

**TRANSPORTATION SCIENCES  
CRASH DATA RESEARCH CENTER**

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**VERIDIAN REMOTE ADVANCED OCCUPANT PROTECTION SYSTEM  
INVESTIGATION  
SCI TECHNICAL SUMMARY REPORT**

**NASS/SCI COMBO CASE NO. 02-08-148E**

**VEHICLE – 2003 DODGE STRATUS**

**LOCATION - STATE OF PENNSYLVANIA**

**CRASH DATE – AUGUST 2002**

Contract No. DTNH22-01-C-17002

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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<p>16. <i>Abstract</i> This remote investigation focused on the performance of the Advanced Occupant Protection System (AOPS) in a 2003 Dodge Stratus sedan. The AOPS included safety belt pretensioners and multi-stage frontal air bags. The Status was occupied by a 36-year-old male driver who was unrestrained. He was operating the Stratus on a two-lane roadway on approach to a four-leg intersection. The driver lost control of the vehicle and departed the roadside after traveling through the intersection. The vehicle struck a wood utility pole with the front right aspect in sideswipe configuration, which caused the right front alloy wheel to fracture. The Stratus sustained moderate right side damage and the impact was sufficient to deploy the frontal air bag system. The unrestrained driver loaded the driver's air bag and sustained a minor right scalp laceration and contusion from contact with the rear-view mirror. The driver was transported by ambulance to a local hospital and treated for minor severity injuries, and released.</p>			
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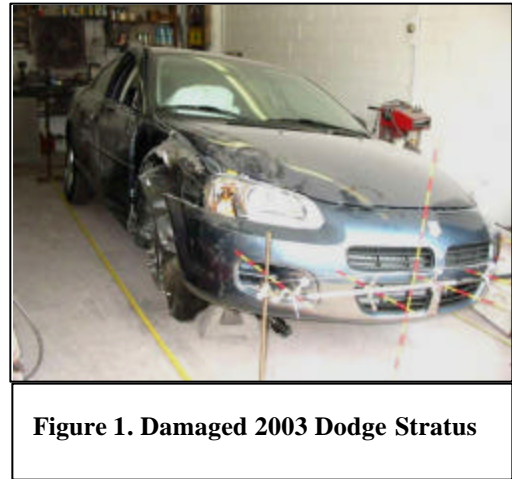
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**VERIDIAN REMOTE ADVANCED OCCUPANT PROTECTION SYSTEM  
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SUBJECT VEHICLE – 2003 DODGE STRATUS  
LOCATION - STATE OF PENNSYLVANIA  
CRASH DATE - AUGUST 2002**

***BACKGROUND***

This remote investigation focused on the performance of the Advanced Occupant Protection System (AOPS) in a 2003 Dodge Stratus sedan (**Figure 1**). The AOPS included safety belt pretensioners and multi-stage frontal air bags. The Stratus was occupied by a 36-year-old male driver who was unrestrained. He was operating the Stratus on a two-lane roadway on approach to a four-leg intersection. The driver lost control of the vehicle and departed the roadside after traveling through the intersection. The vehicle struck a wood utility pole with the front right aspect in sideswipe configuration, which caused the right front alloy wheel to fracture. The Stratus sustained moderate right side damage and the impact was sufficient to deploy the frontal air bag system. The unrestrained driver loaded the driver's air bag and sustained a minor right scalp laceration and contusion from contact with the rear-view mirror. The driver was transported by ambulance to a local hospital and treated for minor severity injuries, and released.

