

**NS-BODY
SAFETY LEADERSHIP TEAM (SLT)**

GENERAL INTRODUCTION
AND
ACTIVITIES/ISSUES REVIEW

**Product Direction Team
February 23, 1994**

**NS BODY
SAFETY LEADERSHIP TEAM (SLT)**

AGENDA

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*Voice over item

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General Review Schedule

- T.R. Cunningham Minivan Staff Meeting November 23, 1993
- NS-Body Market Launch Team December 16, 1993
- Minivan Operations Review with T.R. Cunningham February 15, 1994
- **Product Direction Team February 23, 1994**
- Owner Interview Clinic February 26/27, 1994
- Market Positioning Research May 1994
- NS-Body Market Launch Team Ongoing
- Product Strategy Team Ongoing
- Safety Leadership Team Ongoing

NS-BODY SAFETY LEADERSHIP TEAM (SLT)

Membership List

<u>Members</u>	<u>Organization</u>	<u>CIMS</u>	<u>Telephone</u>
James L. Boeberitz	Sales	414-05-29	876-3942
Mark W. Clemons	Chrysler-Plymouth Marketing	414-04-35	876-3763
Michael T. Delahanty	Competitive Information	483-10-08	776-6742
Virginia J. Fischbach	Safety Development	482-02-13	776-4758
William H. Hines	Dodge Marketing	414-04-40	876-5523
Neal E. Hoxsie	Finance	482-12-02	876-4898
Harlan E. Kifer	Product Design	483-46-10	776-1258
Frank O. Klegon	Electrical/Electronics	482-12-01	776-2843
Kenneth S. Mack	Liberty	463-00-00	880-5222
Fred W. Schmidt	Program Management	482-10-02	776-4827
Paul V. Sheridan	Minivan Operations*	482-08-02	776-4824
Scott A. Sullivan	Market Research	414-02-10	876-6280
Ronald S. Zarowitz	Safety Office	429-10-03	889-8211

* Chair

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Purpose/Mission Statement

- **Short Term** The immediate and crucial mission of the SLT is to ensure that the launch of the 1995-1/2 NS-Body includes cost effective features that legally support and therefore reclaim an advertisable safety leadership position versus competition within the minivan segment.

This short-term task will include establishment and communication of the safety leadership issue as a high priority among top management.

- **Ongoing** Continue to support the Minivan Platform with the task of maintaining safety leadership.

This ongoing effort will be rendered in the context of the ever-increasingly competitive challenges in the 1995 through 1998 model years.

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Approach

Establishment of an advertisable safety leadership claim is contingent upon a comparative advantage (versus competition) that is *legally defensible*. This contingency forces examination of each safety feature or function in the context of consistency with strict legal definitions/rulings. The "legally defensible" portion of proposed/existing safety features represent the focus of SLT activities.

Examples of (standard) safety features that support the leadership claim include:

- ABS
- Side Impact Protection
- Air Bags

Precedence has established a distinction between standard safety items versus those that are optional (or have price class dependent availability). In general, safety items need to be standard in order to be considered supportive of a safety leadership claim. Safety items that are optional can be utilized to support the overall safety image.

Examples of optional safety features that support the overall safety image include

- AWD/Traction Control
- Side and Rear Object Detection (SROD)
- Fog Lamps

It is also recognized that non-safety features, which have been associated with safety by previous practice, the competition or the media, merit SLT attention. Due to the resultant customer perceptions, and similar to optional safety features, non-safety items can be supportive of the overall safety image.

Examples of non-safety items that are perceived as safety-related include:

- 5 MPH Bumpers (financial)
- Theft/Security System (security)
- Extended Vehicle Range (convenience)

SLT activity will prioritize and recommend those standard safety features that establish superiority versus competition, and therefore support the advertisable leadership claim. Prioritization will involve managing the compromises between cost/investment and marketplace effectiveness. Optional safety features and non-safety items will be recommended on the basis of their support of the overall safety image. Proper execution of all three categories will support the optimal mix of reality and image.

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Minivan Segment Purchase Reasons History/Review

Listed below by segment are those respondents that list safety as either "Important" or "Very Important":

	1990	1992	1993
• Minivan Segment	72%	84%	86%
• Chrysler	71%	86%	88%
• Car Segment	73%	81%	82%
• Truck Segment	66%	71%	74%

Source: *Second Quarter C.A.R.*

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Minivan Segment Purchase Reasons History/Review

Two of the most important parameters of a marketing plan involves: 1) identifying the long-standing top purchase reasons among buyers
2) identifying the most rapidly rising reason(s) for purchase.

Shown below are the "Top Ten" purchase reasons for minivans through time. Note that in 1984, safety was not yet in the top-ten among (Chrysler) minivan buyers. The first year safety entered the top-ten was 1986, and has recently attained the #3 purchase reason position. This establishes safety as the most rapidly rising purchase reason among minivan buyers.

Note that the top two purchase reasons (Durability & Reliability and Well-Made Vehicle) are common across all vehicle segments through time. This implies that "Safety" is the number one purchase reason among Chrysler minivan buyers for normalized statistics, with "Riding Comfort" placing number two.

