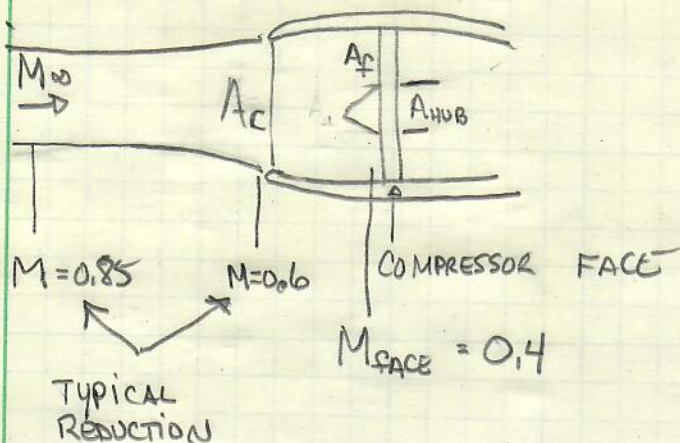


# CAPTURE AREA DETERMINATION



$A_T \equiv$  TOTAL AREA OF FAN + HUB  
 $A_{fan} \equiv$  AREA OF FAN ONLY  
 $A_{hub} \equiv$  AREA OF HUB  
 $A_c \equiv$  CAPTURE AREA OR THROAT AREA  
 $r_f = 17.9''$  (F91 BASELINE ENGINE)  
 $r_h = 7.2''$

STEP ① CALCULATE FAN AREA (MAKE SURE TO SUBTRACT HUB AREA)

$$A_{fan} = A_T - A_{hub}$$

$$A_{fan} = \pi ((17.9 \text{ in})^2 - (7.2 \text{ in})^2)$$

$$A_{fan} = 843.7 \text{ in}^2$$

ONLY AN EXAMPLE, NEED TO USE VALUES FROM YOUR ENGINE

STEP ② ASSUME INSENTROPIC FLOW

FROM ELEMENTS OF GAS DYNAMICS (LIEPMANN & ROSHKO)

$$\left(\frac{A}{A^*}\right)^2 = \frac{1}{M^2} \left[ \frac{2}{\gamma+1} \left( 1 + \frac{\gamma-1}{2} M^2 \right) \right]^{\frac{\gamma+1}{\gamma-1}} \quad (\text{Eq 5-2})$$

WHERE  $\gamma = 1.4$ , AND SOME SIMPLIFICATION

$$\frac{A}{A^*} = \frac{1}{M} \left( \frac{1 + 0.2(M^2)}{1.2} \right)^3$$

STEP ③ NOW USE

$$\frac{A_{capture}}{A_{fan}} = \frac{\left(\frac{A}{A^*}\right)_{capture}}{\left(\frac{A}{A^*}\right)_{fan}}$$

FOR  $M_{\infty} = 0.85$  USE  $M = 0.4$  FOR FAN  
 USE  $M = 0.6$  FOR THROAT ASSUMPTION

SOLVE FOR  $A_c$  USING  $A_{fan}$  DETERMINED FROM ENGINE SIZING +  $M$  REQUIREMENTS.