

SPEED BUS JUMP

Background: In the 1994 thriller "Speed" a bomb is set to detonate on a city bus if the bus ever reduces its speed below 50 mph. At one point the bus is traveling on a freeway overpass with a large portion of the road missing. In an attempt to save the lives of all the passengers, the brave Sandra Bullock decides to speed up in hop that it will be able to jump the 50 ft hole and land safely on the other side.

Part 1: No initial incline

The camera zooms in on the roadway revealing that the freeway has no incline. This means that the bus's initial velocity is perfectly horizontal. Assume the bus was traveling at 70 mph (31 m/s).

1. What is the x-component of the bus's initial velocity for this situation?
2. What is the y-component of the bus's initial velocity for this situation?
3. If the bus jumped the gap of 50 ft (15.24 meters), how long was it in the air?
4. Use the time from #3 to determine the vertical distance the bus would have fallen before landing on the other side.
5. Would it be physically possible for the bus to land on the other side of the overpass in this situation? Why or why not?

Part 2: 5 degree incline

Let's give the moviemakers the benefit of the doubt and assume the freeway was on a slight inline of 5 degrees. Assume the bus was still traveling at 70 mph (31 m/s).

1. What is the y-component of the bus's initial velocity for this situation?
2. What is the x-component of the bus's initial velocity for this situation?
3. If the bus jumped the gap of 50 ft (15.24 meters), how long was it in the air? (Careful, not quite the same as #3 in previous problem!)
4. What vertical distance would the bus have fallen before landing on the other side?
5. In this situation, would the bus have landed safely on the other side? Why or why not?