		1993			Memo
1984 Caravan/Voyager	1986 Caravan/Voyager	Caravan/Voyager/T&C	Minivan Segment	Passenger Cars	
Well-Made Vehicle	Well-Made Vehicle	Durability & Reliability	Durability & Reliability	Durability & Reliability	
Durability & Reliability	Durability & Reliability	Well-Made Vehicle	Well-Made Vehicle	Well-Made Vehicle	
Ease of Handling	Riding Comfort	SAFETY	Riding Comfort	Ease of Handling	
Warranty Coverage	Ease of Handling	Riding Comfort	SAFETY	Value	
Trunk/Cargo Space	Seating Capacity	Ease of Handling	Ease of Handling	Price/Deal Offered	
Riding Comfort	Warranty Coverage	Price/Deal Offered	Price/Deal Offered	Riding Comfort	
Seating Capacity	Value	Seating Capacity	Seating Capacity	SAFETY	
Gas Mileage	Trunk/Cargo Space	Value	Value	Manufacturer's Rep.	
Value	Dealer Service	Warranty Coverage	Warranty Coverage	Warranty Coverage	
Dealer Service	SAFETY	Manufacturer's Rep.	Manufacturer's Rep.	Fuel Economy	

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Safety Feature Prioritization Research

- Purpose:**
- Gather qualitative data to determine minivan segment requirements to sustain an advertisable safety leadership position for NS-Body launch.
 - Establish safety feature prioritization for launch and ongoing executions.
 - Verify value (and awareness) of existing AS-Body safety content, and NS-Body direction/plan.

Approach: It is recognized/emphasized that this research was only intended to provide an overall qualitative "snap shot" of the safety issue within the minivan segment. As such, strict quantitative assertions were not established.

Format: A focus group format was executed to expedite the input, and maintain low expenditure. Eight separate sessions occurred, split evenly between two geographic locations:

Ownership	Chicago		San Diego		Totals	
	Males	Females	Males	Females	Males	Females
• Chrysler (F)	---	10	---	8	---	18
• Chrysler (M)	10	---	11	---	21	---
• Domestic Competition	4	6	3	7	7	13
• Import Competition	2	8	3	9	5	17
Totals	16	24	17	24	33 41%	48 59%

Vehicle "ownership" was limited to 1992 and 1993 models; no (known) 1994 vehicle owners were present.

This research occurred November 3, 4, 5, 6, 1993. Analyzed as follows:

- Accident Avoidance
- Accident Survivability
- Other

Safety feature prices were presented to the groups to establish overall commercial viability.

The primary participants were from the SLT. Other organizational participation included Market Research, Volume Planning, Pricing, etc. Both advertising agencies (BBDO and Bozell) were present at both locations.

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Safety Feature Prioritization Research

General: For the Minivan segment, safety is of utmost importance, second only to "Durability & Reliability". In fact, several respondents felt that D&R was actually a safety item since roadside failure could cause endangerment.

In general, women are more conscious of the safety issue, prioritizing the "Accident Survivability" category. Men are concerned with safety but prioritize a vehicle's attributes with respect to "Accident Avoidance". Typically the women led the discussion during mixed groups, and were very responsive/active during "female-only" groups.

The group response to what they perceive to be "gimmicks or gadgets" was very negative. In the area of safety, only substantive features with recognizable function were favored.

Dual front air bags have become a primary purchase consideration for the segment. Those buyers that recently purchased minivans with driver's-only air bags were very sensitive to this deficiency. All groups assumed that dual air bags will eventually be standard for all brands.

A large majority voiced concern over blind spots or poor visibility. Both side and rear areas were mentioned, as well as both day and nighttime scenarios.

→ Vulnerability to side impacts, especially for rear seat passengers, was mentioned in all groups. For example, sliding side doors are interpreted as weak spots (as is the rear tailgate area). In general, the respondents felt that the minivan cannot have too much "structural strength".

A timely input involved ABS. Although more prominent in Chicago, the "average" conclusion is that ABS must be standard if a manufacturer expects to project a leadership position.

An important and valuable input from the groups was the low mental recall of Chrysler's minivan safety feature and compliance status as presented in our merchandising/advertising. Although the respondents were not currently "in the market," their lack of knowledge on the 1994 AS-Body safety status was apparent.

Specific: Recommended responses to the above generalities will occur on a priority basis. Prioritization of the safety features is shown on the "Original List" below.

Where possible the prioritization has included focus group opinion on safety feature merit and pricing, platform limitations such as timing, investment and piece price impacts, and the consensus of the SLT.

This overall process will continue to include/solicit MPT inputs.

Priority Key:

