a) Anderson p. 502, problem 15.

At 80000 ft = 15.15 mi = 24.38 km:

Std Atmosphere

$a_1 = 298$ m/s

$\rho_1 = 0.0437$ kg/m^3

$P_1 = 5430$ Pa

$T_1 = 221$ K°

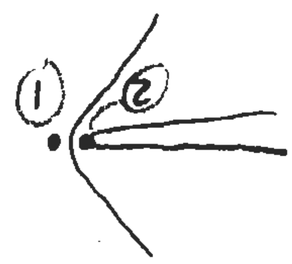
$V_1 = V_\infty = 2112$ mph $= 943.9$ m/s

$M_1 = \frac{V_1}{a_1} = 3.17$

$$\frac{T_2}{T_1} = \left[1 + \frac{2\gamma}{\gamma+1}\left(M_1^2 - 1\right)\right] \frac{2 + (\gamma-1)M_1^2}{(\gamma+1)M_1^2} = 2.885$$

$$\boxed{T_2 = T_1 \cdot 2.885 = 638\ K^\circ = 1148\ R^\circ = 656\ F^\circ}$$

b) P_{o_2} will be behind bow shock at tip



From Anderson Appendix B:

for $M_1 = 3.17 \rightarrow \frac{P_{o_2}}{P_1} = 13.4$

$$\boxed{P_{o_2} = P_1 \cdot 13.4 = 7.28 \times 10^4\ Pa}$$