# Physics 215
## Free Fall

1. On January 26, 1972, a Yugoslavian DC-9 airliner blew up in the skies over Srbská Kamenice in what is now the Czech Republic. The plane was flying at 33,330 feet when the explosion occurred. Amazingly enough, one of the air hostesses, Vesna Vulovic was found alive in the tail section of the plane. She was in a coma for 27 days and remained hospitalized for 16 months, but lived for many years after the event. If we neglect friction, then long did it take for her to hit the ground? How fast is she going when she hit? How would your results change if we didn't neglect friction?

2. An electron enters the electric field inside the electron gun of a television set. Its initial velocity is $5.0 \times 10^5$ m/s and the region of acceleration is 0.01 m long. It comes out of the region of acceleration moving at $5.7 \times 10^6$ m/s. If its acceleration was constant, what was it?

3. A model rocket is fired vertically and ascends with a constant acceleration of 4.0 m/s$^2$ for 6.0 s. Its fuel is then exhausted and it continues going straight up with only gravity acting on it. What is the maximum altitude reached? What is the total time elapsed from launch until the rocket lands on the Earth?

4. The terminal speed of a skydiver in the spread-eagle position is 160 km/hr. In the nose-dive position, the terminal speed is 310 km/hr. Assuming that the drag coefficient $C$ does not change from one position to the next, find the ratio the effective cross-sectional area $A$ in the slower position to that in the faster position.