- A-Recommended
- B-Discussion/Development
- C-Drop
- NR-Not Researched

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Original List

SAFETY FEATURE PRIORITIZATION RESEARCH ITEMS

	Priority	Price Class Availability		
		Base/SE	LE	Luxury
Accident Avoidance				
• Signal O/S Rear View Mirrors	B	NA	NA	NA
• Proximity Detection/Enhancement		NA	NA	NA
– Side Object	A			
– Rear Object	A			
– Back-up Alert	C			
• Intelligent Cruise Control	C	NA	NA	NA
• Front O/S Lighting Enhancement		NA	NA	NA
– HID Headlamps	NR/B			
– Illuminated Entry/Keyhole	A			
– Ambient Sensitive On/Off Headlamps	NR/B			
– Remote and Delay Light-Your-Way	A			
– Daylight Running Lights	NR/B	NA	NA	NA
• Rear O/S Lighting Enhancement:				
– Fog Lamps	C			
– Amber Turn Signals	B			
– Bright B/U Lights	A			
– Fast Response CHMSL/Brake Lights	NR/A			
• Automatic Tire Pressure Adjustment	C	NA	NA	NA
• Low Tire Pressure Warning	B	NA	NA	NA
• Automatic Tint Rear View Mirrors	B	NA	S	S
• Tinted O/S Rear View Mirrors	B	NA	NA	NA
Accident Survivability				
• Center Rear Headrests	A	NA	NA	NA
• Off-set Impact Protection	A	NA	NA	NA
• Child Safety Seat				
– Split Recline	A	NA	NA	NA
• Side Air Bags	A			
• Shatter-proof side glass	B	NA	NA	NA
Other				
• Enhanced Cellular Communications				
– Telephone*	A	O	O	O
– Service Locator/Alert	B	NA	NA	NA
– Air Bag Deploy/Theft/Locator alert	B	NA	NA	NA
• Remote Keyless Entry	A			
– Locator/Panic Alert	A	NA	O	S
• Remote Start	C	NA	NA	NA
– With remote Heater - On				
– With remote A/C - On				
• Enhanced Fuel Economy Range	B	NA	NA	NA
• Remote Fuel Filler Door	NR	NA	NA	NA
• Sleep Alert	C	NA	NA	NA

*Dealer installed at present.

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1995 Ford Windstar Leadership Claim Statements

"More standard safety features than any other minivan"

**"The only minivan which meets Federal passenger car safety standards
and has standard ABS brakes and 5 mph bumpers"**

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Ford Windstar Safety Feature Comparison - Status

	1995		1995-1/2 NS-Body		
	Windstar	AS-Body	Base/SE	LE	Luxury
Accident Avoidance					
● ABS	S	O	S	S	S
● Park-Shift Interlock	S	NA	NA	NA	NA
● Amber Rear Turn Signals	S	NA	NA	NA	NA
Accident Survivability					
● Dual Front Air Bags	S	S	S	S	S
● Rear Seat Headrests					
- Second (2)	O*	O	O	O	S
- Third Outboard (2)	NA	NA	O	O	S
- Third Center (1)	NA	NA	NA	NA	NA
● FMVSS-208 (Frontal Impact)	S	S	S	S	S
● FMVSS-214 (Dynamic Side)	S	S	S	S	S
● Fuel Shut-Off Switch (360°, inertial)	S	NA	NA	NA	NA
Other					
● 5 MPH Bumper					
- Front	S?	NA	S?	S?	S?
- Rear	S?	NA	NA	NA	NA
● Dual Liftgate Latches	S	NA	NA	NA	NA
● Factory Anti-theft	O	NA	NA	O	O
● Extended Vehicle Range	O	NA	NA	NA	NA

Included as part of 1995 Ford safety leadership claim.

*Not available on third position; only available on LX with Quad Captain seating option.

SAFETY FEATURE INVESTIGATION ITEMS

Accident Avoidance

- Proximity Detection/Enhancement :
 - Side Object
 - Rear Object
- Traction Control
 - Low Speed
 - Full Speed
- Front O/S Lighting Enhancement:
 - Wipers On/Headlights On
 - Illuminated Entry/Keyhole
 - Remote and Delay Light-your-way
- Rear O/S Lighting Enhancement:
 - Bright B/U Lights
 - Fast Response CHMSL/Brake Lights

Accident Survivability

- Rear Seat Headrests
- Center Rear Headrests
- Child Safety Seat:
 - Split Recline
- Off-set Impact Protection
- Side Air Bags
- Seat Belt Pre-tensioners
- Automatic Power Door Lock Release
- Fuel Shut-Off Switch

Other

- Enhanced Celular Communications
 - Telephone*
- Remote Keyless Entry
 - Locator/Panic Alert
- 5 MPH Bumper
 - Front
 - Rear

<u>Timing</u>	<u>Financials</u>	<u>Piece Cost</u>	<u>Investment</u>	<u>Volume</u>	<u>Weight</u>
	Information				
	to be				
	submitted/consensed				
	by				
	Minivan				
	Platform				
	Team				
	Submittal timing				
	to be				
	discussed				
	at				
	PDT				

*Dealer installed at present.

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SAFETY FEATURE INVESTIGATION ITEMS

Accident Avoidance

- Signal O/S Rear View Mirrors
- Front O/S Lighting Enhancement
 - HID Headlamps
 - Automatic On/Off Headlamps
 - Daylight Running Lights (DRL)
- Rear O/S Lighting Enhancement:
 - Amber Turning Signals
- Park Shift Interlock
- Low Tire Pressure Warning
- Automatic Tint Rear View Mirrors
- Tinted O/S Rear View Mirrors

Accident Survivability

- Shatter-proof Side Glass

Other

- Enhanced Celular Communications
 - Service Locator/Alert
 - Air Bag Deploy/Theft/Locator Alert
- Enhanced Fuel Economy Range

Timing	Financials		
	Piece Cost	Investment	Volume Weight
	Information to be submitted/consented by Minivan Platform Team		
	Submittal timing to be discussed at PDT		

