“KEEPING PACE” - #6

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LARGE CARS VS SMALL CARS:

The following is quoted from the March, 1985 issue of the Society of Automotive Engineers magazine, “Automotive Engineering,” which in turn referred to a NHTSA Preliminary Report: “Risk of Fatal Injuries in Vehicles of Different Size” (DOT HS 806-653, November, 1984). The report found that “the overall risk of driver fatality in two-vehicle collisions differs considerably among vehicles of different classes. The risk to drivers of mini-compacts is 10 times larger than for drivers of full size cars, whose risk is also 10 times higher than for drivers of large trucks.” In addition, it found that “in vehicle-to-vehicle collisions among passenger cars, the risk of a driver fatality between the smallest and the largest of the five classes of passenger cars is as large as 14 to 1 in favor of the largest class.” Copies of this report can be obtained by contacting the NHTSA office of Public Affairs, 202-426-9550. In the experience of P.A.C.E., the problem with smaller cars is not just their smaller size, which puts less metal materials between the passengers and the oncoming vehicle, but also their lesser weight. Because of the laws of physics, these two factors compound each other. The lesser weight causes a higher speed change (kinetic energy absorbed) during impact; yet the small size means that it takes less kinetic energy to reach a passenger. This explains the differences in risk which NHTSA observed.

AIRPLANE INCIDENT:

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AIRPLANE INCIDENT: (REVISED): The foregoing photograph is a view of a Cessna 182RG retractable landing gear airplane which I purchased, used, in 1984. When I purchased it, they told me that if there was ever a problem with the landing gear, we could just set it down on its bottom. A month and a half later, we proved them right. Coming into the Cleveland airport, one wheel would not come down. So, to be closer to home when we landed, we flew to the Dayton, Ohio airport. I had been skidding vehicles to a stop from 45 mph to test their brakes for a long time. So setting this airplane down to skid on the grass from 50 mph was not really that different. Also, it gave me the chance to check out some coefficient of friction data in the textbooks.

I measured the marks in the grass to be 200 feet long, indicating that we had skidded for 200 feet from 50 mph. That confirmed that the coefficient of friction of metal on grass (dirt) was about 0.4, as indicated in the textbooks. This is determined from the formula:

$$V^2 = \sqrt{30\mu S}$$

where V is the speed in MPH, μ is the coefficient of friction, and S is the skidding length, when the vehicle comes to a stop at the end of the skid. Substituting the numbers gives a μ of 0.42—close to the textbook values.

The cause was a bolt that had come loose. This should have been caught on the inspection performed at the time the airplane was purchased. Just based on the photographs I took, USF&G was able to successfully subrogate the cost of the engine repairs, which was about $20,000.

I only kept this airplane for a year. It could not be used very well in the wintertime, because it had no "boots" on the wings to deal with freezing rain (most small airplanes do not). Also, an analysis demonstrated that it was not saving us any time, let alone cost. It was fun, but it was an expensive lesson.

Sincerely,

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Forensic Engineer

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