CCMTA·CCATM
CANADIAN COUNCIL OF MOTOR TRANSPORT ADMINISTRATORS
CONSEIL CANADIEN DES ADMINISTRATEURS EN TRANSPORT MOTORISÉ

Evaluation of 15-Passenger Vans

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Note: The focus of the testing reported in this document was on stability control, dynamic manoeuvring and crashworthiness (although limited crashworthiness testing for occupant protection was conducted).

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Executive Summary

The Canadian Council of Motor Transport Administrators (CCMTA) has been directed by the Council of Ministers for Transportation to address concerns relating to the regulation and use of 15-passenger vans. CCMTA's mandate is to develop a national approach to the use of 15-passenger vans, especially when used for school purposes.

The term "15-passenger van" refers to large vehicles with five rows of seats intended to transport up to 15 people including the driver.

In general, a 15-passenger van is a large light-duty vehicle with some characteristics of a heavy-duty vehicle.

In Canada there are four makes of 15-passenger vans: Chevrolet, Dodge, Ford and GMC. Dodge discontinued its 15-passenger vans in 2002. Tables 1 and 2 below indicate the number of 15-passenger vans registered in Canada as of 2009 and the number of fatalities from 1998 to 2007:

Table 1 – Registered 15-Passenger Vans in Canada, 2009

Make	Total Registered in Canada
Chevrolet	9,507
Dodge	3,840
Ford	11,358
GMC	2,968
Total	**27,673**

Table 2 – Comparison of 15-Passenger Van Fatalities (1998–2007)

Description	Motor Vehicle Collision Fatalities	
	Number	Percentage
All Motor Vehicles	28,532	100%
School Buses	13	0.05%
15-Passenger Vans	34	0.12%

Background

On January 12, 2008, a 15-passenger van carrying a school team crashed in New Brunswick, and eight of the twelve occupants were killed.

In June 2010, then federal transport minister John Baird announced a review of the safety standards applicable to 15-passenger vans. The safety review was to include consultation with provincial and territorial governments, and was subsequently discussed at the Council of Ministers for Transportation (COMT) meeting in September 2010 in Halifax.

At the COMT meeting, the Canadian Council of Motor Transport Administrators (CCMTA) was directed to address concerns relating to the regulation and use of the vehicles for the purposes of transporting pupils.

CCMTA's evaluation of the design and use of 15-passenger vans includes a review of:

1. Research related to vehicle safety testing
2. Manufacturing standards/design and collision statistics
3. Review of safety and collision data of 15-passenger vans vs. other like vehicles and the recommendations and actions that resulted from this testing
4. Review of the current safety standards and guidelines for the use of 15-passenger vans in Canadian jurisdictions
5. Alternative vehicles used to transport pupils
6. Identification and analysis of possible options for a national approach to the use of 15-passenger vans in Canada

Transport Canada's Van Safety Review

Transport Canada completed 3 phases of testing as part of its Van Safety Review, with a focus on 15-passenger vans:

Phase I – Stability Testing

- Seven vehicles tested: a minivan, a 12-passenger van, two 15-passenger vans, two small school buses and a Multi-Functional Activity Bus (MFAB)

- Four tests completed: emergency stop, static stability factor, static rollover threshold and load configuration

Phase II – Dynamic Manoeuvring Testing

- Three vehicles tested: two 15-passenger vans and an MFAB
- Three tests completed: sudden lane change and recovery

Phase III – Limited Crashworthiness Testing

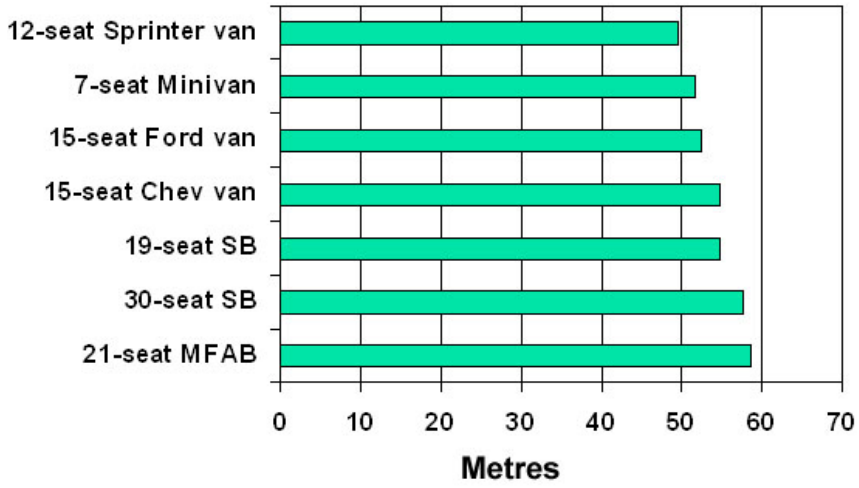
- Two vehicles tested: a 15-passenger van and an MFAB
- Side impact crash testing for each vehicle with a Ford F150 pickup truck

Results

Phase I – Emergency Stopping

- The emergency stopping distance was determined both when unloaded and fully loaded. The testing determined that emergency stopping distances from 100 km/h varied from 49.6 to 59.9 metres when unloaded and from 49.6 to 58.5 metres when loaded.

Table 3 – Emergency Stopping Distance from 100 km/h for Loaded Vehicles



- Test results show stopping distance generally increased with an increase in load, with the exception of the 12-seat Sprinter, which obtained the shortest distance in the test.

Transport Canada's testing shows that 15-passenger vans performed marginally better than both school buses and MFABs.

Phase I – Static Stability Factor (SSF)

- SSF is a measure of the rollover resistance of a vehicle. A vehicle with a high SSF will be more stable in roll than a vehicle with a lower SSF. SSF is a measure of how top-heavy a vehicle is. It is used to estimate the probability (rollover risk) that a vehicle will roll if tripped sideways in a single-vehicle crash, such as when a vehicle leaves the paved shoulder of the road.

Table 4 – Static Stability Factor for Test Vehicles

Vehicle	SSF	Rollover Risk	US Rollover Rating
7-seat minivan	1.27	17%	★★★★
15-seat Ford van	1.08	33%	★★
15-seat Chevrolet van	1.06	36%	★★
21-seat MFAB	1.06	36%	★★
30-seat school bus	0.99	52%	★
12-seat Sprinter van	0.95	69%	★
19-seat school bus	0.94	74%	★

- Transport Canada's test results ranged from the most stable, a 7-seat minivan with an SSF of 1.27, and the least stable, the 19-seat school bus with an SSF of 0.94. The two 15-passenger vans and the MFAB ranked after the minivan, with an SSF between 1.08 and 1.06.

Phase I – Static Rollover Threshold (SRT)

- SRT is the basic measure of the rollover stability of a vehicle; it is computed from the results of a test where the vehicle is tilted sideways until it rolls over. The SRT provides a good predictor of the risk of rollover in a constant radius curve and constant speed situation such as a highway exit ramp.

Table 5 – Static Rollover Threshold (SRT) for Fully Loaded Vehicles

Vehicle	SSF	Roll Threshold (g)
7-seat minivan	1.27	1.04
21-seat MFAB	1.06	0.81
15-seat Chevrolet van	1.06	0.80
12-seat Sprinter van	0.95	0.80
15-seat Ford van	1.08	0.78
30-seat school bus	0.99	0.77
19-seat school bus	0.94	0.72

- Test results show there are three groupings in the tilt table tests: first the minivan, with an SRT of 1.04 g; second the two 15-passenger vans, the MFAB, the 12-seat Sprinter and the 30-seat school bus, with a SRTs of 0.77 to 0.81; third the 19-seat school bus, with an SRT of 0.72. All tested vehicles had SRTs greater than 0.6 g, so it would be extremely difficult, if not impossible, to induce a pure rollover.

Phase II – Step Input Manoeuvre

- The purpose of this test is to characterize how the vehicle reacts to a sudden steer input. The test was performed at three levels of steering severity.
- These manoeuvres help evaluate the characteristics of each vehicle.
- Seven step input metrics were computed as follows (see Appendix C for results):
    - **Steady-state yaw velocity response gain** [s^{-1}] is obtained by dividing the yaw rate by the steering wheel angle when yaw rate reaches steady state.
    - **Lateral acceleration response time** [s] is obtained by measuring the time required for lateral acceleration to first reach 90% of the steady-state lateral acceleration.
    - **Yaw velocity response time** [s] is obtained by measuring the time required for yaw rate to first reach 90% of the steady-state yaw rate.
    - **Lateral acceleration peak response time** [s] is obtained by measuring the time required for lateral acceleration to reach its peak value.

- **Yaw velocity peak response time** [s] is obtained by measuring the time required for yaw rate to reach its peak value.
- **Overshoot value of lateral acceleration** [unitless] is the ratio of the difference of the peak value and steady-state value of lateral acceleration divided by the steady-state value of lateral acceleration.
- **Overshoot value of yaw velocity** [unitless] is the ratio of the difference of the peak value and steady-state value of yaw rate divided by the steady-state value of yaw rate.

Phase II – Sine with Dwell Manoeuvre

- This test simulates a sudden lane change to avoid an obstacle on the road. It is also used by Transport Canada to verify compliance with CMVSS 126 Electronic Stability Control (ESC) systems. This manoeuvre is designed to create an oversteering reaction (spinout) in a vehicle with either no or a poorly performing ESC.
- The yaw rate ratio is defined as the vehicle yaw rate measured 1 second (or 1¾ seconds) after completion of the manoeuvre divided by the first peak value of yaw rate measured after the steering wheel angle changes sign. Yaw rate ratios in the Sine with Dwell manoeuvre at 1 s and 1 ¾ s after completion of the manoeuvre can be reviewed in Appendix B.
- Test results show that both 15-passenger vans could complete the Sine with Dwell manoeuvres when ESC was enabled. None of the vehicles could complete the Sine with Dwell manoeuvres with ESC deactivated or not present.

Phase II – Fishhook Manoeuvre

- This test approximates the steering that a driver, acting in panic, might use in an effort to regain lane position once the vehicle has strayed onto an unpaved shoulder of the road.
- Test results show that both 15-passenger vans could complete the fishhook manoeuvres when ESC was enabled. None of the vehicles could complete the fishhook manoeuvres with ESC deactivated or not present. Some wheel lift was apparent on the 15-passenger vans when ESC was deactivated. This occurred mostly at the end of the spinout. The test

videos did not show any contact between the outriggers and the test track surface. The situation was quite different with the MFAB; the vehicle rolled so much that it would have rolled over if it had not been fitted with outriggers.

- In the last test performed with the Chevrolet Express, with ESC disabled, full load, and rear tires inflated to 340 kPa (50 psi), the rear tire on the exterior side of the vehicle de-beaded; this was the only case where tire de-beading occurred.

Phase III – Limited Crashworthiness Testing

- Crash testing was completed with two 2009 Ford F150 pick-up trucks colliding with the sides of both a 2011 Ford 15-passenger van and a 2011 Girardin MFAB.
- Both the 15-passenger van and MFAB exhibited significant casualties and limitations in their ability to protect the dummy occupants. A more severe collision (for example, the F150 travelling at a higher speed, or a heavier striking vehicle such as a tractor-trailer instead of the F-150) would be expected to result in even higher casualties. As such, no further crash testing is planned.

- Results show all seven test dummies in both vehicles sustained moderate to severe injuries to the head, neck, chest, organs or spine.

Canadian Safety Data

Fifteen-passenger vans are considered light-duty vehicles such as smaller vans and Sport Utility Vehicles (SUVs) with a GVWR range from 4,128 kg to 4,491 kg. Fifteen-passenger vans also meet the definition of a bus, which is defined as a vehicle designed for 10 or more passengers. Below are the safety features and requirements for the design and use of 15-passenger vans in Canada:

Safety Standards	Requirements in Canada
Vehicle Manufacturing Standards	Fifteen-passenger vans along with other heavier light-duty vehicles have fewer requirements regarding roof strength than other passenger vehicles. However by 2016 there will be more stringent roof strength requirements for all vehicles, including 15-passenger vans.

Safety Standards	Requirements in Canada
Manufacturers' Safety Features	Fifteen-passenger vans, like all vehicles, have added safety features as standard equipment such as: ▪ Front, passenger and curtain airbags ▪ Three-point seatbelts ▪ Electronic Stability Control (ESC) and ▪ Low tire pressure warning system
Vehicle Inspection Requirements (NSC 11B & 13)	According to the CCMTA survey, 11 provinces and territories consider 15-passenger vans to be commercial vehicles, except those operated for personal use. As commercial vehicles, they require semi-annual inspections under National Safety Code (NSC) 11B and daily inspections under NSC 13.
Tire Maintenance	A 15-passenger van's tire pressure is required to be measured semi-annually under NSC 11B to the placard required pressure. Transport Canada recommends tire pressure be measured monthly, although there is no requirement to do so.
Driver Licensing	▪ Commercial Use – all jurisdictions require a minimum of Class 4 licence. ▪ Unscheduled transportation of pupils – 6 of 11 jurisdictions require a minimum of Class 4 licence, 2 jurisdictions do not permit the use of 15-passenger vans, 1 requires a school bus endorsement (SBE) and 2 require a Class 5. ▪ Scheduled transportation of pupils to and from school – 4 jurisdictions require a minimum of Class 4 licence, 3 require Class 4 with SBE, 3 jurisdictions do not permit the use of 15-passenger vans and 1 requires a Class 5.
Hours of Service (NSC 9)	Drivers of 15-passenger vans other than those operated for personal use are required to manage fatigue as per the requirements of NSC 9 –Hours of Service. NSC 9 limits the number of hours a commercial driver is permitted to drive and requires a log to be kept of on-duty time, driving time and off-duty time.
Distracted Driving	Distracted driving has been recognized in Canada as a road safety concern. As of September 2011, all Canadian provinces and Yukon Territory had implemented legislation prohibiting the use of handheld devices, including cell phones, text messaging, global positioning devices and display screens.
Load Restrictions	Vehicles with higher weight ratings are required to enter inspection stations where the vehicles are weighed and inspected. The minimum weight requirements vary from province to province, with a minimum of 4,500 kg. Fifteen-passenger vans do not meet the weight requirements to enter the inspection stations and therefore the weight of the vehicle is rarely, if ever, monitored.

Safety Standards	Requirements in Canada
Limitations on use of 15-passenger vans	▪ Four provinces and one territory (BC, MB, ON, NW, SK) allow the use of 15-passenger vans for daily trips to and from school, but Saskatchewan restricts the use to 8 pupils or fewer. ▪ Five provinces and one territory (BC, AB, MB, ON, NW, SK) allow the use of 15-passenger vans for extracurricular activities. ▪ Six provinces (AB, QC, NB, NS, NL, PE) do not allow the use of 15-passenger vans for daily trips to and from school. ▪ Five provinces (QC, NB, NS, NL, PE) do not allow the use of these vehicles for any school-related trips. ▪ Manitoba, New Brunswick and Alberta provide guidelines for the use of 15-passenger vans.

Key Findings

Fifteen-passenger vans were generally found to be as safe as other highway vehicles and to provide an economical alternative to school buses.

Electronic Stability Control and correct tire pressures based on the GVWR significantly improve the stability of this class of vehicle (buses with a GVWR over 4,000 kg).

Fifteen-passenger vans would benefit from guidelines highlighting the importance of tire maintenance, passenger/cargo loading from front to back and the requirements under the National Safety Codes for 15-passenger vans, excluding those for personal use.

Fifteen-passenger vans, excluding those for personal use, are included in the definition of a commercial vehicle requiring semi-annual inspections, daily inspections, hours of service record-keeping and a Class 4 driver's licence.

Options Considered

Canada does not have a national approach to the use and oversight of 15-passenger vans. Part of the project's mandate is to develop guidelines/recommendations on the use of 15-passenger vans, especially for the transportation of pupils.