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- Signal Outside Rear View Mirrors: These outside rear view mirrors also function as taillamps. When the turn signals, brake, back-up, or emergency flashers are activated, the mirror illuminates with an appropriate signal, thus making the driver's intentions more obvious. The driver only sees the reflective mirror at all times: other drivers, which are adjacent to the signal mirror equipped vehicle, see the signal lights only. These mirrors can also be used in conjunction with the side or back-up object detection system as an electronic warning display for driver information. (See "Proximity Detection").
- Proximity Detection/Enhancement
 - Back-up Detection System: This feature will inform the driver who is in "reverse" that his/her path is not clear of traffic or obstructions. This information could be displayed on an overhead console or in the mirrors. This feature is especially useful when the obstruction is blocked from the driver's line-of-sight, or is not viewable in the mirrors.
 - Back-up Alert: Like the Back-up Detection System, the Back-up Alert increases the safety of rearward motion of the vehicle. In this case, pedestrian traffic is the recipient of an audible beeper or chime that informs them of the driver's intention to back up. Like the Back-up Detection System, the Back-up Alert is engaged when the vehicle gearshift is placed in "reverse". The beeper would be mounted on the rear of the vehicle.
 - Side Object Detection System: This feature would serve as a lane change aid, informing the driver when objects are next to or approaching the vehicle in adjacent lanes. Similar to the Back-up Detection System, this information could be displayed in the mirrors, and is especially useful when the adjacent vehicle is in the "blind spot".
- Intelligent Cruise Control: In today's cars, cruise control maintains the vehicle speed at a speed that is pre-set by the driver. A new kind of cruise control, "Intelligent Cruise Control", maintains the speed and keeps a safe distance to the car in front as when it was set. It won't let the car go any faster than the set speed, but it allows the car to decelerate to keep the safe distance when a car in front slows down. Then, it will automatically return to the set speed when the road is clear, the driver changes to an open lane, or the car in front speeds up again. The driver still has to pay attention for sudden changes which might require braking or turning, but on long drives this system will reduce fatigue and therefore enhance driver alertness.
- Front Outside Lighting Enhancement
 - High Intensity Discharge (HID) Headlamps: Today's headlamp operation is similar to the familiar incandescent household lamp. The halogen lamp and changes in filament construction and material have vastly improved automotive headlamp life and light output. However, there remains some drawbacks to the incandescent technology. They still burn out during the life of the vehicle, and light tone and quality is usually not optimal for all highway conditions. For example, today's halogen does not illuminate all objects with the same clarity due to a tendency to have a brown tint to the light tone. The HID incorporates a technology similar to the florescent lamp. Because there is no filament to burn out, the HID is expected to last about ten years and would probably be warranted for the life of the vehicle. Like the florescent lamp, different shades or tones can be designed which improve the light quality. Research has shown that light that has a blue-white tone is superior to the brown commonly found in today's incandescent halogen headlamp. With the improved light quality of the HID, there is less need to increase light brightness, which can be a hazard to oncoming drivers.

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- Front Outside Lighting Enhancement, continued
 - Illuminated Entry/Keyhole: Either by remote key fob control or by momentary front door handle movement, the interior lights and keyhole are illuminated. In night-time or dark surroundings, interior lighting provides added security via detection of hidden intruders, etc. Keyhole illumination allows quicker unlock and entry, etc.
 - Ambient Sensitive On/Off: This system will sense when ambient light levels have changed, and respond by automatically controlling headlamp on/off operation. For example, when a vehicle is driving down a sunny highway, the headlamps would be "off". When this vehicle enters a tunnel and the light level drops to darkness, the headlamps will automatically turn "on". Once through the tunnel, the headlamps would again turn "off". A similar operation would occur when entering a darkly lit parking area or garage. This system will also operate during the normal daily transitions from day to night and from night to day.
 - Remote and Delay Light-Your-Way: In low light circumstances it would be convenient to remotely operate the headlamps. Conditions such as dark or unlighted parking lots, driveways, unfamiliar terrain, etc. could be more safely traveled en route to the vehicle with lighting provided by the headlamps. Typically the key fob would be used to transmit the headlight "on-off" command to the vehicle. After a specified period of time the headlamps would automatically turn "off" or would return to normal operation controlled by the dashboard switch. When traveling away from the vehicle, this system would delay turning "off" the headlamps for a specified period of time.
 - Daylight Running Lights: This system will automatically turn on the headlights when the engine is started. The headlights remain on regardless of operating conditions, and will improve vehicle conspicuousness. (Currently required in Canada.)
 - Wipers On/Headlamps On: Many states now require that the headlamps be on when conditions warrant use of the windshield wipers. (Current system requires manual turn-on of the headlamps, and therefore manual turnoff, concurrent with wiper status.) This system would automatically turn on and off the headlamps with the wipers, but not during windshield washer function.
- Rear Outside Lighting Enhancement
 - Fog Lamps: In moderate to dense fog conditions, the visibility of the standard red taillamp and brake light is severely reduced. This is because the color red is absorbed by the water vapor that causes fog. Rear end collisions can occur when the range of the standard red taillamps does not alert the driver, who is approaching from the rear, in sufficient time. In Europe, a high intensity, rear-facing fog lamp is used to ensure that the light penetrates the fog and therefore provides adequate warning to approaching drivers.
 - Amber Turn Signals: In older taillamp designs, the brake light and the turn signal light were in the same location, using the same bulb, with the same red lens color (same location, same color). In other designs, the brake light and the turn signal light have separated locations, using two separate bulbs, but continue to use a red lens (different location, same color). This second design has been shown to enhance the response time of the driver who is following the signaling vehicle in front. By having two separate bulbs, the reliability of the driver's intentions is increased because it is rare that

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- Rear Outside Lighting Enhancement, Continued

both bulbs will burn out. Amber turn signals are similar to this second design but the lens color for the turn signals is amber. This design adds an extra dimension to the communication process between drivers. The amber color is distinct from the red taillamp and red brake light, and more strongly communicates an intention to turn by virtue of its separated location and color.

