INTRODUCTION
The Road Safety and Motor Vehicle Regulation Directorate of Transport Canada has a mandate to regulate the safety of new vehicles in Canada. As part of this effort, Transport Canada conducts a research program focused on real-world collisions. The field investigations are conducted by various contractors throughout Canada. The authors of this paper conduct the field work for the Alberta region. The goal of the program is to reduce the societal costs of fatalities, injuries, and property damage resulting from motor vehicle collisions. A comprehensive analysis and reconstruction of the collision events of each case is conducted in order to understand various aspects of the crash such as occupant kinematics, injury causation, and the role of restraint systems in injury severity.

METHODS
The research program currently includes studies investigating four areas: advanced airbags, side impacts, rear occupant protection, and special investigations such as school bus collisions and child restraint performance. These studies are pertinent to the monitoring of current and future regulations. Collisions meeting the study criteria are identified through the media and collaboration with Alberta police forces. Collision investigations include documentation of the collision site, description and measurement of vehicle exterior damage and occupant compartment intrusion, identification of occupant contact points and witness marks on occupant restraint systems, and the retrieval of crash data from supported vehicles’ electronic control modules. Investigators also interview the case vehicle occupant(s) of primary interest in order to document occupant anthropometric and demographic information, pre-collision occupant positioning, restraint usage, and injury details. Additional analysis may include analysis and reconstruction of vehicle dynamics, occupant kinematics, collision severity, occupant injury mechanisms, and evaluation of the collision performance of relevant motor vehicle safety standards.

Two brief case studies will be presented to highlight occupant injury mechanisms.

RESULTS
The first case involved a collision between a school bus and a dump truck (Figure 1). The collision occurred on the right shoulder of an urban roadway. The dump truck was parked on the side of the road and the school bus was approaching the dump truck from the rear. The right front corner and right side of the school bus struck the left rear corner and left side of the dump truck box. A portion of the right side of the bus was separated from the vehicle and there was extensive intrusion into the occupant compartment of the bus. Eleven students were on the school bus at the time of the collision. A 9-year-old student seated near the front right side of the bus sustained fatal injuries due to occupant compartment intrusion.

Figure 1: School bus exterior damage

The second case involved an urban, side-impact collision between a four-door hatchback and a two-door coupe (Figure 2). The collision took place at an urban intersection. The coupé was travelling westbound through an intersection when the southbound hatchback attempted to make a left turn in front of it. The front end of the coupé struck the left side of the hatchback. The driver of the hatchback was the sole occupant of the vehicle. The vehicle was equipped with side torso, side curtain, and front airbags, all of which deployed in the collision. The seatbelted driver of the hatchback sustained multiple injuries due to contact with the left side interior of the vehicle.

Figure 2: Four-door hatchback exterior damage

DISCUSSION
This data is used by Transport Canada to conduct Canada-wide, ongoing investigations into real-world motor vehicle collisions. These investigations provide important information regarding the effectiveness of current safety standards and data to evaluate the needs and potential of new safety devices.