CCMTA considered the six options below in response to the high profile collisions involving 15-passenger vans in Canada and the United States.

Each option was evaluated based on the testing and research completed in Canada and the U.S., implementation and enforcement limitations, impact on society, and how it addressed the concerns of organizations like the Van Angels.

Outline of Options

Option	Description
No Change	No changes to the current national approach to 15-passenger vans or their use for school purposes. Canada would remain silent and not provide guidelines or regulations specific to 15-passenger vans.
Create guidelines for the transportation of pupils	Address the transportation of pupils to and from school and extracurricular activities by providing guidelines to promote the safety of school purpose transportation regardless of the vehicle used.
Create guidelines for the use of 15-passenger vans	Address the use of all 15-passenger vans and promote safety and proper maintenance by educating all users.
Restrict the use of non-ESC 15-passenger vans.	Restrict the use or phase out older 15-passenger vans that do not have electronic stability control/roll stability control. This restriction or phase-out could be applied to varying degrees, from prohibiting use for the transportation of pupils to banning all use.
Prohibit the use of 15-passenger vans for transporting children	Prohibit the use of 15-passenger vans for school purposes while permitting use of the vehicle by other organizations or owners.
Prohibit the use of 15-passenger vans.	Prohibit the use of 15-passenger vans in Canada for all users.

Recommendations

1. Develop national guidelines for the safe operation of 15-passenger vans regardless of use. The guidelines should include the importance of:

    - Performing monthly tire maintenance, including measuring tire pressure and checking tire condition
    - Loading cargo and passengers from front to back
    - Complying with seatbelt and child restraint requirements

- Complying with requirements for periodic commercial vehicle inspections (NSC 11B), daily inspections (NSC 13), hours of service record-keeping (NSC 9) and Class 4 driver's licence (NSC 4)

2. Implement national requirements for the safe transportation of pupils to and from school and extracurricular activities, including:

    - Developing guidelines to promote the safe operation of all vehicles and safety practices for transporting pupils
    - Requiring a higher class driver's licence for vehicles operated by or under contract with school boards
    - Amending the definition of commercial vehicles to include vehicles operated by or under contract with school boards and to thus require them to comply with NSC 11B, NSC 13 and NSC 9

End of Executive Summary

Introduction

In June 2010, then federal transport minister John Baird announced a review of the safety standards applicable to 15-passenger vans. The safety review was to include consultation with provincial and territorial governments, and was subsequently discussed at the Council of Ministers for Transportation (COMT) meeting in September 2010 in Halifax.

At the COMT meeting, the Canadian Council of Motor Transport Administrators (CCMTA) was directed to address concerns relating to the regulation and use of the vehicles for school purposes.

The CCMTA Board approved the creation of an Oversight Group on October 25, 2010, to manage the project to ensure the work was completed for reporting to the COMT.

CCMTA's Oversight Committee consisted of resources from all three standing committees to work collaboratively on the review of the safety standards applicable to 15-passenger vans. The three standing committees are listed below and consist of representatives from each jurisdiction as well as industry stakeholders:

1. Compliance and Regulatory Affairs – responsible for compliance activities related to commercial drivers and vehicles, transportation of dangerous goods, and motor carrier operations.
2. Drivers and Vehicles – responsible for all matters relating to motor vehicle registration and control, light vehicle standards and inspections, and driver licensing and control.
3. Road Safety Research and Policies – responsible for the coordination of the federal, provincial and territorial road safety efforts, preparation of recommendations in support of road safety programs, and development of overall expertise and action plans to prevent road accidents and reduce their consequences.

CCMTA's mandate is to develop a national approach to the use of 15-passenger vans, especially when used for school purposes.

The Report

The following report contains six parts that review and evaluate the design and use of 15-passenger vans:

Part 1 – Issue – Description of a 15-passenger van, inventory and history of 15-passenger vans in Canada

Part 2 – Research – Vehicle testing, manufacturing standards/design and collision statistics, review of safety and collision data of 15-passenger van vs. other vehicles with similar capacities, recommendations and actions that have resulted from this testing

Part 3 – Review of the current safety standards and guidelines for the use of 15-passenger vans in Canadian jurisdictions

Part 4 – Alternative vehicles used for school purposes

Part 5 – Identification and analysis of possible options for a national approach to the use of 15-passenger vans in Canada

Part 6 – Conclusion

Part 7 – Recommendation

1 Issue

1.1 Subject

The term “15-Passenger Van” refers to large vehicles with five rows of seats intended to transport up to 15 people, including the driver.

In general, a 15-passenger van is a large light-duty vehicle with some characteristics of a heavy-duty vehicle. The size and weight may contribute to the difficulties some drivers have had with its handling characteristics.

Figure 1: 15-Passenger Van Image.

In Canada there are four makes of 15-passenger vans: Chevrolet, Dodge, Ford and GMC. Dodge discontinued its 15-passenger vans in 2002. The chart below indicates the number of 15-passenger vans registered in Canada as of 2009:

Table 1 – Registered 15-Passenger Vans in Canada, 2009

Make	Total Registered in Canada
Chevrolet	9,507
Dodge	3,840
Ford	11,358
GMC	2,968
Total	**27,673**

For a complete list of 15-passenger vans registered in Canada as of 2009 broken down by model year, see Appendix A.

1.2 Background

On January 12, 2008, a 15-passenger van carrying a school team crashed in New Brunswick, and eight of the twelve occupants were killed. In response to the tragic collision, New Brunswick made the following changes with respect to pupil transportation:

- Prohibit use of 15-passenger vans
- Mandate the use of winter tires
- Impose mandatory training for drivers
- Provide additional funding for extracurricular transportation

In May 2010 New Brunswick MP Yvon Godin proposed in a private member's bill (Bill C-522) that the federal government make it a criminal offence to transport pupils in a motor vehicle that carries more than 10 and fewer than 17 and prohibit the importation and sale of similar full-sized vans with seating in the rear of the vehicle.

Transport Canada announced in June 2010 a review of the safety standards applicable to 15-passenger vans and presented the results at the meeting of the Council of Ministers Responsible for Transportation and Highway Safety in September 2010.

"Van Angels," an organization made up of mothers who have lost children in 15-passenger van collisions, also met with the ministers outside the formal meeting to express its concerns regarding the dangers of 15-passenger vans.

The ministers directed CCMTA to bring forward recommendations for improving the safety of 15-passenger vans.

There have been other high profile collisions in Canada and the U.S. involving 15-passenger vans, stimulating public discussion questioning the safety of these vehicles with regard to their construction, use, maintenance and oversight. Two of these high profile collisions are described on the following pages. It should be noted that the basic design of the vehicle was not identified as a factor by any of the experts who studied either of these collisions.

March 7, 2007, Abbotsford, B.C.

A 15-passenger van (1998 Dodge) rolled over after making contact with two transport trucks and landed on its roof. There were 17 occupants of the 15-passenger van, whose two front seats were the only ones equipped with restraints. The restraints had been removed from the bench seats. Three farm workers were killed and fourteen occupants (including the driver) were injured.

The coroner listed several factors that contributed to loss of control of the vehicle, including

- poor visibility and wet roads,
- improperly inflated tires with poor tread on some tires,
- lack of adequate driver knowledge and training (driver held a Class 5 driver's licence instead of the legally required commercial driver's licence) and
- increased risk of rollover for a 15-passenger van when there are more than 10 occupants (in this case there were 17 occupants, two more than the van accommodates).

Further factors that put the passengers in danger included the fact that

- there were only two seatbelts in the van and
- some of the original seats had been removed and replaced by benches in order to accommodate more passengers.

As a result of this collision, the driver was convicted on two charges (driving without reasonable consideration for others using the highways, and driving without being the holder of an appropriate licence), fined $2,000 and prohibited from driving for a year.

January 12, 2008, Bathurst, N.B.

A 15-passenger van (1997 Ford) struck a transport truck head-on during a snow storm at highway speed. It was determined that after the vehicle briefly travelled on a gravel shoulder,

the driver made a hard correction to the left and entered into the opposing lane. The right front corner of the 15-passenger van struck the right corner of the oncoming transport truck. The 15-passenger van was driven by a school teacher/coach returning from a school basketball game, and he had been on duty for 16 hours at the time of the collision. Eight of the twelve occupants were killed. Notably, the vehicle did not roll over.

A number of factors contributed to the collision, including

- bad weather,
- mechanical fitness deficiencies,
- improperly inflated tires and poor tread,
- lack of winter tires,
- driver fatigue and

Six of the dead were not wearing seatbelts, while a seventh was not properly restrained (the lead Transport Canada investigator suggested that seatbelts most likely would not have saved the victims' lives in this collision).

2 Research

2.1 National Highway Traffic Safety Administration (NHTSA) Research

The National Highway Traffic Safety Administration (NHTSA), under the U.S. Department of Transportation, was established to carry out safety and consumer programs. Specifically, the agency:

- Sets and enforces safety performance standards for motor vehicles and motor vehicle equipment and, through grants, enables state and local governments to conduct effective local highway safety programs
- Investigates safety defects in motor vehicles; sets and enforces fuel economy standards; helps states and local communities reduce the threat of drunk drivers; promotes the use of safety belts, child safety seats and air bags; investigates

odometer fraud; establishes and enforces vehicle anti-theft regulations; and provides consumer information on motor vehicle safety topics

- Conducts research on driver behaviour and traffic safety, to develop the most efficient and effective means of bringing about safety improvements

In response to high profile collisions involving 15-passenger vans, the United States via NHTSA has completed studies on 15-passenger van safety. As in Canada, the focus has been on the number of fatalities, rollover resistance, use of restraints, and tire pressure. CCMTA has reviewed the results from NHTSA's studies to help offer recommendations regarding best practices for the use of 15-passenger vans in Canada. NHTSA's studies include:

- Fatalities to Occupants of 15-Passenger Vans 2003-2007 DOT HS 811 143
- Testing the Effect of Tire Pressure Monitoring System Minimum Activation Pressure on the Handling and Rollover Resistance of a 15-Passenger Van DOT HS 809-701
- 12 and 15 Passenger Van Tire Pressure Study: Preliminary Results DOT HS 809 846
- Data from the U.S. National Centre for Statistics and Analysis, Fatality Analysis Reporting System (NCSA FARS)

NHTSA used data from its Fatality Analysis Reporting System (FARS). The vehicles were identified by vehicle identification number (VIN).

For added perspective on the number of fatalities from collisions involving 15-passenger vans, the table below lists numbers of fatalities by vehicle type. This data is further broken down to identify the number of 15-passenger vans involved in fatal collisions where the vehicle rolled over. For the five-year period of 2003 to 2007, fatalities involving 15-passenger vans represented 0.22% of all vehicles involved in fatalities (note that although the vehicles were involved in fatal crashes, the fatalities may not have occurred in the vehicles listed). In 27% of cases, the vehicles rolled over. (see Tables 2 & 3)

Table 2 – Vehicles in the United States Involved in Fatal Crashes 2003–2007

Vehicle Type	2003	2004	2005	2006	2007	Total	Percentage

School Buses	113	111	111	118	109	**562**	**0.19%**
Minivans	2,523	2,577	2,586	2,457	2,316	**12,459**	**4.27%**
15-Passenger Vans	144	150	124	113	113	**644**	**0.22%**
Light Passenger Vehicles and Trucks	48,861	48,168	48,133	46,671	44,666	**236,499**	**81.15%**
All Vehicles	58,877	58,729	59,495	58,094	56,253	**291,448**	**100%**

Source: NCSA FARS 2003-2007

Table 3 – 15-Passenger Vans (Total and Rollovers) Involved in Fatal Crashes, 2003–2007

Year	Total	Vehicles That Rolled Over	
		#	%
2003	144	46	32%
2004	150	47	31%
2005	124	34	27%
2006	113	20	18%
2007	113	30	27%
Total	**664**	**177**	**27%**

Fatalities to Occupants of 15-Passenger Vans 2003-2007:

This next study revealed that the 664 15-passenger vans that rolled over in collisions between 2003 and 2007 were responsible for a total of 473 fatal injuries to occupants. The study first compared the fatalities of occupants by person type (driver or passenger). Since 15-passenger vans can carry a large number of passengers, it was expected that the number of driver fatalities would be much lower than that of passengers. The second study compared the ages of the fatally wounded occupants.

Table 4 – Fatalities to Occupants of 15-Passenger Vans by Person Type 2003–2007 in the United States

Year	Driver		Passenger		Total
	No.	%	No.	%	
2003	26	20%	101	80%	**127**
2004	29	24%	91	76%	**120**

2005	26	26%	73	74%	**99**
2006	13	22%	45	78%	**58**
2007	14	20%	55	80%	**69**
Total	**108**	**23%**	**365**	**77%**	**473**

Source: NCSA FARS 2003-2007

Table 5 – Fatalities to Occupants of 15-Passenger Vans, by Age Group and Person Type 2003–2007

Age	Driver		Passenger		Total
	No.	%	No.	%	
Under 5	0	0%	7	2%	7
5-9	0	0%	9	3%	9
10-15	1	1%	22	6%	23
16-20	1	1%	38	11%	39
21-24	8	7%	44	12%	52
25-34	15	14%	62	17%	77
35-44	15	14%	47	13%	62
45-54	21	20%	46	13%	67
55-64	23	21%	38	11%	61
65-74	17	16%	22	6%	39
75 +	6	6%	24	7%	30
Total	**108**	**100%**	**365**	**100%**	**473**

Source: NCSA FARS 2003-2007 (total includes unknown age – an additional 7)

Review of the age of occupants shows the impact of 15-passenger van collisions on school-aged children. In the U.S. from 2003 to 2007, there were 39 fatalities involving occupants under the age of 16. This represents only 12% of occupants of 15-passenger vans fatally injured in this timeframe. When developing recommendations on the use of 15-passenger vans, it should be borne in mind that a majority of fatally injured occupants in the U.S. are older than school-aged children. It is probably therefore better to make recommendations that apply to 15-passenger vans in general, and not limit them to school use only.

NHTSA's summary of this report on 15-passenger van occupant fatalities highlighted the following findings:

- In 2007, fatalities to occupants of 15-passenger vans increased nearly 20% from the previous year. (It should be noted that the number of 15-passenger van fatalities in 2006 was the lowest since 1993, with fatalities increasing in 2007 by 11, or 20%.)
- The median age group for drivers killed in 15-passenger vans was 45 to 54; the median age group for passengers was 24 to 34.
- Fatalities, both in total and in vans that rolled over, began a declining trend in 2001, although there was an increase in 2007.
- Restraint use continues to be low among occupants of 15-passenger vans involved in fatal crashes. About 80% of the fatally injured 15-passenger van occupants in rollovers in the past five years were not restrained.

2.1.1 Rollover Occurrence

This next study compared the number of occupants killed in all passenger vehicle rollovers vs. 15-passenger van rollovers. Further review examined the number of occupants injured and the severity of their injuries in 15-passenger van rollovers. Both studies reviewed the same five-year time period of 2003–2007.