- Bright Back-up Lights: Many vehicles, especially minivans, utilize tinted or sunscreen glass to reduce glare, minimize interior materials fading from sunlight, and reduce the load on the air conditioner. However, this type of glass can reduce driver visibility when looking through the side or rear windows. This is especially true at night. In the minivan there can be additional limitations on visibility due to the size and layout of these vehicles, rear seat headrests, and rear seat passengers. Therefore the night time backing of these vehicles could be enhanced with the use of brighter back-up lights. The typical back-up light is 10 watts. This proposal would increase the bulb to 50 watts, and would greatly increase illumination and therefore visibility.

- Rear Outside Lighting Enhancement, continued

- Fast Response CHMSL/Brake Lights: Similar to today's headlamp design, brake lights use incandescent bulb technology (see "High Intensity Discharge Headlamps" above). Incandescent bulbs take a relatively long time to rise from zero light to full luminosity. Neon lighting technology is much faster. The "rise time" of a light bulb is very important when talking about brake lights, and stopping distances. A typical neon light will reach full luminosity 200 milliseconds faster than an incandescent bulb. At 65 mph, a typical highway speed limit, this 200 milliseconds is equivalent to nearly 20 feet, or two full car lengths. This extra distance will reduce the likelihood of rear end collisions.

- Automatic Tire Pressure Adjustment: The inflation level of the tires is crucial to safe vehicle handling at high speed, maneuvering at low speed, and stopping at all speeds. Inflation level affects ride quality, and therefore the fatigue experienced by the driver from vibration and noise. Inflation will also affect tire wear rate and overall reliability. During normal vehicle operation, the pressures can vary as much as 50%. Changes in tire temperature can drastically change pressure. During early morning when the outside temperature is low and the vehicle has remained stationary overnight, the tire pressure might be too low. That same vehicle driving at highway speeds in the afternoon might have high tire pressures. Sometimes the vehicle will have different pressures in all four tires. An Automatic Tire Pressure Adjustment system is proposed for the minivan. This system would operate the instant the engine was started. Sensors at all four tires would be able to measure their pressures and signal the system computer that a tire is low or high or properly inflated. If a tire is low, an air compressor which is routed by valves and tubing to the tires would increase the pressure to the proper level. If a tire was too high, those same valves would be directed by the system to bleed off pressure. This system would maintain constant, proper tire inflation pressure in most conditions. If a bad leak develops and the air compressor cannot establish the proper inflation, the system would alert the driver with a warning light that repairs are required. During high temperature highway speeds, if the system detects high pressure, it would automatically reduce the inflation level to prevent possible tire failure (blowout).

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- Low Tire Pressure Warning: Similar to the Automatic Tire Pressure Adjustment, this device would be capable of individually monitoring the tire pressures at all four locations. This system would alert the vehicle operator of a low pressure condition via a warning indicator at the instrument panel. The driver would then have to manually inflate the low tire(s) to the proper level.
- Automatic Tint Mirrors: These mirrors are common on today's higher priced vehicles. The primary function is to automatically increase the tint level in the mirrors which will minimize the glare from headlights or sunlight. This mirror feature operates similar to photosensitive sunglasses, and will automatically decrease the tint when the light levels are reduced. These mirrors are available for both inside and outside locations.
- Tinted O/S Rear View Mirrors: The tint level would remain constant, typically in blue or gray, to reduce headlight/sunlight glare.
- Park-Shift Interlock: This system prevents inadvertent movement of the automatic transmission shift lever from the 'park' position unless the brakes/brake pedal are first engaged.

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Accident Survivability, Page 1 of 2

- **Headrests:** Many of today's minivans have seats for seven people. All minivans have headrests on the front seats and some have headrests at four of the five rear seat positions, leaving the headrest off the center seat of the back row to improve rear visibility for the driver. However, this visibility is eliminated when a passenger is seated in this position. It is therefore proposed that all passenger locations have the availability of headrests, which would ensure protection for all passengers in the rear end collision scenario.
- **Off-set Impact Protection:** When cars, trucks, or vans are crash tested, they are crashed head-on into a solid wall. This crash test hits the front of the car evenly. A new idea for testing would hit only part of the front, forcing the energy of the accident into a smaller part of the car. The off-set accident scenario is very common on today's highway, and therefore added protection on a side-to-side basis is realistic. This off-set impact protection requires specific engineering changes to the design of the minivan structure.
- **Integrated Child Safety Seat:** Some minivans have two built-in child safety seats, next to each other in the first rear bench. Starting in 1994, some of these child seats can recline to let the children sleep more comfortably. It is proposed that each of the two child seats be able to recline separately, instead of both being forced to recline to the same angle. This will improve the ability of the driver to provide appropriate comfort levels for two different size and age children. By doing so, distractions from complaining child passengers should be minimized, which will enhance driver attentiveness.
- **Side Air Bags:** Most minivans have a driver's side air bag. Some newer models have both a driver and a front passenger air bag. These air bags have been the most effective safety device for protecting frontal crash victims. The mounting of air bags to protect against side impact is being considered for minivans. These devices would be mounted in the door panels or the vehicle side panel and would be activated in a similar manner to the front crash, except would protect during the so-called "broadside" collision. This side air bag is meant to complement the existing side and door intrusion beams, which are additional pieces of steel meant to protect against crash intrusion.
- **Seat Belt Pre-Tensioners:** Seat belt systems are designed to minimize discomfort during use. Typically this requires a looser fit than optimal for certain crash or hard stop scenarios. The pre-tensioners would react with similar speed to that of the air bags, and would quickly tighten the belts to optimize occupant retention.
- **Automatic Power Door Lock Release:** In the event of a serious crash or rollover, rapid exit from or access to the passenger compartment is crucial. This system would automatically unlock all doors equipped with a power mechanism.

