



Lesson 4: How does crush zone length affect a vehicle’s crashworthiness?

Engineers design vehicles to protect the occupants when crashes occur. The safety cage and surrounding structures are built to limit the injuries to the people inside the vehicle. Can you determine the best crush zone frame length that best protects a vehicle’s occupants? Slam into this challenge head-on and start this simulation.

Doing the Science

1. Start the Car Crash Simulation.
2. Select the blue SUV on the left side of the screen.
3. Select the “Soft” crush zone stiffness.
4. Select the “Short” crush zone length.
5. Select the “Crash Center” button at the bottom of the screen.
6. Select the “40 MPH” speed, and then select the “Crash It” button.
7. Note and record in Table 1 the average acceleration and crash duration for the crash.
8. Select the “Analysis Center” button at the bottom of the screen.
9. Select the “Measure” button. Select the green round target, then select the next green round target to measure the frame intrusion. Record this information in Table 2.
10. Repeat measuring the intrusion for the other two targets (yellow and red). Record this information in Table 2.
11. Select the “Medical Report” button. Record this information in Table 3.
12. Select the “Design Center” button at the bottom of the screen.
13. Repeat steps 3–12, except choose the “Medium” crush zone length.
14. Repeat steps 3–11, except choose the “Long” crush zone length.

Table 1. Acceleration and Crash Duration

Crush Zone Length	Average Acceleration (g’s)	Crash Duration (seconds)
Short		
Medium		
Long		

Table 2. Crash Zone Intrusion

Crush Zone Length	Frontend Deformation (green target in meters)	Footwell Intrusion (yellow target in meters)	Dashboard Intrusion (red target in meters)
Short			
Medium			
Long			

