

Parachutists bend their legs and roll with the fall on landing. They do this to reduce the chance of injury. Explain why this technique means they are less likely to suffer broken bones on hitting the ground.

Answer

When parachutists land, they keep their knees bent and roll over all in an effort to lengthen the period of the force of impact, thus reducing its effects.

When the parachutist first makes contact with the ground, they have a certain speed. Soon, their speed will be zero. That means they have an acceleration

$$a = \frac{\Delta v}{\Delta t}$$

which must be caused by the force on them

$$F = ma.$$

If they hit the ground stiff-legged, then their speed goes to zero very quickly. Δt is small, a is large, and F is large. Large forces can cause injuries.

But if they bend their knees and roll, then they've increased their interaction time with the ground. Δt is larger, a is smaller, and F is smaller. Smaller forces are less likely to cause injuries.