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Accident Survivability, Page 2 of 2

- Fuel Shut-Off Switch: Similar to the automatic power door lock release, the fuel shut-off switch is activated during a serious incident. The sensor inputs needed to activate the system are multi-directional (frontal, rear, side, rollover, etc.) This system will automatically shut down the electric fuel pump, thereby minimizing the changes or severity of after-crash fires.
- Shatter-proof side glass: TBD

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Other Safety Features, Page 1 of 2

- **Enhanced Cellular Telephone:** Many people have cellular telephones today. It would be possible for the cellular telephone to provide the following additional safety-related features:
 - **Service Location:** For emergency roadside help (towing, repair), touch one button to be connected to a national telephone number. You will then be automatically connected to a local dealer or other repair facility.
 - **Accident Alert:** When the air bag or bags are triggered, the telephone automatically dials 911. All you need to do is speak, or if you are unable to speak, the phone will send its own accident alert message to authorities, who can locate the cellular phone call, and respond accordingly.
 - **Theft Alert:** If your security system is triggered and not correctly turned off within a certain time, the telephone automatically dials 911 and sends a special theft message to police who can locate the position of a cellular phone call, and therefore the location of the stolen vehicle.
- **Remote Keyless Entry with Panic:** This can be thought of as a customer's personal alarm using the vehicle's remote keyless entry system. As a customer approaches their vehicle, they can activate the horn and lights by pressing the red "panic" button on the hand-held transmitter during any unsafe situation. The system is automatically turned off after 3 minutes or by pressing the "panic" button or turning on the ignition. The customer must be within the operating range of the transmitter (approximately 22 feet from the vehicle). Upon pressing the panic button the horn will pulse, headlamps and marker lamps will flash, and the interior lights are turned on for up to three minutes. The system is automatically turned off after 3 minutes or by pressing the "panic" button or turning on the ignition.
- **Remote Start:** From the same key fob used with Remote Keyless Entry, a vehicle can be equipped to start the engine, and turn on certain accessories from a remote location. This can be useful in winter climates when the vehicle has been stored outside, especially overnight. While preparing for the daily commute, the driver could start the vehicle from the household, turn on the heater and defroster, and therefore save the time and effort associated with de-icing, or the attainment of vehicle interior comfort levels. A similar scenario can be envisioned for warm climates, especially when the vehicle has been stored in direct sunlight. In this case the air conditioner could be part of the remote engine start feature.

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Other Safety Features, Page 2 of 2

- **Enhanced Vehicle Fuel Range:** During urban travel, when numerous gas stations are available, how far a vehicle will travel between fuel fills is not usually a concern. As fuel efficiency continues to improve, vehicle range will also improve. On level roads the vehicle's travel range is maximized. A typical range in these conditions can be as high as 500 miles. However when a vehicle, like a minivan, is loaded with passengers and luggage, or is towing a trailer, the fuel economy will decrease substantially. When minivans are driven in hilly terrain, the fuel economy will be decreased as well. These conditions, which are frequently experienced, can reduce a minivan range to 300 miles. This reduced range can be an issue when traveling in non-urban settings, where fuel stations are more sparsely located. For a given fuel efficiency, the easiest way to improve a minivan's fuel range is by increasing the fuel tank capacity. A typical fuel tank will hold 20 gallons. To enhance a minivan's range, a 26 gallon tank can be made optional. In good highway conditions with light loads, this optional capacity can increase the range to 650 miles. When fuel efficiency has been reduced due to load or terrain, the 26 gallon tank can provide nearly 400 miles of range. When traveling long distances, the enhanced range can be a substantial convenience.
- **Remote Fuel Filler Door:** This feature provides a locking mechanism at the fuel filler door to prevent theft or tampering. Unlocking the fuel filler door is remotely controlled (typically) from the driver's seat via a cabled lever or a button when solenoid controlled.
- **Sleep Alert:** Drowsiness or falling asleep while driving contributes to accidents. Eyes and eyelids move in a different way when someone is beginning to become sleepy. A harmless, invisible beam of light aimed from the dashboard at the driver's eye can tell when the eye and eyelid begin to move in a way which means the driver is becoming sleepy. Then, an alarm can be sounded to wake the driver up.

