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ENGINEERING ANALYSIS OF ACCIDENTS

HEAD-ON COLLISIONS

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Among the most feared of accidents is the head-on collision. At highway speeds, serious injury or death is almost certain. Head-on collisions may involve the entire front or they may be offset engaging only part of the front. In order to understand head-on collisions, the momentum of the vehicles must be considered. In its simplest terms, momentum is the vehicle's mass (weight) multiplied by its velocity (speed). Therefore, a 5,000 pound vehicle traveling at 30 mph has the equivalent momentum of a 2,500 pound vehicle traveling at 60 mph.

Fig. 1 Head-on collision at highway speeds

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In head-on collisions, it is important to identify the area of collision, the rotations of the vehicles, establish the paths of travel from impact to rest and evaluate why the collision occurred. When vehicles collide head-on, they either 1.) stop essentially where they collide or 2.) travel forward or backwards from impact or 3.) if the collision is offset or only involves part of the front of the vehicles, both may rotate and continue forward.

In most head-on collisions, one or both of the vehicles will have crossed the centerline. The area of impact can usually be identified from skidmark patterns, gouge patterns or the general mechanics of the accident. For example, consider the collision illustrated in Fig. 2. Vehicle A collides with similar weight vehicle B in an offset frontal collision, that is there is only partial overlap at the front. In this case, the collision forces are directed rearward on both vehicles, but the forces are offset toward the driver's side. This results in a counterclockwise rotation for both vehicles. They rotate around the area of collision and continue forward from impact (Fig. 3). This indicates that the vehicles had similar momentums. Had the momentum of one been significantly greater that the other, then rather than the impact point being roughly centered in the debris fields and the resting points of the vehicles, the collision point would be on the far end of the debris field.

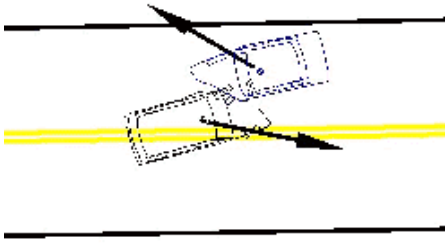

Fig. 2 During the collision

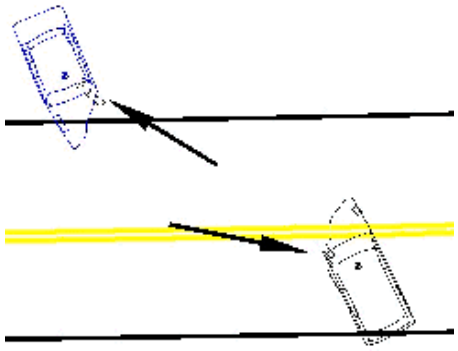

Fig. 3 Movement to rest

Head-on collisions often have extensive damage, large rotations and small relative movement. However, with careful analysis it is possible to identify which of the vehicles was across the centerline.