Falling and Air Resistance - Terminal Velocity

Bronco skydives and parachutes from a stationary helicopter. Various stages of fall are shown in positions **a** through **f**. Using Newton's 2nd law,

$$F_{net} = F_{air} - F_g = ma$$

$$a = \frac{F_{air} - F_g}{m}$$

Find Bronco's acceleration at each position (answer in the blanks to the right). You need to know that Bronco's mass ***m* = 100 kg**, we will use ***g* = 10.0 m/s²** so his weight ***Fg* =1000 N**. Air resistance ***Fair*** varies with speed and cross-sectional area as shown. *Circle the correct answers.*

1. When Bronco's speed is least, his acceleration is
   (least) (most)

2. In which position(s) does Bronco experience a downward acceleration?
   (a) (b) (c) (d) (e) (f)

3. In which position(s) does Bronco experience an upward acceleration?
   (a) (b) (c) (d) (e) (f)

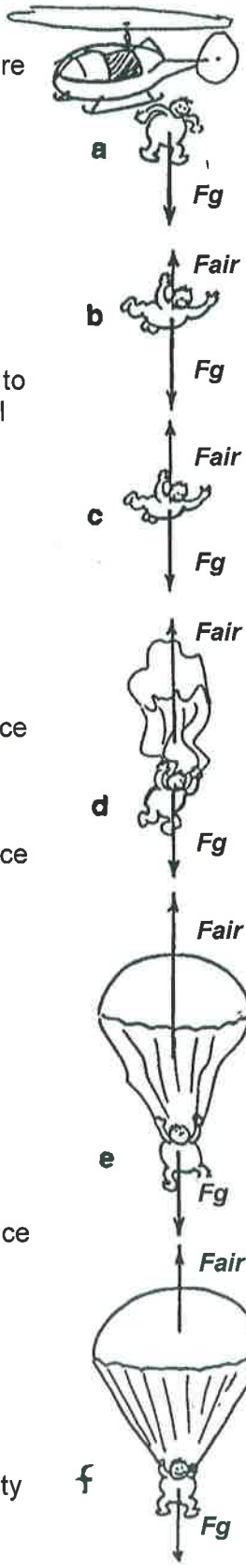
4. When Bronco experiences an upward acceleration, his velocity is
   (downward) (upward).

5. In which position(s) is Bronco's velocity constant?
   (a) (b) (c) (d) (e) (f)

6. In which position(s) does Bronco experience terminal velocity?
   (a) (b) (c) (d) (e) (f)

7. In which position(s) is terminal velocity greatest?
   (a) (b) (c) (d) (e) (f)

8. If Bronco were heavier, his terminal velocity would be
   (greater) (less) (the same).



Fair = 0
Fg = 1000 N
a= −10 m/s²

Fair = 400 N
Fg = 1000 N
a= −6 m/s²

Fair = 1000 N
Fg = 1000 N
a= 0

Fair = 1200 N
Fg = 1000 N
a= 2 m/s²

Fair = 1800 N
Fg = 1000 N
a= 8 m/s²

Fair = 1000 N
Fg = 1000 N
a= 0