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Appendix

- **General Safety Statistics Overview**
 - **Vehicle/Roadway Death Statistics**
 - **Death Cause Statistics - 1990**
 - **Injury-Related Death Statistics - 1990**
 - **Accident Causation Statistics**
 - **Fatality Risk - Psychographic Profile**

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Vehicle/Roadway Death Statistics

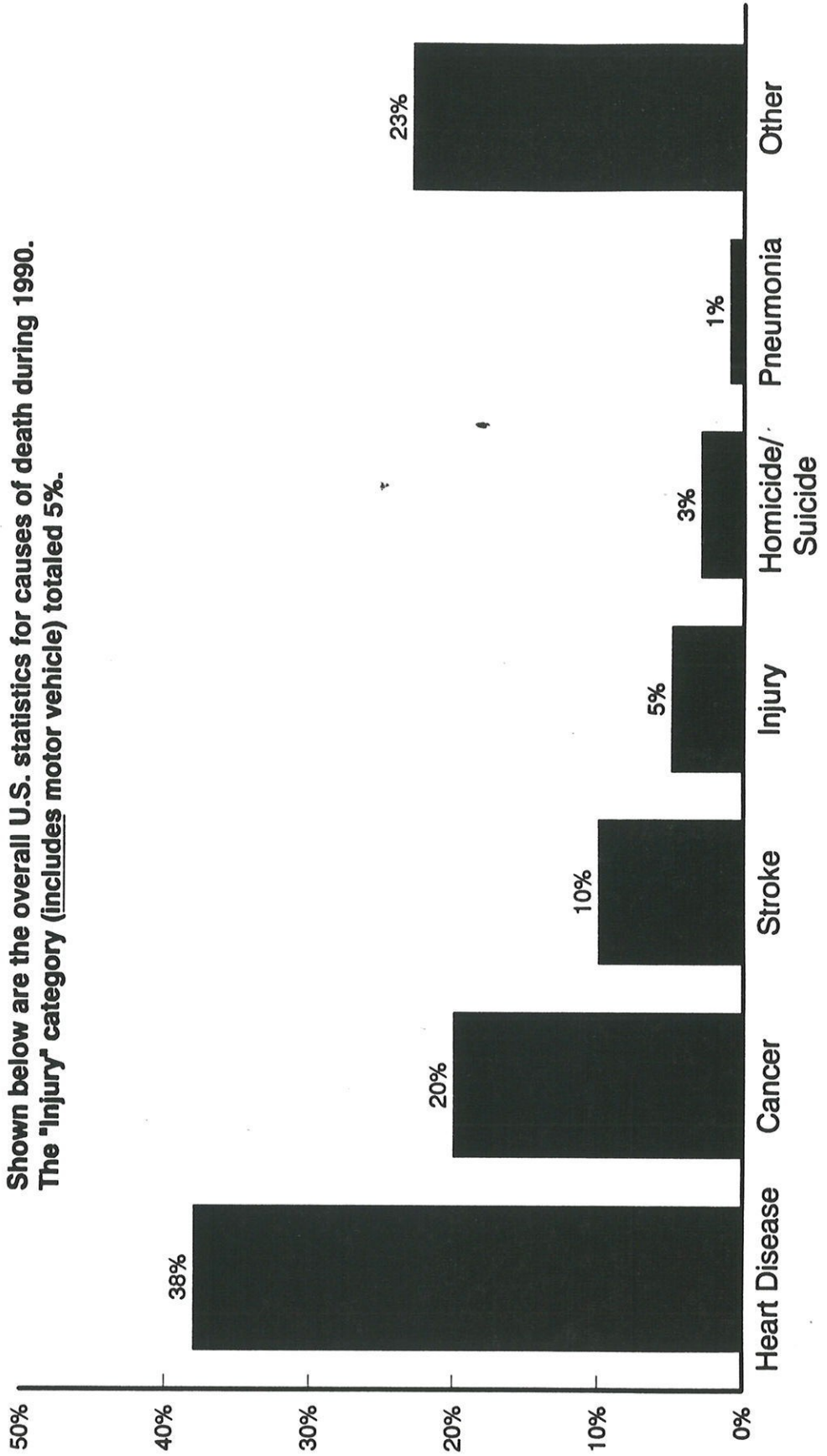
The statistics listed below are meant to demonstrate the trend in highway/vehicle safety in the context of "fatalities per." For example, the fatalities in the year 1930 per 100 million miles traveled was 15.60. By 1990, this statistic dropped 86% to 2.10. Similar trends are indicated in the other normalized data.

Calendar Year	All Deaths	Occupant Deaths	Deaths Per		
			100M Miles	10K Vehicles	100K Pop.
1930	31,050	5,700	15.60	12.10	25.30
1940	33,549	9,500	11.49	10.41	25.40
1950	34,763	11,650	7.59	7.07	23.00
1960	38,137	14,800	5.31	5.12	21.20
1970	54,633	23,200	4.98	4.92	26.80
1980	53,172	23,000	3.50	3.28	23.40
1990	48,000	21,500	2.10	2.60	19.90
Improvement/(Degradation) 1990 vs. 1930			86%	79%	21%
			(55%)	(277%)	

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**Death Cause Statistics - 1990
(Percent)**