Table 6 – Occupants of Passenger Vehicles Killed and Rollover Occurrence, 2003–2007

Year	All Passenger Vehicles			15-Passenger Vans		
	No. of Occupants	No. in Rollovers	% in Rollovers	No. of Occupants	No. in Rollovers	% in Rollovers
2003	32,271	10,442	32%	127	65	51%
2004	31,866	10,590	33%	120	69	58%
2005	31,549	10,870	35%	99	60	61%
2006	30,686	10,742	35%	58	26	45%
2007	29,072	10,240	35%	69	45	65%
Total	**155,444**	**52,884**	**34%**	**473**	**265**	**56%**

Table 7 – Restraint Use of Occupants of 15-Passenger Vans Involved in Fatal Crashes That Rolled Over, by Injury Status 2003–2007

Year	Fatally Injured Occupants				Surviving Occupants				Total
	Restrained		Unrestrained		Restrained		Unrestrained		
	No.	%	No.	%	No.	%	No.	%	
2003	10	2%	55	14%	120	29%	222	55%	**407**
2004	19	5%	50	14%	114	33%	164	47%	**347**
2005	11	5%	49	21%	59	26%	109	48%	**228**
2006	3	2%	23	13%	38	22%	109	63%	**173**
2007	10	5%	35	17%	55	26%	112	53%	**212**
Total	**53**	**4%**	**212**	**16%**	**386**	**28%**	**716**	**52%**	**1,367**

These studies show there has been a 22% increase in the percentage of 15 passenger van rollovers with fatalities compared to other passenger vehicles. This could be due to the larger size of 15-passenger vans and their higher centres of gravity. Another contributing factor is the tendency toward unrestrained occupants in 15-passenger vans. A significant 68% of all occupants involved in fatal collisions that included survivors were unrestrained. This compares to a 2005 NHTSA survey that revealed that restraint use by state ranged from 61% to 95%, with nine states achieving over 90% compliance for all vehicle types. Transport Canada completed a similar study in 2009-2010 with results showing that 95% of Canadians in urban areas and 92% in rural communities wore seatbelts.

2.1.2 Tire Pressure

Testing the Effect of Tire Pressure Monitoring System Minimum Activation Pressure on the Handling and Rollover Resistance of a 15-Passenger Van (DOT HS 809-701):

This study looked at the effect of tire pressure on the handing and rollover resistance of 15-passenger vans. The study looked at the minimum activation pressure (MAP) of a tire pressure monitoring system recommended to be standard on 15-passenger vans that would warn drivers to inflate their tires. The test was completed using one 2003 Ford E-350 15-passenger van with all new tires and varying tire pressure, loaded with both 5 passengers

and 10 passengers. Three tests were performed (for safety, outriggers were used for test group 1 and test group 2):

- Test Group 1 (TG1) was intended to evaluate handling in the linear range of lateral acceleration at a variety of inflation pressure combinations, due to the low lateral acceleration targets.
- Test Group 2 (TG2) was used to evaluate handling at or near maximum lateral acceleration with the vehicle at the same inflation pressure combinations as during the TG1 tests.
- Test Group 3 (TG3) used two of the inflation pressure combinations used in TG1 and TG2, in conjunction with two load configurations, to determine what effect lower pressures may have on dynamic rollover propensity.

Table 8 – Inflation Combinations Used for This Study

Description	Inflation Pressure	
	Front	Back
Placard	55	80
Increased Front	80	80
MAP recommended by Alliance	38	60
Current MAP	46	60
National Transportation Safety Board (NTSB) Concern (based on two specific collisions)	60	60

It should be noted that the results of this study cannot be construed to be fully indicative of the handling of 15-passenger vans as only one van was used in the testing, and applying the results to all 15-passenger vans may not be accurate. The conclusions of this study were as follows:

- Load configuration had a more pronounced effect on maximum lateral acceleration than did tire inflation pressure. The small changes in maximum lateral acceleration due to changes in the tire inflation pressures used in this study were not believed to be of practical significance.

- The lateral stability of the 15-passenger van with five occupants was irregular, with spinouts occurring during every right-steer test for each inflation pressure.
- At maximum occupancy (15 occupants), the lateral stability left-steer test was the only one that induced spinout (opposite of the five-occupant results)
- Front and rear inflation pressures less than placard (55psi front, 80 psi rear) adversely affected 15-passenger van rollover resistance. Lower manoeuvre entrance speeds produced two-wheel list during tests performed with five and ten occupants. Results are indicated below:

Table 9 – Effect of Tire Pressure on Rollover Resistance

Load Configuration	Placard Inflation (55 psi front, 80 psi rear)		Current MAP (46 psi front, 60 psi rear)	
	Left – Right Steering	Right – Left Steering	Left – Right Steering	Right – Left Steering
5 Occupants	---	---	49.5 (79.7km/hr)	TNP
10 Occupants	44.6 mph (71.8 km/hr)	TNP	39.5 (63.6 km/hr)	TNP

TNP = Test Not Performed

- When the 15-passenger van was tested with ten or more occupants on board and tire inflation below placard, the vehicle showed lower rollover resistance. In all other test results, lower tire inflation pressure produced no changes of practical significance to the linear range handling characteristics of the vehicle, and vehicle manoeuvring was essentially unaffected.

12 & 15-Passenger Van Tire Pressure Study DOT HS 809 845

NHTSA completed a tire pressure study of 12 and 15-passenger vans by inspecting the tire pressure of vehicles registered in the U.S. This was further to a similar tire pressure special study (TPSS) conducted by NCSA in 2001 that showed 27% of passenger cars in the U.S. had at least one significantly underinflated tire. For the purposes of both studies, significantly under or overinflated was 25% above or below the placard recommended inflation. This data

was collected via a random sampling of vehicles in multiple climates and demographics throughout the U.S. The total number of vehicles inspected was 1,242, including 937 15-passenger vans. The results are outlined below:

Table 10 – Percent of Vehicles with at Least One Tire Improperly Inflated

Vehicle	Overinflated by 25% or more	Underinflated by 25% or more
15–Passenger Vans	74%	57%
Other Vans	68%	54%
All Vans	72%	56%
Light Trucks from TPSS	39%	29%
Passenger Vans from TPSS	39%	27%

Table 11 – Percent of Vehicles with All Four Tires Improperly Inflated

Vehicle	Overinflated by 25% or more	Underinflated by 25% or more
15–Passenger Vans	7%	4%
Other Vans	11%	9%
All Vans	8%	6%
Light Trucks from TPSS	7%	4%
Passenger Vans from TPSS	6%	3%

Table 12 – Percent of Vehicles in the VTPS with at Least One Tire Overinflated

Vehicle	Overinflated by 25% or more	Overinflated Past Max Pressure
15–Passenger Vans	23%	6%
Other Vans	18%	8%
All Vans	22%	7%

Table 13 – Percentage of Vehicles in the VTPS with at Least One Tire Below Certain Tread Depth

Vehicle	Tread Depth of 2/23 of an inch or less	Tread Depth of 4/32 of an inch or less
15–Passenger Vans	6%	18%
Other Vans	5%	17%
All Vans	5%	18%
Passenger Cars from TPSS	9%	34%

Results from this tire pressure study show that a very high percentage of large vans have significantly underinflated tires, a much larger percentage than passenger cars. This poor tire maintenance suggests a need for better van tire safety awareness or the integration of tire pressure monitoring systems into 12 and 15-passenger vans.

2.1.3 Recommendations and Actions of NHTSA

NHTSA's statute at 49 U.S.C. 30112 requires that conventional 12 and 15-passenger vans not be sold or leased as new vehicles to carry pupils of high school age or younger to or from schools or child daycare facilities on a regular basis.

NHTSA has provided the following top safety recommendations for 15-passenger van use:

Tire Pressure	Check tire condition and tire pressure as per the placard.
Spares	Avoid using old spares.
Driver	Only trained, experienced drivers who operate these vehicles on a regular basis, preferably holders of commercial driver's licences. Warning: 15-passenger vans handle differently than passenger cars, especially if the vehicle is fully loaded.
Attention	Driver should be well rested and attentive to driving at all times. Handheld devices should be prohibited and driving time limited to 8 hours per 24 hour period.
Size	A 15-passenger van is substantially longer and wider than a car, and requires more space to manoeuvre. It also requires additional reliance on side-view mirrors for changing lanes.

Speed	Drive at a safe speed based on driving conditions.
Occupancy	Never allow more than 15 occupants; when the van is not full, passengers should sit in seats that are in front of the rear axle
Cargo	Cargo should be placed forward of the rear axle; placing any loads on the roof should be avoided.
Seatbelts	All occupants need to wear seatbelts at all times. An unrestrained 15-passenger van occupant involved in single-vehicle crash is approximately three times as likely to be killed as a restrained occupant.

2.2 Transport Canada

Transport Canada compiles and publishes, in cooperation with CCMTA, a 20 year rolling window of Canadian motor vehicle traffic collision statistics under the Road Safety and Motor Vehicle Program. In the most recent 2009 edition, none of the collision statistics have been broken down by vehicle type and therefore provide little insight for the purpose of reviewing the frequency of collisions involving 15-passenger vans.

Transport Canada has taken on a study of the safety of 15-passenger vans specifically focused on the transportation of pupils. This study has provided the following statistics:

Table 14 – Motor Vehicle Collision Fatalities in Canada, 1998–2007

Description	Motor Vehicle Collision Fatalities 1998–2007	
	Number	Percentage
All Motor Vehicles	28,532	100%
School Buses	13	0.05%
15-Passenger Vans	34	0.12%

In the summer of 2010, Transport Canada launched a safety review of vans used for pupil transportation. This safety review included an evaluation of the braking and stability performance of 15-passenger vans through vehicle testing. Seven vehicles were tested—a minivan, two 15-passenger vans, a 12-passenger van, two school buses, and one multi-functional activity bus (MFAB).

Table 15 – Vehicles Tested by Transport Canada

Vehicle	Occupants	Vehicle Type	Gross Vehicle Weight Rating, kg (lb.)
2010 Kia Sedona	7	Minivan	2,675 (5,896)
2010 Mercedes-Benz Sprinter	12	Van	3,878 (8,547)
2009 Ford Econoline E350	15	Van	4,128 (9,098)
2010 Chevrolet Express	15	Van	4,355 (9,598)
2010 Corbeil Quantum	19	School Bus	4,491 (9,898)
2010 Corbeil Grand Quantum	30	School Bus	6,577 (14,496)
2010 Girardin Minibus IV	21	MFAB	6,577 (14,496)

2.2.1 Phase I – Stability Testing

Testing was performed to evaluate the following three metrics:

1. Emergency stopping distance from 100 km/h: The stopping distance of a road vehicle is an important part of vehicle performance and crash avoidance. Vehicle loading affects emergency stopping distance, and all test vehicles were tested in both a lightly loaded and fully loaded state.

2. Static Stability Factor (SSF): SSF is a measure of a vehicle's rollover resistance, obtained by dividing the average track width of the vehicle by twice the height of the centre of gravity. A vehicle with a high SSF will be more stable in a roll than a vehicle with a lower SSF.

3. Static Rollover Threshold (SRT): SRT is the basic measure of a vehicle's rollover stability, obtained by tilting the vehicle sideways until it begins to roll over. This test is a good approximation of the dynamics experienced by a vehicle in a long, quasi-constant radius turn, such as on many highway on and off ramps. The angle at which the vehicle needs to be tilted to roll is expressed in terms of lateral acceleration; vehicle loading affects SRT, and vehicles were tested in both a lightly loaded and fully loaded state.

4. Load Configuration: Additional testing is performed to measure the effects of load in the shift of centre of gravity and axle weight.

Table 16 – Emergency-Stopping Test, Loaded and Unloaded

Vehicle	Lightly Loaded		Fully Loaded	
	Mass (kg)	Stopping Distance (m)	Mass (kg)	Stopping Distance (m)
12-seat Sprinter	2870	49.6	3877	49.6
7-seat Minivan	2187	46.7	2670	51.6
15-seat Ford Van	3129	51.2	4123	52.4
15-seat Chevrolet Van	3137	53.3	4355	54.6
18-seat School Bus	3298	54.2	4531	54.8
30-seat School Bus	4554	55.7	6570	57.7
21-seat MFAB	4344	59.9	6575	58.5

Test results show stopping distance generally increases with an increase in load, with the exception of the 12-seat Sprinter, which obtained the shortest distance in the test. Transport Canada's testing shows that 15-passenger vans performed marginally better than both school buses and MFABs.

Static Stability Factor

In order to quantify vehicle stability, Transport Canada tested the seven vehicles' static stability factor (SSF) = track width/2 (height of centre of gravity of the vehicle). The height of the centre of gravity is determined in a laboratory test, and vehicle track width is measured directly. SSF is used to compute a rollover risk; the equation was derived by the National Highway Traffic Safety Administration from analyses of U.S. collision data for 100 specific vehicle models. The U.S. New Car Assessment Program assigns a star rating based on rollover risk; a 5-star rating is given if the vehicle has a rollover risk under 10% (SSF greater than 1.45).

The higher the SSF, the more stable the vehicle. This has been proven to be a good predictor of rollover in single vehicle collisions, especially when the vehicle leaves the roadway. Transport Canada's test results ranged from the most stable, a 7-seat minivan with an SSF of 1.27, and the least stable, the 19-seat school bus with an SSF of 0.94. The two 15-passenger vans and the MFAB ranked after the minivan, with an SSF between 1.08 and 1.06.

Table 17 – Static Stability Factor, Unloaded

Vehicle	SSF	Rollover Risk	U.S. Rollover Rating
7-seat Minivan	1.27	17%	★★★★
15-seat Ford Van	1.08	33%	★★
15-seat Chevrolet Van	1.06	36%	★★
21-seat MFAB	1.06	36%	★★
30-seat School Bus	0.99	52%	★
12-seat Sprinter	0.95	69%	★
19-seat School Bus	0.94	74%	★

Static Roll Threshold (Tilt Table Test)

The tilt table test is a good approximation of the dynamics experienced by a vehicle in a long, quasi-constant radius turn such as on many highway on or off ramps. This test is completed by securing the vehicle to a tilt table, lifting the vehicle sideways, and measuring the height and angle of the tilt table at the point when one, then both, of the vehicle's wheels lift off the table. This test was completed with each vehicle, loaded and unloaded and tilted in both directions.

Static Roll Threshold (SRT) is used to determine the probability of a vehicle rollover and calculate the speed and turn radius required to trigger such an event. In vehicles with SRTs greater than 0.6 g, rollovers can only occur at very high speed or due to a very small turn radius, or both. For vehicles with SRTs greater than 0.6 g (and all test vehicles had SRTs >0.6 g), there is not enough lane width under Canadian road design standards to permit the types of acceleration needed to trigger a roll, nor can a typical untrained driver maintain

control of a vehicle or hold the steering wheel after about 0.5 g. It is therefore unlikely that any vehicle with an SRT greater than 0.6 g could be steered into a rollover situation on a road that was properly designed, unless the wheel was abruptly turned on a tight turn. In such a situation, the vehicle would be forced into another lane or onto the shoulder as there would not be not enough width in a standard lane to generate these types of lateral accelerations.

Table 18 – Static Roll Threshold (Loaded and Driver Only)

Vehicle	Loaded (g)		Driver Only (g)		Difference of Complete
	First Wheel	Complete	First Wheel	Complete	
30-seat School Bus	0.72	0.77	0.88	0.92	16%
19-seat School Bus	**0.62**	0.72	0.80	0.85	15%
21-seat MFAB	0.66	0.81	0.88	0.94	14%
15-seat Ford Van	0.67	0.78	0.90	0.96	19%
15-seat Chevrolet Van	0.76	0.80	0.92	0.96	17%
12-seat Sprinter	0.74	0.80	0.85	0.87	8%
7-seat Minivan	0.91	1.04	1.00	**1.06**	2%
MEAN	**0.72**	**0.81**	**0.89**	**0.94**	**14%**

Table 19 – Comparison of Other Vehicles' SFT Ranges

Vehicle Type	Roll Threshold Range (g)
Tank trailers	0.30 g to 0.47 g
Cement mixers	0.30 g to 0.35 g
Loaded dump trucks	0.35 g to 0.45g
Delivery trucks	0.40 g to 0.65
Armoured delivery trucks (commercial)	0.58 g to 0.62 g
Light armoured vehicles (military)	0.72 g to 0.87 g
Test Vehicles	**0.62 g to 1.06 g**
Passenger Cars	1.00 g to 1.30 g

Test results show there are three groupings in the tilt table tests: first the minivan, with an SRT of 1.04 g; second the two 15-passenger vans, the MFAB, the 12-seat Sprinter and the 30-seat school bus, with a SRTs of 0.77 to 0.81; third the 19-seat school bus, with an SRT of 0.72. All tested vehicles had SRTs greater than 0.6 g, so it would be extremely difficult, if not impossible, to induce a pure rollover.

