33. We use Eq. 6-14, $D = \frac{1}{2}C\rho A v^2$, where ρ is the air density, A is the cross-sectional area of the missile, v is the speed of the missile, and C is the drag coefficient. The area is given by $A = \pi R^2$, where $R = 0.265\,\mathrm{m}$ is the radius of the missile. Thus

$$D = \frac{1}{2}(0.75)(1.2\,\mathrm{kg/m^3})\pi(0.265\,\mathrm{m})^2(250\,\mathrm{m/s})^2 = 6.2 \times 10^3\,\mathrm{N}\ .$$

37. The magnitude of the acceleration of the car as it rounds the curve is given by v^2/R, where v is the speed of the car and R is the radius of the curve. Since the road is horizontal, only the frictional force of the road on the tires makes this acceleration possible. The horizontal component of Newton's second law is $f = mv^2/R$. If N is the normal force of the road on the car and m is the mass of the car, the vertical component of Newton's second law leads to $N = mg$. Thus, using Eq. 6-1, the maximum value of static friction is $f_{s,\text{max}} = \mu_s N = \mu_s mg$. If the car does not slip, $f \le \mu_s mg$. This means

$$\frac{v^2}{R} \le \mu_s g \quad \Longrightarrow \quad v \le \sqrt{\mu_s R g} \ .$$

Consequently, the maximum speed with which the car can round the curve without slipping is

$$v_{\text{max}} = \sqrt{\mu_s R g} = \sqrt{(0.60)(30.5)(9.8)} = 13 \text{ m/s} \ .$$

57. We convert to SI units: $v = 94(1000/3600) = 26$ m/s. Eq. 6-18 yields

$$F = \frac{mv^2}{R} = \frac{(85)(26)^2}{220} = 263 \text{ N}$$

for the horizontal force exerted on the passenger by the seat. But the seat also exerts an upward force equal to $mg = 833$ N. The magnitude of force is therefore $\sqrt{263^2 + 833^2} = 874$ N.