Given: The Lockheed SR-71 aircraft is thought to cruise at $M = 3.3$ at altitude $z = 85,000$ ft.

Find: a) speed of sound and flight speed for these conditions.
b) Compare speed to muzzle speed (700m/sec) of a 30-06 rifle bullet.

Solution:

At altitude, $z = 85,000 \text{ ft} \times 0.3048 \frac{m}{ft} = 25.9 \text{ km}$

From Table A.3, $T = 222 K$

$\therefore c = \sqrt{kRT} = \left[1.4 \times 287 \frac{N \cdot m}{kg \cdot K} \times 222K \times \frac{kg \cdot m}{N \cdot s^2} \right]^{1/2} = 299 \text{ m/s}$ _____ c

$V = Mc = 3.3 \times 299 \text{ m/s} = 987 \text{ m/s}$ _____ V

$\frac{V}{V_{bullet}} = \frac{987}{700} = 1.41$ _____