It should be noted that the vehicles did not necessarily have the same ranking for SSF and SRT. Most notably, the 12-seat Sprinter ranked sixth in SSF and third for SRT. Part of the reason for this is that the SSF does not account for suspension design. During the SRT test, the suspension is free to move, and suspension design can have an effect on performance.

Shift in Centres of Gravity (CG)

Transport Canada completed tests on all seven vehicles, both loaded and unloaded, to measure how the lateral and longitudinal centres of gravity shifted.

Shifts in lateral centre of gravity are not as important as shifts in vertical centre of gravity in determining rollover stability, and there were very similar results for all seven vehicles. All of the test vehicles had lateral centres of gravity within 2% of the vehicles' centre lines, and the drift upon loading was at most 1% for all vehicles.

Shifts in longitudinal centre of gravity create a loss of stability and increase the chance of oversteering. Transport Canada's results were consistent with previous studies by NHTSA on the effects of 15-passenger van loading, which concluded that there was a significant difference in longitudinal centre of gravity position between empty and loaded vehicles (as much as 17.9 inches). Transport Canada test results below in Table 20 show longitudinal shifts between 11 inches (7-seat minivan) and 20 inches (19-seat school bus).

Table 20 – Longitudinal Centre of Gravity (Loaded and Unloaded)

Vehicle	Wheelbase (inches)	Distance from Front Axle to CG Empty (inches)	Distance from Front Axle to CG Loaded (inches)	Difference
30-seat School Bus	159	96	111	15
19-seat School Bus	141	74	94	20

21-seat MFAB	159	99	116	17
15-seat Ford Van	138	74	89	15
15-seat Chevrolet Van	155	76	92	16
12-seat Sprinter	144	68	78	10
7-seat Minivan	118	50	61	11
MEAN	**144.9**	**76.7**	**91.6**	**14.9**

Axle Loading

Part of the testing included weight distribution on all four wheels, both loaded and unloaded, for all seven vehicles. Loading the test vehicles had very limited effect on the weight carried by the front axle, with the exception of the Sprinter and the Chevrolet Express, and to a lesser extent the minivan. This was due to the shorter rear overhangs on these vehicles. In fact, the axle configuration on the MFAB and the 18 passenger bus dictated that fully loading these vehicles actually removed load from the front axle by 3% and 4% respectively. Removing some load off the front axle is acceptable; however, removing significant load off the front axle can impair vehicle handling and braking.

Conversely many of the vehicles had significant load increases on the rear axles—as high as 89% for the 19-occupant school bus on the right rear wheel. This increased load on the right rear wheel is caused by an additional seat positioned on the right side of the 19-occupant school bus, directly in front of the rear wall. The left side of that bus does not contain a similar seat and thus the increase over the rear left tire is significantly less, at 71%. The mean right rear wheel load increase for all test vehicles was 68%, and the mean on the left rear wheel was 65%.

Table 21 – Percentage Change in Individual Wheel Station Loads, Driver Only vs. Loaded

Vehicle	Front Left	Front Right	Rear Left	Rear Right
30-seat School Bus	6%	2%	63%	59%
19-seat School Bus	1%	-4%	71%	89%

21-seat MFAB	4%	-3%	66%	65%
15-seat Ford Van	1%	3%	63%	65%
15-seat Chevrolet Van	16%	7%	73%	72%
12-seat Sprinter	26%	17%	62%	62%
7-seat Minivan	5%	10%	54%	63%
MEAN	**8%**	**5%**	**65%**	**68%**

Overhang and wheelbase distribution affect the axle weight distribution and balance of a vehicle. There are design principles and guidelines that are used for medium to heavy trucks and buses. One of these guidelines recommends the rear overhang of a heavy vehicle not be more than 40% of the bed length. The longer the rear overhang, the more weight on the rear axles. In addition, removal of weight from the front axles can negatively affect high speed handling and braking. This can negatively impact the driver's ability to handle the vehicle, particularly if the driver does not have experience driving a loaded vehicle. The measurements of the test vehicles are outlined in Table 22. Overhang on four test vehicles was more than 40% of bed length—on the 30-seat school bus, 19-seat school bus, 21-seat MFAB and Ford 15-passenger van.

Table 22 – Overhang and Wheelbase Distribution

Vehicle	Wheelbase/ Overall Length	Rear Overhang/ Overall Length	Front Overhang/ Overall Length	Overhang/ Bed Length
30-seat School Bus	55.8%	30.6%	13.6%	**47.2%**
19-seat School Bus	56.6%	26.5%	16.8%	**45.4%**
21-seat MFAB	55.8%	30.6%	13.6%	**46.3%**
15-seat Ford Van	58.3%	25.3%	16.4%	**42.1%**
15-seat Chevrolet Van	64.3%	17.1%	18.5%	29.6%
12-seat Sprinter	62.3%	19.7%	18.0%	33.5%
7-seat Minivan	58.7%	16.1%	25.2%	35.5%
MEAN	**58.8%**	**23.7%**	**17.4%**	**39.9%**

2.2.2 Phase II – Dynamic Handling Testing

Transport Canada completed a series of dynamic handling testing on three vehicles:

1. 2011 Ford E350 – 15-passenger van with ESC
2. 2010 Chevrolet Express – 15-passenger van with ESC
3. Girardin Minibus (D270 compliant) – MFAB without ESC

A total of 800 tests were performed using an automated steering controller pre-programmed to execute three manoeuvres: Step Input, Sine with Dwell and Fishhook. Each vehicle was tested with both a nominal load and fully loaded; nominal load includes a driver with a total mass of 168 kg made up of the test driver, automated steering controller, instrumentation and, if needed, ballast. Fully loaded includes the 168 kg plus 68 kg in each seating position except the driver and one front passenger position.

Outriggers were purchased for vehicles with a mass of up to 4,536 kg and used in all of the testing to eliminate the risk of rollover.

New tires were installed on the vehicles at the beginning of each of the three tests and for both nominal and fully loaded conditions in order to prevent tire wear from becoming an influencing variable during testing. Tire pressure was adjusted to the manufacturer's recommended tire pressure, that is:

- Ford F150 – 55 psi for the front tires and 80 psi for the rear tires
- Minibus – 50 psi for the front tires and 80 psi for the rear tires
- Chevrolet Express – 50 psi for the front tires and 80 psi for the rear tires

Fishhook testing in the loaded condition only was also performed with the rear tires underinflated to 50 psi.

In addition, a Slowly Increasing Steer manoeuvre was used to determine the steering characteristics and steering wheel angles to be used for these three manoeuvres. This is done by completing a variety of steering trials to determine the angle of steering where the

vehicle's lateral acceleration is 0.3 g. The angle determined through this process is denoted $\delta_{0.3g,}$ and is used to compare results on several vehicles by testing at multiples of their $\delta_{0.3g}$.

Sine with Dwell Manoeuvre

The Sine with Dwell test simulates a sudden lane change to avoid an obstacle on the road. It is also used by Transport Canada to verify compliance with CMVSS 126 – Electronic Stability Control Systems. This manoeuvre is designed to create an oversteering reaction (spinout) in a vehicle with either no ESC system or a poorly performing ESC system.

In this test the driver accelerates to a speed slightly higher than 80 or 100km/h, depending on the test being performed, and then the accelerator pedal is released. When the vehicle reaches test speed, the driver activates the automated steering controller. These manoeuvres are repeated with steering wheel angles starting at 1.5 times $\delta_{0.3g}$ and increasing by steps of 0.5 times $\delta_{0.3g}$ until the angle reaches 6.5 times $\delta_{0.3g}$ or 300°, whichever is smaller; if 6.5 times $\delta_{0.3g}$ is smaller then 270°, testing continues until the steering wheel angle is 270° or the vehicle spins out.

Results for Fully Loaded Vehicles – Sine with Dwell Manoeuvre:

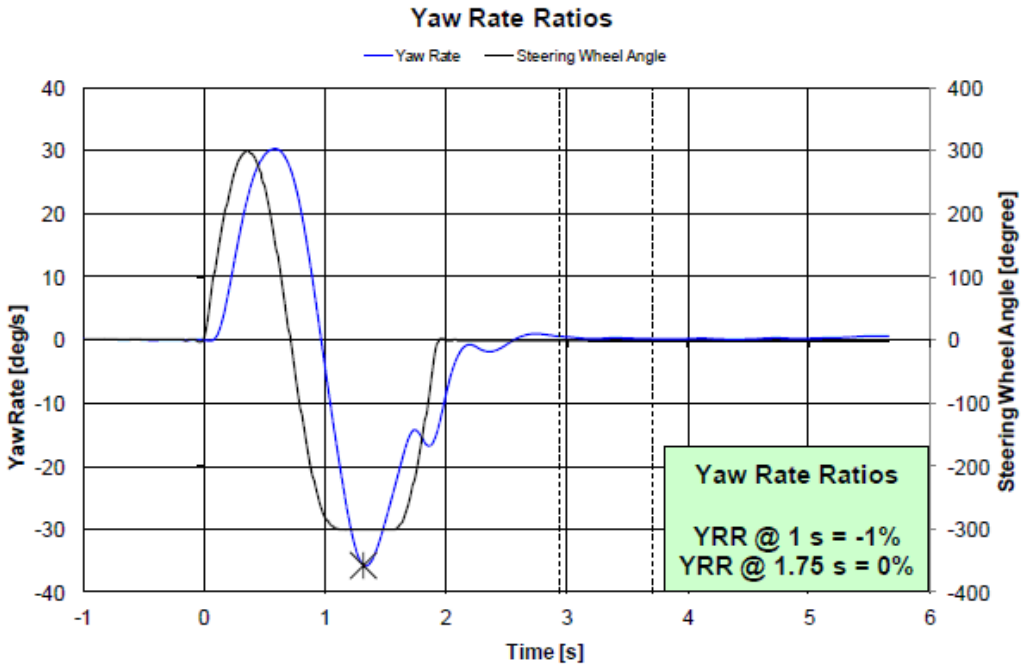
Table 23 – Sine with Dwell Manoeuvre

Test Conditions	Ford E350	MFAB	Chevrolet Express
ESC on 80 km/h	Performed all tests	Not performed	Performed all tests
ESC on 100 km/h	Performed all tests	Not Performed	Performed all tests
ESC off 80 km/h	Vehicle spun out at steering angle of 216°	Vehicle spun out at steering angle of 122°	Vehicle spun out at steering angle of 179°
ESC off 100 km/h	Not performed	Vehicle spun out at steering angle of 106°	Not performed

Yaw rate is a measure of how fast the direction of a vehicle is changing (rotation about the vertical axis). The Sine with Dwell test provides data to assess vehicle stability by computing the yaw rate ratio at 1 second and 1 ¾ seconds after completion of the manoeuvre. Basically this tests how much the vehicle has stopped turning (yaw) after the steering angle has been brought back to 0°.

The yaw rate ratio is defined as the vehicle yaw rate measured 1 second (or 1¾ seconds) after completion of the manoeuvre divided by the first peak value of yaw rate measured after the steering wheel angle changes sign (see Figure 2).

Figure 2 –Yaw Rate Ratios



To comply with CMVSS 126, the ESC system must meet various requirements; in particular, when the vehicle undergoes Sine with Dwell manoeuvres, the yaw rate ratio must be smaller than

a) 35% one second after completion of the Sine with Dwell manoeuvre and

b) 20% 1¾ seconds after the completion of the Sine with Dwell manoeuvre.

Yaw rate ratios in the Sine with Dwell manoeuvre at 1 s and 1 ¾ s after completion of the manoeuvre can be reviewed in Appendix B.

Step Input Manoeuvre

The purpose of the step input manoeuvre is to characterize how the vehicle reacts to a sudden steer input. The test was performed at three levels of steering severity. The vehicles were accelerated to a speed of 80 and 100 km/h. During the manoeuvre, the position of the accelerator pedal is kept constant even though vehicle speed may decrease.

Results

Seven step input metrics were computed as follows (see Appendix C for results):

a) **Steady-state yaw velocity response gain** [s^{-1}] is obtained by dividing the yaw rate by the steering wheel angle when yaw rate reaches steady state.
b) **Lateral acceleration response time** [s] is obtained by measuring the time required for lateral acceleration to first reach 90% of the steady-state lateral acceleration.
c) **Yaw velocity response time** [s] is obtained by measuring the time required for yaw rate to first reach 90% of the steady-state yaw rate.
d) **Lateral acceleration peak response time** [s] is obtained by measuring the time required for lateral acceleration to reach its peak value.
e) **Yaw velocity peak response time** [s] is obtained by measuring the time required for yaw rate to reach its peak value.
f) **Overshoot value of lateral acceleration** [unitless] is the ratio of the difference of the peak value and steady-state value of lateral acceleration divided by the steady-state value of lateral acceleration.
g) **Overshoot value of yaw velocity** [unitless] is the ratio of the difference of the peak value and steady-state value of yaw rate divided by the steady-state value of yaw rate.

Fishhook Manoeuvre

The fishhook manoeuvre test approximates the steering that a driver, acting in panic, might use in an effort to regain lane position once the vehicle has strayed onto an unpaved shoulder of the road. The test is used by NHTSA as part of its New Car Assessment Program for evaluating the rollover propensity of vehicles. The manoeuvre is designed to attempt to make the vehicle roll over. In this test the driver accelerates the vehicle to a speed slightly higher than the test speeds (55, 65, 70, 75 and 80 km/h) and then releases the accelerator pedal. When the vehicle reaches the test speed, the driver activates the automated steering controller at two steering wheel angles 6.5 and 5.5 times $\delta_{0.3g}$ (in that order). These manoeuvres are repeated with increasing speed until the vehicle spins out, two wheels lift off

the pavement or the maximum test speed is reached. This test was performed in fully loaded condition with the rear tires inflated to the manufacturer's recommended pressure of 80 psi and at a severely underinflated pressure of 50 psi.

Results

Both 15-passenger vans could complete the fishhook manoeuvres when ESC was enabled. None of the vehicles could complete the fishhook manoeuvres with ESC deactivated or not present.

Some wheel lift was apparent on the 15-passenger vans when ESC was deactivated. This occurred mostly at the end of the spinout. The test videos did not show any contact between the outriggers and the test track surface. The situation was quite different with the MFAB; the vehicle rolled so much that it would have rolled over if it had not been fitted with outriggers.

In the last test performed with the Chevrolet Express, with ESC disabled, full load, and rear tires inflated to 340 kPa (50 psi), the rear tire on the exterior side of the vehicle de-beaded; this was the only case where tire de-beading occurred.

Results of Fully Loaded Vehicles Without ESC – Fishhook Manoeuvre

Table 24 – Fishhook Manoeuvre

Test Conditions	Ford E350	MFAB	Chevrolet Express
Rear tires with 80 psi	Vehicle spun out at 70 km/hr	Vehicle lifted both wheels and rolled at 65 km/h	Vehicle spun out at 70 km/hr
Rear tires with 50 psi	Vehicle spun out at 70 km/hr	Vehicle lifted both wheels and rolled at 55 km/h	Vehicle spun out and tire de-beaded at 65 km/h

2.2.3 Phase III – Limited Crashworthiness Testing

Transport Canada has completed limited crashworthiness testing for two vehicles: a 2011 Ford 15-passenger van and a 2011 Girardin multi-functional activity bus. Each vehicle was

impacted at a 90° angle over the left rear axle by identical 2009 Ford F150 pick-up trucks. The impacted test vehicles were stationary, and the pick-up truck was travelling at a speed of 75 km/h at impact. Seven crash test dummies were placed on board each vehicle in comparable seating locations.