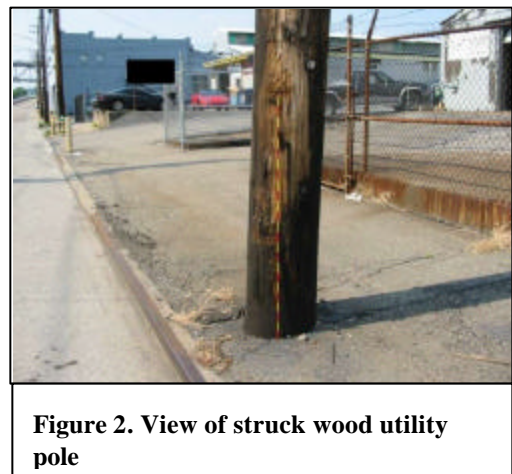


This crash was selected for investigation by the National Automotive Sampling System (NASS) as CDS case number 02-08-148E. The crash occurred in August 2002. Initial notification of this crash was made following a NASS CDS case review. The NASS PSU performed the vehicle and scene inspection. Due to the presence of the Advanced Occupant Protection System, NHTSA assigned the tasks of case review and report preparation to the Veridian Special Crash Investigation (SCI) team on October 8, 2002.

***SUMMARY***

**Crash Site**

This single-vehicle crash occurred during the nighttime hours of August 2002 in the state of Pennsylvania. At the time of the crash, it was dark and the asphalt roadway surface was dry. The crash occurred on an unmarked, north/south, two-lane, local roadway bordered by 7.6 cm (3.0") concrete curbs. The roadway was straight and level at the crash site and was illuminated by overhead lights on wood utility poles. The utility poles (**Figure 2**) were located along both sides of the roadway, measured 35.6 cm (14.0") in



diameter, and were located 50.8 cm (20.0”) outboard of the curb lines. The roadside environment consisted of concrete sidewalks and commercial buildings. The posted speed limit for the north/south roadway was 24 km/h (15 mph). A four-leg intersection was located approximately 61 m (200’) south of the crash site. Traffic flow through the intersection was controlled by stop signs on each corner. The NASS scene schematic is included as **Figure 13** of this report.

### **Pre-Crash**

The 36-year-old driver was operating the vehicle northbound on the two-lane roadway (**Figure 3**). It was not known if the driver was distracted, although the police report stated the driver was operating the vehicle under the influence of alcohol. The vehicle traveled through the four-leg intersection and continued northbound on the roadway. The driver lost control of the vehicle and departed the right roadside onto the curbed sidewalk. The pre-impact speed of the Stratus was not reported and it was not known if the driver attempted any avoidance maneuvers.



**Figure 3. Northbound trajectory for the 2003 Dodge Stratus**

### **Crash**

The 2003 Dodge Stratus struck a wood utility pole with the front right corner in a sideswipe configuration. The direction of force was in the 12 o’clock sector. The impact was sufficient to deploy the frontal air bag system in the Stratus. The direct damage began at the right front corner of the bumper fascia and extended 204.5 cm (80.5”) rearward along the right side plane. As the right side of the Stratus engaged the pole, the right front wheel snagged against the pole and was displaced rearward against the rear aspect of the wheel opening. The contact with the pole resulted in the complete fracture of the right front alloy wheel around the entire circumference of the wheel. The pole did not sustain visible damage. The Stratus rotated slightly clockwise (CW) after the impact with the pole and came to rest adjacent to the pole with the right front aspect straddling the curb.

### **Post-Crash**

The police report stated that as police officers arrived on-scene, the driver was observed attempting to drive the vehicle away from the pole. Upon their arrival, the driver exited the vehicle under his own power. He sustained visible soft-tissue head injuries and was transported by ambulance to a local hospital. He was treated for his injuries and released.

### ***VEHICLE DATA – 2003 Dodge Stratus***

The 2003 Dodge Stratus was identified by the Vehicle Identification Number (VIN): 1B3EL46X33N (production sequence omitted). The Stratus was a four-door sedan equipped with a 2.4 liter, 4-cylinder engine, front-wheel-drive, four-speed, automatic transmission, four-wheel disc anti-lock brakes, power-assisted steering, a tilt steering wheel, power mirrors, and remote keyless entry. At the time of the vehicle inspection, the vehicle’s odometer read 303 km (188 miles).