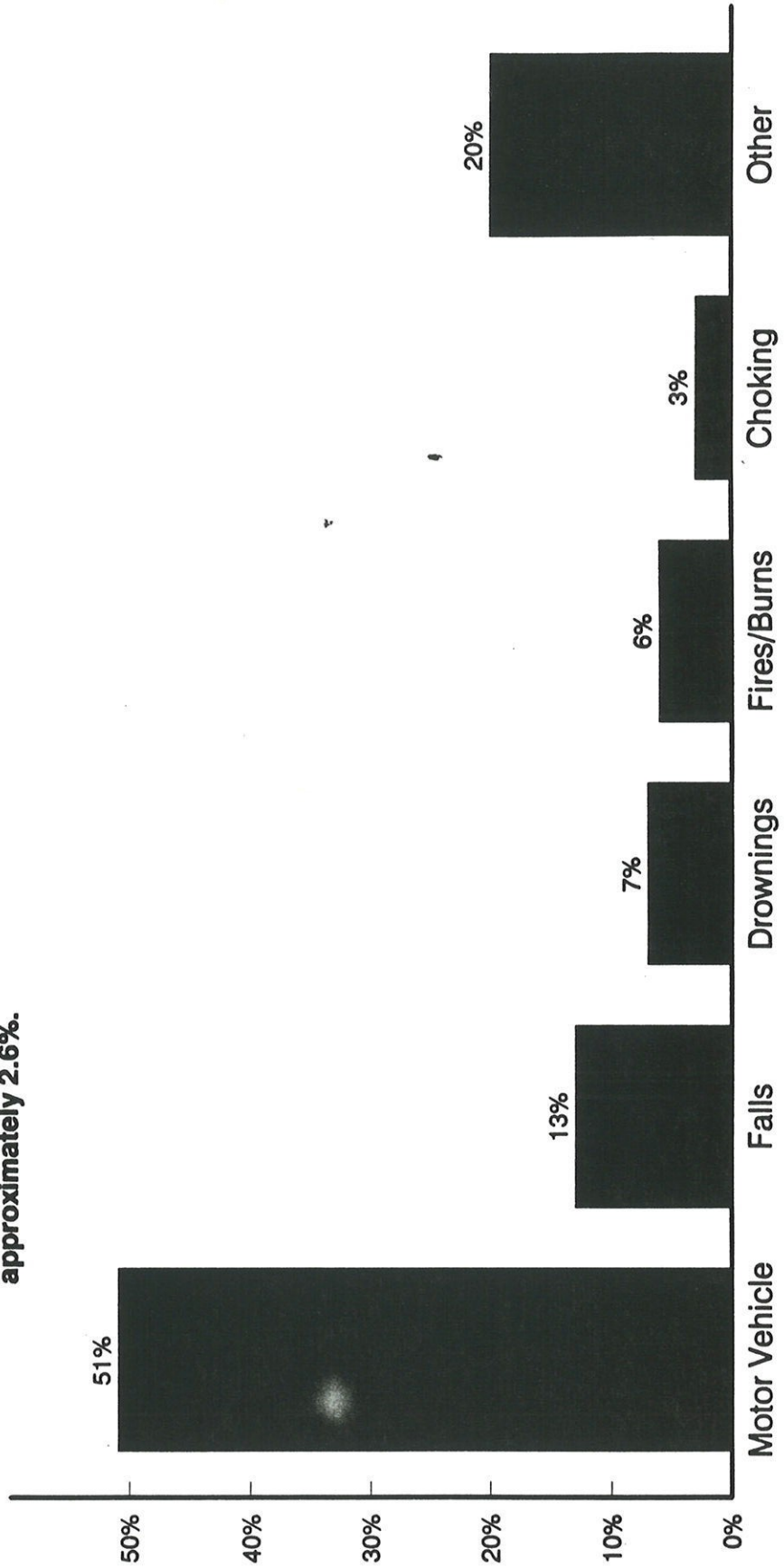
Shown below are the overall U.S. statistics for causes of death during 1990.
The "Injury" category (includes motor vehicle) totaled 5%.



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**Injury-Related Death Statistics - 1990
(Percent)**

Of the 5% overall death rate attributed to "Injury", 51% within this category were caused by use of motor vehicles. The conglomerate statistic is approximately 2.6%.



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Accident Causation Statistics

	Reported Conditions	Accident Outcome		
		Fatality	Injury Only	All
▶	Improper Driving	61.9%	73.7%	72.7%
-	Speeding	26.7	23.1	18.9
-	Right-of-Way	12.2	25.4	23.4
•	Failure to Yield	8.4	18.2	17.8
•	Passed Stop Sign	2.1	2.0	1.6
•	Disregard Signal	1.7	5.2	4.0
-	Drive Across Centerline	4.5	1.5	1.7
-	Improper Passing	6.2	2.0	2.4
-	Improper Turn	0.4	1.5	2.6
-	"Tailgating"	0.7	6.1	6.4
-	Other	11.2	14.1	17.3
▶	Other	38.1%	26.3%	27.3%

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Fatality Risk - Psychographic Profile

Risk Factor	Maximum	Mean	Minimum
• Gender	Male	---	Female
• Age	18	TBD	40
• Vehicle Weight	700 pounds lighter than mean	Mean	700 pounds heavier than mean
• Lap/shoulder Belt Use	No	---	Yes
• Road Type	Two-Lane	---	Separated Highway
• Conditions	Night	---	Day
• Sobriety	Intoxicated	---	Sober
▶ Fatality Risk	93.1 per 100M miles	1.2 per 100M miles	0.08 per 100M miles
▶ Relative Risk Range	←	1200:1	→