Results show all seven test dummies in both vehicles sustained moderate to severe injuries to the head, neck, chest, organs or spine. Both the 15-passenger van and MFAB demonstrated significant casualties and limitations in their ability to protect the dummy occupants. A more severe collision (for example, the F150 travelling at a higher speed, or a heavier striking vehicle such as a tractor-trailer instead of the F150) would be expected to result in an even higher level of casualties. As no further crashworthiness testing is planned, Transport Canada plans to publish a summary of the crashworthiness testing results on its existing van and bus safety testing web page in the spring of 2012. The technical report should be available to interested parties.

The testing conducted by Transport Canada represents very specific combinations of vehicle models, speeds at time of impact, dummies used, seating configurations, etc. The results do not lend themselves to generalization on how the same vehicle models would behave under different testing conditions or how different vehicles (other models of 15-passenger vans, MFABs) would behave under the same (or different) testing conditions. Therefore Transport Canada does not draw any general conclusions concerning the crashworthiness of 15-passenger vans or MFAB-type vehicles.

2.2.4 Recommendations and Actions of Transport Canada:

Static Roll – All of the vehicles achieved a higher static roll threshold when empty compared to fully loaded with simulated passengers and cargo. Since all other factors were consistent between tests, it can be concluded that adding passengers to these vehicles raises the vertical centre of gravity. The degree to which the centre of gravity is raised, however, varies from vehicle to vehicle. Every tilt test resulted in the front wheel lifting off the table before the rear wheel. However, the measured angle between these two events varied from vehicle to vehicle, and from loading condition to loading condition.

The results of the testing indicate that as long as these test vehicles are being driven on properly constructed roads and the driver is heeding all advisory posted speed limits at curves and straightaways, it would be extremely difficult, if not impossible, to induce a pure rollover assuming loading conditions and centre of gravity heights are similar to those of the test vehicles. To achieve these types of lateral accelerations on conventional roads, the vehicle would have to leave its lane.

Tire Pressure – Many of the vehicle specifications call for much higher rear tire pressure than front tire pressure, sometimes by as much as 25 psi. It will be critical for bus/van operators to ensure that all the tires are properly inflated in order to support the large increase in weight on the rear axle when the van goes from empty to fully loaded. Failure to heed tire pressure recommendations could lead to rear tires that overheat as a result of carrying high loads at high speed for sustained periods. Underinflated rear tires can also adversely affect vehicle stability during panicked steering to avoid collision.

Load Distribution and Axle Weights – Vehicle loading was dictated by differing criteria. Loading was ceased on some vehicles due to the rear axle gross weight rating (GAWR-R); for other vehicles it was the gross vehicle weight rating (GVWR), and for still others it was the original equipment manufacturer's printed maximum cargo allowance. Operators should pay close attention to GVWR for the vehicle and axles and the printed maximum cargo label to ensure they are loading the vehicles correctly and respecting all of these limits. Loading should cease as soon as one of these criteria is attained.

Some of the test vehicles have rear overhang lengths that approach 50% of the passenger area length. This leads to very high increases in weight carried by the rear axle when all passenger seats are occupied as compared to when the vehicle is empty. The average increase in rear axle load was 66.5% whereas the average increase in front axle load was less than 7%. The most extreme case was the right rear axle of the 18 passenger school bus, which experienced a load increase of 89%.

The geometry of some of the vehicles dictated that front axle loading actually decreased by as much as 4% after the vehicle was fully loaded.

In order to properly balance weight distribution between the front and rear axles, none of the test vehicles should carry load (be it cargo or passengers) behind the rear axle until all available seating ahead of the rear axle is occupied. Where possible, the vehicles should be loaded from front to rear. Failure to do so could overload rear axles and tires and reduce the load on front axles, leading to poor steering and braking performance.

Centres of Gravity – All of the test vehicles had extremely well-balanced lateral centres of gravity.

Vertical centre of gravity was only measured as part of the test with nominal loads and not at full load. However, an effort was made to ensure that the simulated loading closely matched the seating location and centre of gravity of passengers and baggage.

The longitudinal centre of gravity of some of the vehicles moved rearward significantly when loaded. A large change in the longitudinal centre of gravity when a vehicle goes from unloaded to loaded results in a loss of stability and increases the chance of oversteering.

Electronic Stability Control – Testing showed that ESC significantly improves the stability of this class of vehicle (buses with GVWRs over 4,000 kg); vehicles with ESC enabled could perform the dynamic testing manoeuvres without spinning out. It was not possible to complete all of the dynamic testing manoeuvres when ESC was disabled on the 15-passenger vans or with the MFAB, which does not have ESC.

Conclusions – The 15-passenger vans that were tested performed as well as, and sometimes better than, the two school buses and the MFAB in all Phase I tests performed.

ESC significantly improves the stability of larger vans and buses like the vehicles tested in Phase II. ESC has been required on all new buses assembled in one stage and with GVWRs of 4,536 kg or less since September 1, 2011. ESC will be required on all new buses assembled in two or more stages and with GVWRs of 4,536 kg or less manufactured after September 1, 2012. Fifteen-passenger vans have been manufactured with ESC as a standard feature since 2005/2006 and, by 2013, MFABs of 4,536 kg or less will also have ESC. Transport Canada also notes that if the GVWR were increased by 46 kg for the MFABs used in this testing, they would no longer need to be fitted with ESC.

Results of Phase III testing on limited crashworthiness showed that both the 15-passenger van and MFAB demonstrated casualties and limitations in their ability to protect the dummy occupants.

3 Safety Standards and Use of 15-Passenger Vans in Canada:

3.1 Vehicle Standards:

Fifteen-passenger vans are considered light-duty vehicles like smaller vans and SUVs.

The distinction between light-duty and heavy-duty vehicles is based on the maximum total weight of the vehicle when loaded. This is known as the Gross Vehicle Weight Rating (GVWR). Federal safety standards based on vehicle weight use GVWR in both Canada and the U.S. GVWR for 15-passenger vans ranges from 4,128 kg to 4,491 kg according to the manufacturers' specifications.

- Under Canadian Motor Vehicle Safety Standard (CMVSS) 216, passenger cars, multipurpose passenger vehicles, and trucks and buses with GVWRs less than 2,722 kg require a roof strength 1.5 times GVWR and downward vertical movement the does not exceed 127 mm. The same vehicles with GVWRs greater than 2,722 kg but less than 4,535 kg are not covered under CMVSS 216. All school buses as per CMVSS 220 require a roof strength 1.5 times GVWR, downward vertical movement that does not exceed 133 mm and emergency doors that open. Starting in 2016 all vehicles with GVWRs under 4,536 kg will require a roof strength 1.5 times GVWR, downward vertical movement that does not exceed 127 mm and no infringement on front seat headspace by the roof. There are no changes related to school bus roof strength.

- Vehicles with GVWRs under 3,856 kg need to meet higher crashworthiness standards; 15-passenger vans are above that threshold.

- In Canada all passenger vehicles are required to be equipped with seatbelts for all occupants, except for the rear occupants of buses with GVWRs over 4,536 kg and

school buses of any size. Therefore 15-passenger vans are required to be equipped with seatbelts for all occupants.

Fifteen-passenger vans along with other heavier light-duty vehicles have fewer requirements regarding roof strength. However by 2016 there will be more stringent roof strength requirements for all vehicles, including 15-passenger vans.

3.2 Manufacturing Standards and Improvements:

In recent years 15-passenger vans, like all vehicles, have added safety features as standard equipment such as air bags, improved restraints, ESC, and tire pressure monitoring equipment.

ESC is a system that helps maintain control of a vehicle when there is a need to swerve or brake suddenly. When steering does not match the direction of the vehicle, ESC automatically brakes one or more wheels for short spurts, reduces engine power or both. Transport Canada tested vehicles equipped with ESC under two scenarios: a sudden lane change on a straight highway and a sudden increase in steering on a highway exit ramp. The results were impressive. Transport Canada determined that ESC improves the stability of vehicles during emergency swerves. As a result there is a new Canada Motor Vehicle Safety Standard that will require ESC on most vehicles with GVWRs of 4,536 kg or less as of September 1, 2012. All currently manufactured 15-passenger vans have ESC as a standard feature. Twenty percent of all 15-passenger vans registered in Canada are equipped with ESC as a standard feature. See Appendix A for details.

Tire pressure monitoring systems alert drivers when a vehicle's tire pressure is below a recommended level, generally 25% under the placard level. Low tire pressure decreases the level of control and handling of a vehicle, decreases the life of a tire and reduces fuel efficiency. In the testing performed by Transport Canada and NHTSA, low tire pressure had a negative impact on the performance of 15-passenger vans, especially when the vehicles were loaded. An NHTSA survey identified that a large number of 15-passenger vans in the U.S. had poor tire maintenance; this warning system alerts drivers to correct the tire

pressure. All currently manufactured 15-passenger vans have tire pressure monitoring systems as standard features.

Since the early 1970s, vehicles have been required to come equipped with seatbelts. Most vehicles today come equipped with front airbags, and some with side or side curtain airbags. The combination of seatbelts and air bags offers good protection in most collisions, working together to keep occupants in the vehicle and lessen the impact of stopping. Transport Canada reports that the 7% of Canadians not wearing seatbelts account for almost 40% of fatalities in vehicle collisions.

Based on the vehicle comparison compiled by Chevrolet, the following safety features are standard on 2011 15-passenger vans models, including the Chevrolet Express 3500, Ford E-350 and GMC Savana 3500:

Table 25 – 15-Passenger Van Manufactured Safety Features

Safety Feature	Chevrolet Express 3500	Ford E-350	GMC Savana 3500
Frontal airbags	Driver and front passenger	Driver and front passenger	Driver and front passenger
Side impact airbags	N/A	N/A	N/A
Overhead airbags	Curtain 1st, 2nd & 3rd row	N/A	Curtain 1st, 2nd, & 3rd row
Side impact beams	Standard	Standard	Standard
Brakes and traction control	4-wheel disk brakes with ABS	4-wheel disk brakes with ABS	4-wheel disk brakes with ABS
Seatbelts	3-point seatbelts	3-point seatbelts	3-point seatbelts
ESC	Standard since 2005	Standard since 2006	Standard since 2005
Body material	Fully galvanized steel	Fully galvanized steel	Fully galvanized steel
Spare tire and wheel	Full sized	Full sized	Full sized
Low tire pressure warning system	Standard since 2008	Standard since 2008	Standard since 2008
Service interval warning system	Standard	Standard	Standard

3.3 Vehicle Inspection Requirements

CCMTA sent a survey to 11 jurisdictions—British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and the Northwest Territories—regarding the use of 15-passenger vans. This survey requested information regarding driver classifications, restrictions or special requirements; driver fatigue management; and collision data. Of the 11 respondents, all consider 15-passenger vans commercial vehicles although there are exceptions for personal use.

Commercial vehicles in Canada have additional operational requirements to passenger vehicles intended to monitor the safety of the owner/operator and driver. Fifteen-passenger vans used for school purposes require a periodic inspection. Eight of the eleven surveyed jurisdictions required semi-annual inspections, and two required annual inspections.

In Canada “buses” are required to have semi-annual inspections under National Safety Code 11 Part B (NSC 11B) – Periodic Commercial Motor Vehicle Inspections. All provinces excluding Quebec have adopted NSC 11B for commercial vehicles. A bus is defined in NSC 11B as designed, constructed and used for the transportation of passengers with a designated seating capacity of more than 10, including the driver, but excluding operation for personal use.

NSC 11B is made up of three parts: truck, trailer and bus. Each part outlines specific inspection requirements and rejection criteria organized into sections of the vehicle: power train, suspension, hydraulic and air brakes, steering, instruments and auxiliary equipment, lamps, electrical system, body, tires and wheels, and couplers and hitches.

Based on the definition of a bus in NSC 11B, a 15-passenger van operated for non-personal use such as school-related activities, transporting workers or as an airport or hotel shuttle would require a semi-annual inspection in most of Canada today.

Commercial vehicles in Canada are required to complete daily trip inspections under National Safety Code 13 (NSC 13) – Trip Inspections. All provinces have adopted or have plans to adopt this standard by 2012. The definition of a commercial vehicle under NSC 13 is a truck,

tractor or trailer or combination thereof exceeding a registered gross vehicle weight of 4,500 kg; or a bus designed, constructed and used for the transportation of passengers with a designated seating capacity of more than 10, including the driver, but excluding operation for personal use.

NSC 13 is made up of four parts: truck and trailer, bus, motorcoach (daily) and motorcoach (30 day or 12,000 kg). Each part defines major and minor defects. Minor defects must be reported to the carrier prior to the following inspection and repaired within a timeframe specified by each jurisdiction. Major defects must be reported immediately, and the vehicle may not be driven until the major defect is repaired.

Based on the definition of a bus in NSC 13, a 15-passenger van operated for non-personal use such as school-related activities, transporting workers, or as an airport or hotel shuttle would require a trip inspection in most of Canada today.

3.4 Tire Maintenance Requirements

In the testing completed by NHTSA and Transport Canada, tire maintenance is an important safety requirement affecting the handling and response of 15-passenger vans.

NSC 11B semi-annual inspections require tire pressure to be measured on each tire to ensure it complies with the placard required pressure. NSC 13 trip inspections require a visual inspection of tires; however, there is no requirement to measure tire pressure. Transport Canada recommends all vehicles' tire pressure be measured once a month.

3.5 Driver Requirements

National Safety Code 4 (NSC 4) – Classified Driver Licensing System defines seven classes of driver's licences of which three have been identified by Canadian jurisdictions as required to operate a 15-passenger van. All jurisdictions excluding Ontario have adopted the NSC 4 driver's licence classifications, although Ontario has comparable driver classifications:

Table 26 – Driver's Licence Classifications in Canada

Licence Class	Requirements
Class 5 **(ON Class G)**	▪ Minimum 16 years old ▪ Any two-axle vehicle ▪ Any two-axle vehicle with a towed vehicle and a combined weight of less then 4,600 kg ▪ Recreational vehicle ▪ Any bus or ambulance without passengers ▪ Moped ▪ No air brakes ON requires a Class M for a moped and limits the weight of the two-axle vehicle to 11,000 kg. ON requires an enhanced renewal process after 80 years of age.
Class 4 **(ON Class F)**	▪ Minimum 18 years of age with retesting after 65 years of age ▪ Any bus having seating capacity of not more than 24 passengers ▪ Any taxi ▪ Any emergency response vehicle ON Class F does not permit use for school purposes.
ON Class E	▪ Minimum 21 years of age ▪ Any school purpose bus with designated seating for no more than 24 passengers

Class 2
(ON Class B and Class C)
	▪ Minimum 18 years of age with retesting after 65 years of age
	▪ Any vehicle combination permitted under Class 4 and 5
	▪ Bus of any seating capacity
	▪ Broken down further to identify:
	  ▪ Class 2A – Transit bus
	  ▪ Class 2B – School bus
	▪ ON requirements:
	  ▪ Class C – does not permit use for school purposes
	  ▪ Class B – School bus and minimum 21 years old

The CCMTA 15-passenger van survey on class of driver's licence compiled the requirements for five vehicles based on use: 15-passenger vans, MFABs, 7/8 passenger vans, less than 24-passenger school buses and over 25-passenger school buses. Results were as follows:

- Commercial use – All jurisdictions require a minimum of Class 4 licence.
- Unscheduled transportation of pupils – Six of eleven jurisdictions require a minimum of Class 4 licence, two jurisdictions do not permit the use of 15-passenger vans, one requires a school bus endorsement (SBE) and two require a Class 5.