The Stratus was equipped with Goodyear Eagle LS, P205/60R16 tires. The specific tire data is summarized as follows:

Tire	Measured Pressure	Tread Depth	Restricted	Damage
LF	200 kpa (29 psi)	7 mm (9/32")	No	None
LR	193 kpa (28 psi)	8 mm (10/32")	No	None
RF	0 kpa	7 mm (9/32")	Unknown	None
RR	200 kpa (29 psi)	8 mm (10/32")	No	None

The seating positions in the 2003 Dodge Stratus were configured with front bucket seats with adjustable head restraints and a rear bench seat with a 60/40 split folding back. Both front seats were adjusted to the full-rear track position at the time of the vehicle inspection.

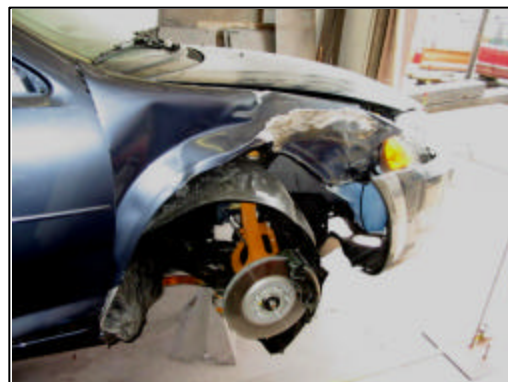
### **VEHICLE DAMAGE**

#### ***Exterior Damage – 2003 Dodge Stratus***

The 2003 Dodge Stratus sustained moderate right front side damage as a result of the impact with the utility pole (**Figure 4**). The direct damage from the frontal impact began at the front right bumper corner and extended 2.0 cm (0.8") across the bumper. A crush profile measured across the front bumper confirmed that there was no residual crush to the frontal structure. The combined direct and induced damage involved the entire width of the bumper. The damage deformation and abrasions continued 204 cm (81") in a sideswipe configuration down the right side aspect to 58 cm (23") aft of the leading edge of the right front door. The right front fender was crushed laterally and abraded from the pole contact. The hood was not displaced. The right aspect of the front bumper fascia was partially separated. The rear aspect of the wheel opening and leading edge of the right sill were deformed and abraded from contact with the right front wheel, which was displaced rearward (**Figure 5**). The post-crash right wheelbase was reduced by 3.0 cm (1.2"). The Collision Deformation Classification (CDC) for the impact with the utility pole was 12-FRES-6.



**Figure 4. View of right front damage**



**Figure 5. View of right front damage and wheel opening**

The right front alloy wheel fractured around the circumference of the wheel (**Figures 6 and 7**). It appeared that the wheel was removed from the vehicle post-crash, as there was no visible damage to the lugs. Inspection of the front right axle, rotors, and caliper did not identify and damage to those components.



**Figure 6. View of front right wheel and inboard aspect of fractured alloy wheel**



**Figure 7. View of outboard aspect of the fractured alloy wheel**

#### ***Interior Damage – 2003 Dodge Stratus***

The 2003 Dodge Stratus sustained minor interior damage as a result of the impact (**Figure 8**). The right front door was jammed shut, but the remaining doors were operational. The right front window was fully opened prior to the crash, and the vehicle glazing was not damaged. The right A-pillar and right instrument panel intruded 3.0 cm (1.2”) longitudinally into the occupant space. The rear view mirror was displaced and fractured from contact with the unrestrained driver’s head. The knee bolster was scuffed on the right aspect from contact with the driver’s right knee.



**Figure 8. View of instrument panel area and fractured rear-view mirror**

#### ***MANUAL RESTRAINT SYSTEMS – 2003 Dodge Stratus***

The 2003 Dodge Stratus was equipped with manual, belt-sensitive, 3-point lap and shoulder belts with Emergency Locking Retractors (ELR)’s for all seating positions. The driver’s safety belt was configured with a sliding latch plate and the remaining safety belts were configured with cinching latch plates. Both front restraints were equipped with adjustable D-rings, which were in the full-down position, and retractor pretensioners, which actuated as a result of the crash. At the time of the vehicle inspection, both front safety belts were found restricted in the retracted mode under high tension, taut against the B-pillars. The driver was not restrained at the time of the crash.