- Scheduled transportation of pupils to and from school – Four jurisdictions require a minimum of Class 4 licence, three require Class 4 with SBE, three jurisdictions do not permit the use of 15-passenger vans and one requires a Class 5.

Table 27 – Driver Classification Requirements Based on Vehicle and Use

Vehicle	Private or Personal Use	Commercial Use	Unscheduled Pupil Transportation to and from School	Scheduled Pupil Transportation Outside of School Hours
7/8 Passenger Van	11 – Class 5	9 – Class 5 2 – Class 4	9 – Class 5 2 – Class 4	9 – Class 5 1 – Class 4 + SBE 1 – Not permitted
15-Passenger Van	6 – Class 5 5 – Class 4	11 – Class 4	6 – Class 4 2 – Class 5 2 – Not permitted 1 – Class 4 + SBE	4 – Class 4 3 – Not permitted 2 – SBE (ON Class E & SK Over 8) 1 – Class 5 1 – Class 2b
MFAB with 12 to 24 Seating Capacity	7 – Class 4 3 – Class 5 1 – N/A	11 – Class 4	8 – Class 4 1 – Class E (ON) 1 – N/A 1 – Not permitted	5 – Class 4 3 – Not permitted 1 – Class 2b 1 – Class E (ON)
<24-Passenger School Bus	5 – Class 4 3 – Class 4 + SBE 1 – Class 5	7 – Class 4 3 – Class 4 + SBE 1 – N/A	6 – Class 4 4 – Class 4 + SBE	5 – Class 4 5 – Class 4 + SBE 1 – Class E (ON)
>25-Passenger School Bus	6 – Class 2 2 – Class 2b 2 – Class 5 1 – N/A	8 – Class 2 2 – Class 2b 1 – N/A	6 – Class 2b 5 – Class 2	7 – Class 2b 4 – Class 2

There are inconsistent licensing requirements across Canada for the use of 15-passenger vans and the transportation of children. All jurisdictions excluding Ontario base the licensing requirements on the size of the vehicle first, with additional school bus endorsements for larger buses. In Ontario, drivers of school purpose vehicles must have higher class licences—either a Class E for under 24 passengers or Class B for over 24 passengers. Drivers operating any vehicle for school purposes in Ontario must therefore have higher class

driver's licences; there is no exemption based on the size of the vehicle, only additional requirements for larger buses.

3.6 Hours of Service

Provisions for the number of hours a driver can operate a vehicle and perform work are intended to manage fatigue and help ensure drivers are taking appropriate breaks and rest periods. Fatigue adversely affects driving performance. There is a very strong connection between fatigue and errors leading to an accident. Drivers do not have to be falling asleep at the wheel for fatigue to impair their ability to operate a vehicle. Fatigue increases reaction time, decreases alertness, distorts judgment, impairs memory, reduces a driver's field of vision and increases the risk of drowsiness or falling asleep while driving.

The National Safety Code 9 (NSC 9) – Hours of Service is intended to reduce the incidence of fatigue and has been adopted by all Canadian jurisdictions. NSC 9 specifies the number of hours a commercial driver is permitted to drive and formulates the requirement to keep a log of on-duty time, driving time and off-duty time. The intent of this standard is to manage driver fatigue and put limitations on the number of hours a driver can be on duty or driving. NSC 9 applies to commercial vehicles defined as the following:

«**commercial vehicle**» means a vehicle that

> (*a*) is operated by a motor carrier and propelled otherwise than by muscular power; and
>
> (*b*) is a truck, tractor, trailer or any combination of them that has a registered gross vehicle weight in excess of 4,500 kg or a bus that is designed and constructed to have a designated seating capacity of more than 10 persons, including the driver.

The definition of "motor carrier" limits this definition of commercial vehicle to exclude vehicles operated for personal use. Based on the above definition of commercial vehicles, a 15-passenger van driver would be required to follow NSC 9 – Hours of Service unless the vehicle is operated for personal use. Manitoba is the only jurisdiction that has changed the definition to exclude buses that are designed and constructed to have a designated seating

capacity of more than 10, including the driver, and replaces this with regulations specific to school buses.

There are other ways to manage fatigue and educate drivers on the dangers of driving while tired that carrier companies can implement in their business practices. Currently only Quebec and Nova Scotia offer additional fatigue management programs that would apply to 15-passenger vans.

3.7 Distracted Driving

CCMTA has defined distracted driving as the following:

> Distracted driving is the diversion of attention from driving as a result of the driver focusing on a non-driving object, activity, event or person. This diversion reduces awareness, decision making or performance, leading to increased risk of driver error, near-crashes or crashes.
>
> The diversion of attention is not attributable to a medical condition, alcohol/drug use and/or fatigue.

CCMTA, NHTSA, Transport Canada and many others with concern for road safety advise against texting or using cell phones or other portable wireless communication devices while driving. Drivers need to stay focused on the driving task. The use of these devices reduces the driver's ability to safely control the vehicle and effectively monitor and respond to events occurring in the road traffic environment. These events are often unpredictable; in Canada there are laws prohibiting the use of these devices while driving that apply to all passenger vehicles, including 15-passenger vans.

The impact of distracted driving has been recognized in Canada as a road safety concern. As of September 2011, all Canadian provinces and Yukon Territory had implemented legislation prohibiting the use of handheld devices, including cell phones, text messaging devices, global positioning devices and display screens. Quebec and Nova Scotia implemented hands-free legislation in 2008; Ontario in 2009; British Columbia, Saskatchewan, Manitoba, Prince Edward Island, and Newfoundland and Labrador in 2010; and New Brunswick and Yukon in early 2011. Alberta's legislation came into effect in September 2011.

3.8 Load Restrictions

Load restrictions are determined by the manufacturer based on the construction of the vehicle and the weight restrictions of the components of the vehicle. The manufacturer determines a gross vehicle weight rating (GVWR) and gross axle weight rating (GAWR) and lists the limits on the placard of the vehicle. Vehicles with higher weight ratings are required to enter inspection stations where they are weighed and inspected. The minimum weight requirements vary from province to province, with a minimum of 4,500 kg. Fifteen-passenger vans do not meet the weight requirements to enter the inspection stations and therefore the weight of the vehicle is rarely, if ever, monitored.

Alberta, New Brunswick and the United States suggest in their guidelines for the use of 15-passenger vans that the vehicle be loaded from front to back. The recommendation is not to have any load (passenger or cargo) behind the back axle until the front of the vehicle is full. Transport Canada's recent testing supports these recommendations.

3.9 Limitations on the Use of 15-Passenger Vans by School Boards

Based on a survey completed by CCMTA and the response of 11 Canadian jurisdictions:

- Five provinces (BC, MB, ON, NW, SK) allow the use of 15-passenger vans for daily trips to and from school. Saskatchewan, however, restricts the use to 8 pupils or fewer.
- Six provinces (BC, AB, MB, ON, NW, SK) allow the use of 15-passenger vans for extracurricular activities.
- Six provinces (AB, QC, NB, NS, NL, PE) do not allow the use of 15-passenger vans for daily trips to and from school. It should be noted that PE is restricted by school board policy, not legislation, and that the other provinces did not provide details on which authority restricts the use of 15-passenger vans.
- Five provinces (QC, NB, NS, NL, PE) do not allow the use of these vehicles for any school-related trips. It should be noted that PE and NL are restricted by school board policy, not legislation.

- Manitoba, New Brunswick and Alberta provide guidelines for the use of 15-passenger vans.

3.10 Guidelines or Best Practices Specifically for 15-Passenger Vans

New Brunswick has developed a regulation around the use of 15-passenger vans in child daycare facilities. These regulations include:

- Use of snow tires between November 1 and April 30
- Year-round tire pressure maintenance
- Use only in the local geographic community, with no driving on major highways or after dark;
- Even distribution of passengers and equipment to ensure vehicle stability
- Compliance with the Motor Vehicle Act with regard to driver qualifications, vehicle registration, restraints and vehicle inspections

New Brunswick also has additional rules for 15-passenger vans on restraint requirements, including that booster seats require a three-point belt, and distribution of load.

Alberta has developed guidelines on 15-passenger vans that suggest MFABs as better alternatives and that stress the increased risk of rollover with 15-passenger vans. The guidelines note the improved safety features in newer 15-passenger vans such as electronic stability control, tire pressure monitoring systems, three-point restraints and side impact airbags. The Government of Alberta encourages those purchasing 15-passenger vans to look for these enhanced safety features. The guidelines also recommend safety precautions, including:

- Maintain the 15-passenger van in good mechanical and operating condition
- Maintain the tires and check tire pressure before use
- Do not exceed the GVWR
- Load the vehicle from front to back
- Ensure the driver is experienced and well rested
- Limit driver distractions
- Limit driving time to 8 hours per 24 hour period
- Avoid swerving at high speed in reaction to an obstacle

Manitoba recommends the following when 15-passenger vans are used to transport pupils: remove the rear seat, avoid towing trailers, only permit carry-on items, use winter tires and do not carry cargo.

The United States federal government prohibits the purchase or lease of 12 or 15-passenger vans as new vehicles to carry pupils of high school age or younger to or from school or to carry children to daycare facilities on a regular basis. NHTSA has also published safety recommendations for the use of 15-passenger vans as discussed previously in this report.

3.11 Current Proposals

Bill C-522

New Brunswick MP Yvon Godin has introduced a private member's bill, Bill C-522, for a national ban on 15-passenger vans. Bill C-522 amends the Criminal Code to make it an offence to transport pupils in a motor vehicle with a designated seating capacity of more than 10 and fewer than 17 persons unless the motor vehicle conforms to certain standards or is prescribed by regulation. This amendment is intended to prohibit the transportation of pupils in vehicles commonly known as 15-passenger vans.

Enactment will also require the Governor in Council to make certain amendments to the Motor Vehicle Safety Regulations to limit the sale, importation and interprovincial shipment of 15-passenger vans that are configured to transport more than one passenger.

Van Angels

The Van Angels is an organization made up of mothers who have lost children in collisions involving 15-passenger vans. They promote recommendations against the use of 15-passenger vans in Canada which can be found on their website www. http://blog.vanangels.ca/.

Department of Education – New Brunswick

The New Brunswick Department of Education has published two policies, 512 and 513, regarding the transportation of pupils and 15-passenger vans.

Policy 512 prohibits schools from acquiring 15-passenger vans and states that all vehicles with the capacity to carry ten or more passengers must meet the Canadian Standards Association (CSA) D270-08 standard for multi-functional activity buses and conform to the Motor Vehicle Act. See http://www.gnb.ca/0000/pol/e/512A.pdf

Policy 513 prohibits the use of 15-passenger vans to transport pupils to or from extracurricular activities. See http://www.gnb.ca/0000/pol/e/513A.pdf. The policy also provides guidelines for this type of travel, including the following:

- Cancel any activity when road conditions make driving hazardous
- Do not transport pupils between midnight and 6 a.m. unless authorized by the superintendent
- Keep a record of the driver and all passengers, provide drivers with contact numbers and ensure parental consent is received
- Follow all regulations related to the operation of commercial vehicles: hours of service, commercial log books and out-of-province trip permits
- Carry out semi-annual inspections, insure for no less than $5 million, do not tow trailers, and equip with a fire extinguisher, first aid kit and winter tires (between November 1 and April 30)
- Ensure drivers are at least 21 years old and not enrolled in public school and that they possess valid driver's licences for the vehicles they are operating, complete a training program offered by the Department of Education or a professional charter operator, and carry out pre-trip inspections

Recommendations of the Jury and Coroner– Collision on January 12, 2008, in Bathurst NB

A Coroner's inquest was held on the January 2008 collision in Bathurst NB where a 15-passenger van collided with a transport truck, resulting in eight of the twelve passengers being killed. The jury provided 21 recommendations, most regarding the transportation of school sport teams, and the Coroner had three recommendations. Many of these recommendations have been implemented in New Brunswick.

Jury's Recommendations

- Weather – Arrange athletic schedules to minimize travel in winter, equip vehicles with snow tires, cancel events in case of inclement weather, and ensure both the travelling and hosting schools are prepared to stay overnight in case of inclement weather
- Make school officials more accountable and provide parents with a voice in all travel plans, travel arrangements and contingency plans
- Require a Class 2 driver's licence, limit drivers to no more than 14 hours of on-duty time and prohibit teachers, coaches, parents and volunteers from driving pupils
- Increase the minimum tread depth to 4/30 for vehicles used for school purposes
- Maintain highway edge drops as seamless at all times
- Ban 7 and 15-passenger vans for pupil travel across Canada and permit only yellow school buses or multi-functional activity vehicles to be used
- Have the province, not the pupil representative council, assume all purchase, maintenance and other costs associated with the vehicles and drivers

Coroner's Recommendations

- Standardize procedures with regard to safeguarding pupil transportation throughout the province
- Ensure the Department of Transportation reviews the condition of road shoulders and makes repairs on the highway where the collision occurred
- Inspect all 15-passenger vans, regardless of who operates them, on a semi-annual basis.

4 Alternative Vehicles to Transport Pupils

Part of CCMTA's mandate is to determine best practices for the use of 15-passenger vans, specifically in relation to transporting pupils to and from school and extracurricular activities. The recommended alternatives to 15-passenger vans for the transport of pupils include the use of school buses and multi-functional activity buses.

There have been recommendations to restrict transportation of pupils to school buses and multi-functional activity buses exclusively. Although there are more school buses licensed in Canada than any other classification of bus, not all pupils travel to and from school on school buses. High school pupils, for example, may also be driven to and from school in passenger cars operated by teen drivers, the age group recognized as being at greatest risk of crash. In

addition, limitations on alternatives for transporting pupils could result in a reduction of the amount of transportation organized by the schools, leaving parents and carpooling as the mode of transportation. This would leave little control over the experience of drivers or the type and condition of vehicles used to transport pupils.

4.1 U.S. Study on the Relative Risks of School Travel

In 2002 the U.S. Transportation Research Board completed a study of the relative risks of school travel. This study looked at children killed or injured in crashes involving school transportation both to and from school and school-related activities. It should be noted that collision reports do not identify whether passengers are travelling for school purposes unless they are travelling in a school bus. Due to this limitation, data was collected and analyzed using six broad categories and collisions involving school-aged children during the normal school travel hours for the period of 1991–1999. The categories were school buses, all other buses, passenger vehicles operated by adults (19 and older), passenger vehicles operated by teenagers (under 19), bicycles and walking. Results showed approximately 51% of injuries and 55% of deaths occurred in passenger vehicles with teen drivers, 33% of injuries and 20% of fatalities occurred in passenger vehicles with adult drivers, 11% of injuries and 22% fatalities were related to bicycles and pedestrians, and only 4% of injuries and 2% of fatalities occurred in school buses. As seen below in Table 21, school buses, other buses, and passenger vehicles with adult drivers had injuries and fatalities below those expected on the basis of the exposure risk implied by the percentage of pupil trips. Conversely, passenger vehicles with teen drivers, bicycles and walking had injuries and fatalities disproportionately greater than expected.

Table 28 – Pupil Injuries and Fatalities by Mode of Transportation

Mode	Pupil Trips	Injuries	Fatalities
School Bus	25%	4%	2%
Other Bus	2%	<1%	<1%
Passenger Vehicle (adult driver)	45%	33%	20%
Passenger Vehicle (teen driver)	14%	51%	55%
Bicycle	2%	5%	6%
Walking	1%	6%	16%

This study resulted in five recommendations based on the relative risk of the various modes of pupil transportation. These recommendations stressed the need to improve the data available in order to improve on similar studies in the future and encouraged planners and policy makers to analyze transportation risks comprehensively in their decision making related to school travel.

4.2 Manufacturing and Safety Requirements

SCHOOL BUS – School bus transportation has been regarded as one of the safest forms of transportation. A school bus is generally defined in Canada as a bus that is primarily designed and equipped to transport pupils “to and from school.” The primary role of federal law in Canada with respect to pupil transportation is to establish and enforce Canadian Motor Vehicle Safety Standards (CMVSS) for the manufacture of new and imported vehicles. In addition to other CMVSS requirements (i.e., braking performance, tire labelling), new school buses must comply with other Canadian manufacturing requirements to make school buses safer. The Canadian Standards Association (CSA) developed a technical standard (D250) for school buses in 1971, and this has been adopted by regulation or policy in all Canadian provinces except Quebec. Canada and the United States have very similar requirements for the manufacturing of school buses.

There are different types of school buses depending on size and construction:

- Type A1 – van cutaway design with a GVWR of 4,536 kg or less; approximately 18 seats
- Type A2 – van cutaway design with a GVWR greater than 4,536 kg; up to 30 seats
- Type C – typical school bus with a GVWR of 14,969 kg; up to approximately 77 seats
- Type D – transit style with a GVWR of 16,420 kg; up to approximately 84 seats

ACTIVITY BUS – Multi-functional activity buses (MFAB) are similar to school buses but not outfitted with traffic warning/control devices, nor subject to colour requirements since they are not designed to pick up and drop off pupils at roadside. The CSA developed a technical standard (D270-08) for multi-functional activity buses in 2008 that has seen limited adoption by Canadian provinces.

Currently Transport Canada does not define MFAB in the federal Motor Vehicle Safety Regulations or identify it as a type of vehicle; therefore the CMVSS requirements for MFABs are the same as for buses. Having said that, there is a common understanding in the industry that MFABs are manufactured much like school buses and meet the recommended requirements outlined in CSA D270. MFABs are manufactured with the same body as school buses and therefore are also available in sizes that match school bus types A, C and D. It should be noted that an MFAB that does not meet the requirements under CSA D270 and is under 4,536 kg has the same requirements as a 15-passenger van, as they both are considered to be buses under Transport Canada and CSA.

Table 29 – Comparison of Manufactured Safety Requirements

			
Safety Feature	**15-Passenger Van**	**School Bus**	**MFAB as per D270**
Seating Capacity	15 occupants	All sizes	All sizes
Crash Protection (Front, Rear, Side)	CMVSS 301 (fuel system integrity) CMVSS 214 (side door strength) CMVSS 201 (occupant protection)	CMVSS 301 (fuel system integrity) CMVSS 221 (body joint strength) CMVSS 222 (seating and crash protection)	CMVSS 301 (fuel system integrity) CMVSS 221 (body joint strength) CMVSS 222 (seating and crash protection)
Rollover protection	CMVSS 216	CMVSS 220 (rollover	CMVSS 220 (rollover

Safety Feature	15-Passenger Van	School Bus	MFAB as per D270
requirements	(optional until 2016)	protection)	protection)
Traffic/pedestrian control devices and flashing lights	Not required	CMVSS 131 (flashing red lights and stop arms)	Not required
Visibility and vision requirements	CMVSS 111 mirror and visibility requirements for passenger vehicles	CMVSS 111 and additional requirements such as defined fields of view that are designed to help drivers see pedestrians close to the front and sides of the bus	CMVSS 111 and additional requirements such as defined fields of view that are designed to help drivers see pedestrians close to the front and sides of the bus
Window retention and release and emergency exits	CMVSS 217 (exit requirements)	CMVSS 217 window retention/release and emergency exits (rear door, roof hatch and window)	CMVSS 217 window retention/release and emergency exits (rear door, roof hatch and window)
Seating/belts	Commercial seats with 3-point seatbelts	CMVSS 222 compliant seats – padded seats and seat backs without seatbelts	CMVSS 222 compliant seats – padded seats and seat backs without seatbelts Option to use commercial seats with seatbelts Seatbelts required if 4536 kg or less since classified federally as a bus
Electronic stability control (ESC)	Standard on Ford since model year 2006, GM since 2005, Chevrolet since 2004 Required—Sept. 2011	Required Aug. 2012 (if GVWR is 4,536 kg or less)	Required Aug. 2012 (if GVWR is 4,536 kg or less)
Tire pressure monitoring system	Standard on all three 15-passenger van models since 2008 Not required	Not required or standard.	Not required or standard.

4.3 Inspection and Human Factors

Most jurisdictions require the following for the operation of Type A school buses, 18 to 21-seat MFABs and 15-passenger vans:

- Enhanced driver training – Ten of the eleven jurisdictions surveyed require a Class 4 or greater and 1 jurisdiction required a Class 5 for the operation of a 15-passenger van or MFAB.
- All jurisdictions require inspection by a technician either annually or semi-annually when not operated for personal use.

- All jurisdictions require daily inspection by the driver when not operated for personal use.
- All jurisdictions have hours of service requirements to manage fatigue when not operated for personal use.
- All jurisdictions prohibit the use of handheld devices when driving and have distracted driving legislation.

4.4 Other factors

Cost must be taken into consideration when reviewing the impacts of limiting the types of vehicles that can be used by school boards and other organizations to transport children. The cost of a vehicle depends on the condition and features of the vehicle. For the purposes of comparison, the following is the cost of the test vehicles used by Transport Canada for testing:

Table 30 – Purchase Price of Transport Canada's Test Vehicles

Vehicle	Purchase Price
Ford 15-passenger van (used)	$29,300
Chevrolet 15-passenger van (new)	$41,100
19-seat school bus (new)	$55,800
30-seat school bus (new)	$65,400
21-seat MFAB	$65,900

It should be noted that 15-passenger vans are a more economical vehicle to purchase.

Despite school buses' excellent safety record, it may not be practical for all pupils in Canada to be transported to and from school on school buses. Moreover, it may not be feasible to transport all pupils to and from extracurricular activities on multi-functional activity buses. Since 15-passenger vans are not the only alternative for transporting pupils, there could be merit in developing best practices for pupil transportation in Canada and not limiting recommendations to 15-passenger van use.

5 Options

Part of CCMTA's mandate is to develop guidelines/recommendations on the use of 15-passenger vans, especially when used for the transportation of pupils. Some jurisdictions do not permit the use of 15-passenger vans to transport pupils to and from school, to extracurricular activities or both. Canada does not have a national approach to the use and monitoring of 15-passenger vans. This section of the report will identify and discuss potential options for developing a national approach for Canada. The six identified options: no changes or do nothing, create guidelines for the transportation of pupils, create guidelines for the use of 15-passenger vans, restrict the use of 15-passenger vans without electronic stability control, prohibit the use of 15-passenger vans for school purposes or prohibit the use of 15-passenger vans in Canada. Each option will be evaluated based on the testing and research completed in Canada and the U.S., implementation and enforcement limitations, impact on society, and how it addresses the concerns of organizations like the Van Angels.

5.1 No Change

This option makes no change to the current national approach to 15-passenger vans or their use for school purposes. Canada would remain silent without providing guidelines or regulations specific to 15-passenger vans. The provinces and territories that have implemented restrictions would also make no changes. Rules and regulations for 15-passenger vans could continue to be made at a provincial level.

PROs of No Change:

- Collision statistics in Canada or the U.S. do not support the idea that 15-passenger vans are involved in a higher number of collisions than other vehicles.
- Stability testing does not support the idea that 15-passenger vans are less stable than other vehicles with similar capacities.
- There would be no additional implementation or enforcement efforts required.
- There would be no impact on current users and owners of 15-passenger vans.

CONs of No Change:

- The testing and surveys completed in Canada and the U.S. have identified maintenance of 15-passenger vans, particularly poor tire pressure maintenance, as having a negative impact on the performance of these and other similar vehicles. Not changing current practice limits communication of these findings to the users of 15-passenger vans.
- Surveys and enforcement show there is a low level of compliance on the proper use of restraints for passengers travelling in 15-passenger vans. Not changing current practice limits communication of these findings to the users of 15-passenger vans.
- Testing has identified that 15-passenger vans perform better when loaded from front to back so as not to overload the rear of the vehicle. Not changing current practices limits communication of these findings to the users of 15-passenger vans.
- Making no changes is not conducive to developing a national approach to the use of 15-passenger vans in Canada.
- Making no changes does not address societal concerns regarding the use and safety of 15-passenger vans, including those of organizations such as the Van Angels.

5.2 Create Guidelines for the Transportation of Pupils

This option addresses the transportation of pupils to and from school and extracurricular activities by providing guidelines to promote the safety of school purpose transportation regardless of the vehicle used.

These guidelines would address such things as vehicle maintenance, including tire pressure, driver licensing, hours of service, restraint compliance and limitations of transportation due to weather or time of day. These guidelines or a standard could recommend all school purpose vehicles be considered commercial vehicles, which would make them subject to NSCs for semi-annual inspections, daily inspections, hours of service and possibly safety ratings.

PROs of guidelines for the transportation of pupils:

- Providing guidelines for the transportation of pupils regardless of the vehicle being used will have a greater impact on improving road safety as more vehicles will be affected.
- The testing and surveys completed in Canada and the U.S. identify that poor tire pressure maintenance can have a negative impact on the performance of large passenger vehicles. Providing guidelines will educate users.

- Testing has identified that larger passenger vehicles perform better when loaded from front to back, so as not to overload the rear of the vehicle. Providing guidelines will educate organizations transporting pupils.

- Such guidelines can promote a more harmonized approach to vehicles operated by or under contract with school boards. Jurisdictions can be provided with parameters and be encouraged to define school purpose vehicles and apply higher licensing and inspection requirements.

- Such guidelines would address the coroner's recommendations from the Bathurst, NB collision.

- Such guidelines would be fairly easy to implement through an education campaign, and enforcement efforts are already established for commercial vehicles.

CONs of guidelines for the transportation of pupils:

- It is difficult to enforce guidelines and recommendations without legislation or regulations to support them.

- Jurisdictions that currently do not require enhanced licensing and inspection requirements for vehicles operated by or under contract with school boards may require regulatory changes to enforce these types of requirements.

- Such guidelines may not meet the expectations of organizations looking for a ban of 15-passenger vans used for transporting pupils.

5.3 Create Guidelines for the Use of 15-Passenger Vans

This option addresses the use of all 15-passenger vans and promotes safety and proper maintenance by educating all users.

These guidelines would address such things as use of restraints, vehicle maintenance including tire pressure, driver licensing, pre-trip requirements and loading guidelines.

PROs of guidelines for the use of 15-passenger vans:

- Guidelines can be implemented through an education campaign, and enforcement efforts are already established for commercial vehicles. Fifteen-passenger vans, excluding those operated for personal use, can be included in the commercial vehicle program, and therefore NSCs for semi-annual inspections, daily inspections, hours of service and safety ratings would apply.

- It is feasible to mail 15-passenger van guidelines to the 27,673 owners registered in Canada.

- Such guidelines would address all users of 15-passenger vans, not just those who transport pupils for school purposes.

CONs of guidelines for the use of 15-passenger vans:

- Collision statistics and stability testing in Canada or the U.S. do not support the idea that 15-passenger vans are involved in a higher number of collisions or are less stable than other similar vehicles. Providing guidelines and special rules without statistics supporting the decision could set a precedent for other vehicle types.
- Such guidelines may not meet the expectations of organizations looking for a ban on the use of the vehicle.

5.4 Restrict Use of Non-ESC 15-Passenger Vans

This option would restrict the use of, or phase out, older 15-passenger vans that do not have electronic stability control/roll stability control. This restriction or phase-out could be applied in varying degrees, from prohibiting use for the transportation of pupils to banning all use.

PROs of restricting use of non-ESC 15-passenger vans:

- Tests prove ESC has a significant impact on the stability and control of all vehicles and especially larger passenger vehicles.
- Such restrictions address the concerns of organizations looking for this type of ban.
- Since 2005/2006 ESC has been a standard feature on 15-passenger vans, and therefore older vehicles will be phased out in time.
- Restrictions could be applied by prohibiting schools from purchasing or leasing non-ESC 15-passenger vans. This would not impact current owners of 15-passenger vans.

CONs of restricting the use of non-ESC 15-passenger vans:

- Collision statistics and stability testing in Canada or the U.S. do not support the idea that 15-passenger vans are involved in a higher number of collisions or are less stable than other similar vehicles. Restricting use without statistics supporting the decision could set a precedent for other vehicle types.
- If the ban were not phased in, current owners could be in a situation where they own vehicles they can no longer use.

5.5 Prohibit 15-Passenger Vans for Transporting Children

This option would prohibit the use of 15-passenger vans for school purposes while permitting use of the vehicle by other organizations or owners.

PROs of prohibiting 15-passenger vans for transporting children:

- Such a prohibition addresses the concerns of organizations looking for this type of ban.
- Banning new 15-passenger vans for this use and prohibiting their lease or rental provides a phase-in period so that current owners of 15-passenger vans are not affected.
- Doing so is in keeping with the U.S. Department of Transportation rule that prohibits schools from purchasing or leasing 15-passenger vans.

CONs of prohibiting 15-passenger vans for transporting children:

- Collision statistics and stability testing in Canada or the U.S. do not support the idea that 15-passenger vans are involved in a higher number of collisions or are less stable than other similar vehicles. Providing guidelines and special rules without statistics supporting the decision could set a precedent for other vehicle types.
- If the ban were not phased in, school organizations could be in a situation where they own vehicles they can no longer use.
- Such a ban does not address the concerns of 15-passenger vans used for other purposes, such as transporting workers or as shuttles.

5.6 Prohibit the Use of 15-Passenger Vans in Canada

This option would prohibit the use of 15-passenger vans in Canada for all users.

PROs of prohibiting 15-passenger vans:

- It meets the requests of some organizations lobbying against 15-passenger vans and in support of Bill C-522.
- It addresses all uses of 15-passenger vans.

CONs of prohibiting 15-passenger vans:

- Collision statistics and stability testing in Canada or the U.S. do not support the idea that 15-passenger vans are involved in a higher number of collisions or are less stable than other similar vehicles. Providing guidelines and special rules without statistics supporting the decision could set a precedent for other vehicle types.
- All owners of 15-passenger vans would be required to purchase new vehicles.
- There would be a direct impact on the manufacturers of 15-passenger vans, which could affect the economy and cause job losses.

- It limits economic options for large families and organizations.

6 Risk and Impacts

Options	Risks	Jurisdictional Impacts
No Changes	▪ Could appear that concerns regarding 15-passenger vans are not being addressed ▪ Provinces make their own restrictions without uniformity	▪ No change to the current legislation, regulations or policies ▪ Does not promote a unified approach to 15-passenger vans in Canada
Create guidelines for the transportation of pupils AND/OR Create guidelines for the use of 15-passenger vans	▪ Not all jurisdictions support or adopt the guidelines, continuing the disconnect between jurisdictions ▪ Sets a precedent to create guidelines for other types of vehicles after high profile collisions	▪ Some guidelines specific to vehicles used for pupil transportation under contract with or by a school board could require jurisdictions to create a definition for this type of vehicle and make amendments to current legislation and regulations, i.e., higher driver's licence classification ▪ Some guidelines could require policy development and enforcement activity ▪ Sets a precedent to create guidelines for similar vehicles ▪ Addresses some of the concerns raised by some jurisdictions
Restrict the use of non-ESC 15-passenger vans	▪ Approximately 80% of 15-passenger vans currently registered in Canada do not have ESC ▪ ESC is not an aftermarket option and cannot be added to a vehicle ▪ Eliminates a more economic alternative to school buses or MFABs ▪ Organizations or individuals that own non-ESC 15-	▪ Requires legislative and regulatory changes ▪ Requires policy development and enforcement activity ▪ Requires communication of the changes ▪ Sets a precedent for similar non-ESC vehicles that test the same as the 15-passenger van with ESC turned off ▪ Non-ESC 15-passenger vans

Options	Risks	Jurisdictional Impacts
	passenger vans would not be permitted to use their vehicles ▪ Research has not been completed to fully understand the impact and options	are currently being phased out since vehicles manufactured after 2005/2006 have ESC as a standard feature ▪ Address the concerns
Prohibit the use of 15-passenger vans for school purposes OR Prohibit the use of 15-passenger vans in Canada	▪ Others will lobby for additional vehicles to be banned without the testing and statistics to prove they are dangerous ▪ Eliminates a more economic alternative to school buses or MFABs ▪ Organizations or individuals that own 15-passenger vans would not be permitted to use their vehicles ▪ Raises the question why they are deemed suitable for adult use but not for children ▪ Raises the question why we should ban 15-passenger vans and not other large passenger vehicles with similar test results ▪ Economic impacts on manufacturers, car dealers, employees and current owners.	▪ Requires legislative and regulatory changes ▪ Requires policy development and enforcement activity ▪ Requires communication of the changes ▪ Sets a precedent to ban vehicles without testing or statistical findings supporting the need for the ban

7 Conclusion

Statistics

There has been extensive research to review the design and handling of 15-passenger vans in both Canada and the United States. The statistical analysis reviewed fatality rates, occurrence of rollover, age of occupants and use of restraints.