#### ***FRONTAL AIR BAG SYSTEM – 2003 Dodge Stratus***

The 2003 Dodge Stratus was equipped with multi-stage frontal air bags for the driver and front right passenger positions that deployed as a result of the impact with the utility pole. The driver’s air bag deployed from a module located in the center of the steering wheel. The driver’s air bag



module was configured with H-configuration cover flaps. The top flap measured 17 cm (7") in width and 8 cm (3") in height and the bottom flap measured 13 cm (5") in width and 3 cm (1") in height. The driver's air bag measured 60 cm (24") in diameter in its deflated state (**Figure 9**). The air bag did not exhibit any occupant contact evidence. The driver's air bag was vented by a single circular port that measured 3.2 cm (1.3") in diameter and was located at the 12 o'clock position on the top rear aspect of the air bag. The air bag was tethered by two internal straps.



**Figure 9. Driver's air bag**



**Figure 10. Front right passenger's air bag**

The front right passenger's air bag measured 45 cm (18") in width and 50 cm (20") in height (**Figure 10**). The air bag was vented by two circular vent ports at the 3 and 9 o'clock positions on the side panels. The air bag was not tethered. The front right passenger's air bag deployed from a top-mount module configured with a rectangular cover flap hinged at the aft aspect (closest to occupant). The cover flap opened rearward, toward the front right occupant position. The pliable vinyl cover flap measured 22 cm (9") in height and 36 cm (14") in width (**Figure 11**). The leading edge of the flap opened at the forward aspect (closest to the windshield) and pivoted upward and rearward around the face of the instrument panel as the air bag deployed. The total flap excursion beyond the face of the instrument panel (**Figure 12**) measured 13 cm (5"). The hinge in the cover flap was located 3.0 cm (1.5") forward of the aft edge of the cover flap. In a NHTSA NCAP frontal test film of a 2001 Dodge Stratus with the same cover flap design, the air bag deployed upward against the windshield as the flap opened. The deflection against the windshield resulted in fractures of the windshield as the air bag inflated. The windshield was not damaged in this crash.



**Figure 11. Front right passenger's air bag cover flap**



**Figure 12. Lateral view from left-to-right showing excursion of front right passenger's air bag cover flap**

## ***OCCUPANT DEMOGRAPHICS – 2003 Dodge Stratus***

### **Driver**

Age/Sex: 36-year-old male  
Height: Unknown  
Weight: Unknown  
Seat Track Position: Full-rear  
Manual Restraint Use: Unrestrained  
Usage Source: Vehicle inspection, injuries  
Eyewear: Unknown  
Type of Medical Treatment: Transported by ambulance to a local hospital and treated and released

### **Driver Injuries**

<b>Injury</b>	<b>Injury Severity (AIS 90/Update 98)</b>	<b>Injury Mechanism</b>
Right scalp contusion/subgaleal hematoma	Minor (190402.1,1)	Rear-view mirror
Minor right scalp laceration	Minor (190602.1,1)	Rear-view mirror

Injury source: Emergency room report

### **Driver Kinematics**

The 36-year-old male driver of the 2003 Dodge Stratus was not restrained by the available manual 3-point lap and shoulder belt. The driver's seat was adjusted to a full-rear position, and his pre-crash posture was unknown. Police reported that the driver was operating the vehicle under the influence of alcohol.

At impact with the pole, the frontal air bag system deployed and the seat belt pretensioners fired. The unrestrained driver initiated a forward trajectory and loaded the driver's air bag. His knees struck the knee bolster evidenced by scuff marks. His head struck the rear-view mirror, which resulted in a right scalp contusion/subgaleal hematoma and a minor right scalp laceration. He rebounded rearward and came to rest in the seat. Police reported that the driver was attempting to drive the vehicle from the scene as they arrived, but the driver was unsuccessful due to the crash damage. He exited the vehicle under his own power as the police arrived on-scene. The driver was transported by ambulance to a local hospital where he was treated for his injuries and released.

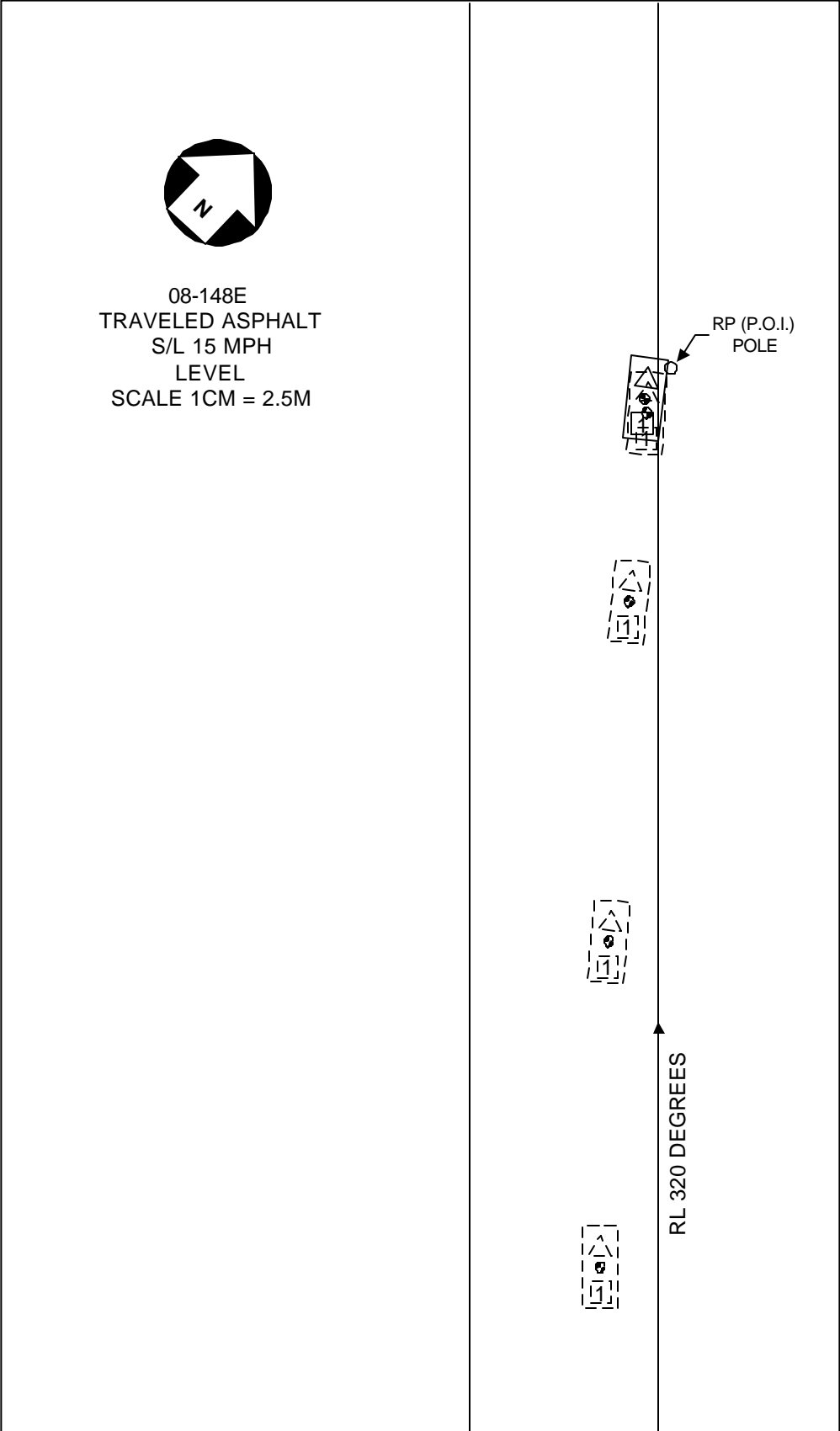


Figure 13. NASS scene schematic