In the U.S. a total of 291,448 vehicles were involved in fatal collisions over the 5-year period from 2003 to 2007 of which 0.19% were school buses, 0.22% 15-passenger vans, 4.27% minivans and 81.15% other light passenger vehicles and trucks. In Canada 28,832 vehicles were involved in fatal collisions over the 10-year period from 1998 to 2007 of which 0.05% were school buses and 0.12% were 15-passenger vans. These statistics do not support the theory that 15-passenger vans are involved in a disproportionate number of fatal collisions.

NHTSA's statistical studies found the median age group for drivers killed in 15-passenger vans to be 45 to 54 and passengers killed to be 24 to 34. Further review shows that of the occupants killed in 15-passenger vans where the age has been determined, 83% were over the age of 20 and 92% over the age of 15. Based on the demographics of fatalities in collisions involving 15-passenger vans, recommendations should likely apply to 15-passenger vans in general and not be limited to use in transporting school-aged passengers.

Statistics also show that U.S. passengers of 15-passenger vans have a high level of non-compliance in relation to use of restraints. Over the 5-year period from 2003 to 2007, 68% of occupants of 15-passenger vans involved in fatal collisions were not wearing seatbelts. In addition, of those passengers that died, 80% were not wearing seatbelts. This is very high compared to studies of all vehicles: nine U.S. states report 10% non-compliance, and Canadian statistics show 5% to 8% of occupants do not wear seatbelts.

The research did not prove a higher incidence of fatalities compared to other vehicles; however, there is a higher occurrence of rollovers in situations where there are fatalities. A U.S. study completed by NHTSA compared passenger vehicles with 15-passenger vans and the number of occupants killed when a vehicle rolls over. The study looked at the number of occupants involved in fatal collisions and the number of rollover occurrences. Results showed that 155,444 occupants of passenger vehicles were killed and, of those, 52,884 were in vehicles that rolled over, for a total of 34%. There were 473 occupants of 15-passenger vans killed and, of those, 265 were in 15-passenger vans that rolled over, for a total of 56%. This study only reviewed rollover occurrences where occupants were killed, and therefore conclusions cannot be made on the incidence of rollovers exclusively. In addition, the percentage was calculated based on the number of occupants killed rather than the number of vehicles that rolled over. This does not take into consideration the number of occupants

per vehicle. The higher rate of fatalities in rollovers could be directly related to the number of passengers per vehicle and the high percentage of unrestrained occupants in 15-passenger vans.

Testing

Both the U.S. and Canada have completed testing on 15-passenger vans and compared them to other vehicles with the same occupant capacity. This testing looked at tire maintenance (including tire pressure and condition), emergency stopping, stability, rollover thresholds and the centre of gravity on the test vehicles.

NHTSA completed testing on the effect of low tire pressure on the handling of 15-passenger vans and determined that low tire pressure had a negative impact on the stability and handling of the vehicle. NTHSA also completed a survey on tire maintenance by randomly selecting vehicles to be inspected; results indicated a very high percentage of large vans had significantly underinflated tires, a much higher percentage than that of passenger cars.

Transport Canada compared seven vehicles, including the following: one minivan, one 12 seat passenger van, two 15-passenger vans, one 19 seat and one 30 seat school buses and one 21 seat MFAB. The results showed that for all vehicles tested it would be extremely difficult if not impossible to induce a pure rollover without leaving the driving lane. The testing also identified the importance of tire maintenance (specifically tire pressure), load distribution and axle weights for all test vehicles. Both poor tire condition and rear overloading could negatively impact vehicle handling and brake performance and increase the chance of tires overheating. Overall Transport Canada's test results found that 15-passenger vans performed as well as, and sometimes better than, the two school buses and the MFAB in all tests performed.

Transport Canada completed dynamic manoeuvre testing on three vehicles, including two 15-passenger vans and an MFAB. The results showed that ESC and tire pressure significantly improved the stability of buses with gross vehicle weight ratings under 4,500 kg. Vehicles with ESC could perform the Sine with Dwell manoeuvre at 80 and 100 km/h in nominal and full load conditions without spinning out. It was not possible to complete the full test sequence

when ESC was disabled on the 15-passenger vans or on the MFAB where ESC was not available. The two 15-passenger vans with ESC activated were also capable of completing the fishhook manoeuvre at nominal and full load, even with the rear tire pressure reduced from 80 psi to 50 psi. Without ESC none of the vehicles was able to complete the fishhook manoeuvres. The fishhook manoeuvre in the full load condition was performed on the MFAB at a speed of 55 km/h with tire pressure of 50 psi and at 65 km/h with tire pressure of 80 psi. It resulted in the vehicle spinning out. Without the outrigger equipment, the vehicle would have rolled.

Limited crashworthiness testing was completed with two 2009 Ford F150 pick-ups colliding with the sides of both a 2011 Ford 15-passenger van and a 2011 Girardin multi-functional activity bus, above the left rear axles. The F150 trucks were travelling at 75 km/h. Both the 15-passenger van and MFAB exhibited significant casualties and limitations in their ability to protect the dummy occupants. A more severe collision (for example, the F150 travelling at a higher speed, or a heavier striking vehicle such as a tractor-trailer instead of the F150) would be expected to result in even higher casualties. As such, no further crashworthiness testing is planned.

Standards

Fifteen-passenger vans, along with other heavier light-duty vehicles, have fewer requirements regarding roof strength than other passenger vehicles. However, by 2016 Transport Canada will require more stringent roof strength for all vehicles, including 15-passenger vans.

There have been several manufacturing improvements to 15-passenger vans similar to all vehicles—safety equipment has been added as standard features, such as driver, passenger and curtain airbags; three-point restraints; ESC; and tire pressure monitoring equipment. ESC has proven impressive in helping maintain control of a vehicle when there is a need to swerve or brake suddenly. ESC has been a standard feature on 15-passenger vans since 2005 for Chevrolet and GMC and 2006 for Ford. Federal regulations have also required most vehicles with GVWRs of 4,536 kg or less to be equipped with ESC since September 2011;

this includes 15-passenger vans. With the introduction of ESC on 15-passenger vans, the process of phasing out 15-passenger vans without this proven safety enhancement is underway. It should be noted that ESC cannot be added to a vehicle as an aftermarket safety feature—it can only be installed during the manufacture of the vehicle.

Inspection and Human Factors

All jurisdictions require 15-passenger vans to be treated as commercial vehicles other than those operated for personal use. The following requirements apply:

- Periodic inspections as per the provincial inspection requirements for a bus, either annually or semi-annually
- Daily Inspections by the driver
- Limit to the number of hours a driver can drive or perform work (drivers are required to prove compliance by keeping a log of driving time, on-duty time and off-duty time)

In addition to requirements to manage fatigue, all Canadian jurisdictions prohibit the use of handheld devices when driving and enforce distracted driving legislation for all vehicles.

A driver's skill level also impacts safety. Currently, there is inconsistency across Canada with driver licensing requirements for vehicles used to transport children. Canada could benefit from harmonizing the licensing requirements for drivers.

The research, statistics and review of requirements across Canada show that there are two issues to address: use, oversight and education of drivers regarding 15-passenger vans, and education and harmonization of requirements for all vehicles used to transport pupils.

8 Recommendations

This report's findings suggest two further actions are needed in Canada: develop a national approach to both 15-passenger van safety and the safe transportation of pupils to and from school and extracurricular activities.

15-Passenger Vans

Research does not support a ban of 15-passenger vans in Canada regardless of their use. There are ramifications to banning a vehicle across Canada, including the impact on current owners, manufacturers, and motor dealers and the elimination of an economical alternative for transporting large groups or families. Fifteen-passenger vans meet all federal manufacturing requirements/standards, and testing has demonstrated that they are not less stable or more prone to roll over than other vehicles with similar capacities. Having said that, there is public interest in improving the safe operation of 15-passenger vans, and research has shown that driver training and proper maintenance can improve driver knowledge and skill level as well as the handling and performance of 15-passenger vans.

Canada should develop national guidelines to promote and educate users on how to safely operate a 15-passenger van regardless of use. The guidelines should stress the importance of:

- Performing monthly tire maintenance, including measuring tire pressure and checking tire condition
- Loading cargo and passengers from front to back
- Complying, except in cases of personal use, with the requirements under NSC 11B for periodic inspections, NCS 13 for daily inspections (NSC 13), NSC 9 regarding hours of service (NSC 9) and NSC 4 regarding possession of at least a Class 4 driver's licence.
- Complying with requirements for seatbelt and child restraint use in all vehicles, including 15-passenger vans

See Appendix D, "15-Passenger Van Safety Guidelines," for a copy of suggested details to be included.

Transportation of Pupils

There have been recommendations to ban the use of 15-passenger vans for the transportation of pupils and permit school boards to use only school buses or MFABs. Vehicle testing did not support reports that 15-passenger vans are less stable or more prone to roll over then school buses and MFABs. A U.S. study looked at the relative risks of school travel and determined the highest risk group are pupils travelling in passenger vehicles with teen drivers. Although school bus transportation has been regarded as one of the safest

forms of transportation, it is not always a feasible option. Limitations on alternatives for transporting pupils could result in a reduction of transportation organized by schools boards, leaving parents and carpooling as the mode of transportation. This would leave little control over the experience of drivers or the type or condition of vehicles used.

Driver qualifications and vehicle maintenance, specifically tire pressure maintenance, have been shown to improve safety for all vehicles. Canada should develop harmonized requirements for the safe transportation of pupils to and from school and extracurricular activities for all vehicles used. These recommendations include:

- Requiring a higher class driver's licence for vehicles operated by or under contract with school boards
- Amending the definition of commercial vehicles to include vehicles operated by or under contract with school boards, requiring these vehicles to comply with NSC 11B, NSC 13 and NSC 9
- Developing safety guidelines that stress the importance of
    - Performing monthly tire maintenance, including measuring tire pressure and checking tire condition
    - Loading cargo and passengers from front to back with heavier vehicles
    - Respecting the requirements for seatbelts and child restraints
    - Developing contingency plans at every school board to be prepared for poor weather or other unplanned situations that limit or require travel to be cancelled

See Appendix D, "15-Passenger Van Safety Guidelines," for a copy of suggested details to be included.

These guidelines and regulations for 15-passenger vans should be developed at a national level and posted on Transport Canada's, school boards' and provincial/territorial government websites. In addition the guidelines for 15-passenger vans could be mailed to each registered owner by jurisdiction, to ensure owners are educated on the safety guidelines.

Appendix **A**
15-Passenger Vans Registered in Canada

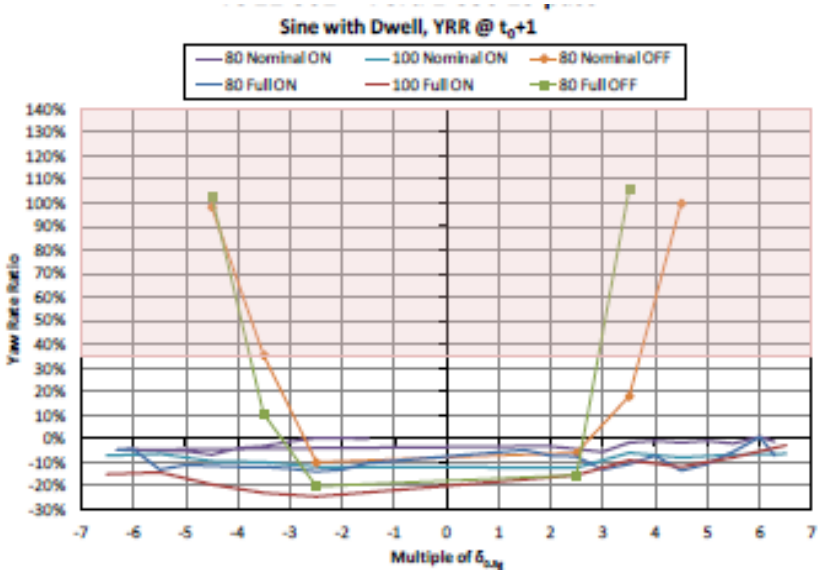
Below is an inventory of 15-passenger vans registered in Canada as of July 1, 2008, broken down by manufacturer. Electronic Stability Control (ESC) has been a standard feature since 2005 for Chevrolet and GMC models and 2006 for Ford. Dodge stopped producing these vehicles in 2002. All 15-passenger vans have been required to have ESC in Canada since September 2011.
Assuming that only those vehicles equipped with ESC as a standard feature actually have ESC, then 20.54% of the 15-passenger vans in Canada have ESC.

15-Passenger Vans Registered in Canada by Make

Model Year	Chevrolet	Dodge	Ford	GMC	Total
1981	0	25	14	0	39
1982	0	25	9	0	34
1983	0	41	13	0	54
1984	0	78	20	0	98
1985	0	126	40	0	166
1986	0	127	59	0	186
1987	0	109	91	0	200
1988	0	157	194	0	351
1989	0	222	211	0	433
1990	94	177	0	57	328
1991	77	181	0	69	327
1992	150	237	160	77	624
1993	147	80	154	116	497
1994	144	385	182	112	823
1995	184	191	179	193	747
1996	101	262	101	88	552
1997	160	301	197	196	854
1998	144	198	172	119	633
1999	703	218	788	189	1898
2000	951	320	754	399	2424
2001	887	220	1004	372	2483
2002	1044	161	1131	269	2605
2003	1538	0	1049	374	2961
2004	1020	0	864	4	1888
2005	550	0	784	332	1666
2006	636	0	1670	0	2306
2007	691	0	1020	0	1711
2008	286	0	498	0	784
2009		0	0	2	2
Total	**9,507**	**3,841**	**11,358**	**2,968**	**27,674**
Total w ESC	**2,163**	**0**	**3,188**	**334**	**5,685**
% w ESC	**22.75%**	**0.00%**	**28.07%**	**11.25%**	**20.54%**

The Sine with Dwell tests were performed at 80 and 100 km/h in nominal and fully loaded condition and with ESC enabled and disabled (where applicable). Figures 1 to 3 show the yaw rate ratio at 1 second and 1 ¾ seconds after completion of the manoeuvre. In order to meet CMVSS 126, the lines must not enter into the shaded area. It can be seen that, when ESC is enabled, all tests meet the criteria; when ESC is disabled or when there is no ESC, some tests do not meet the criteria.

Figure 1: Ford E350 – Yaw Rate Ratios Measured 1 and 1 ¾ Seconds After the Sine with Dwell Manoeuvre



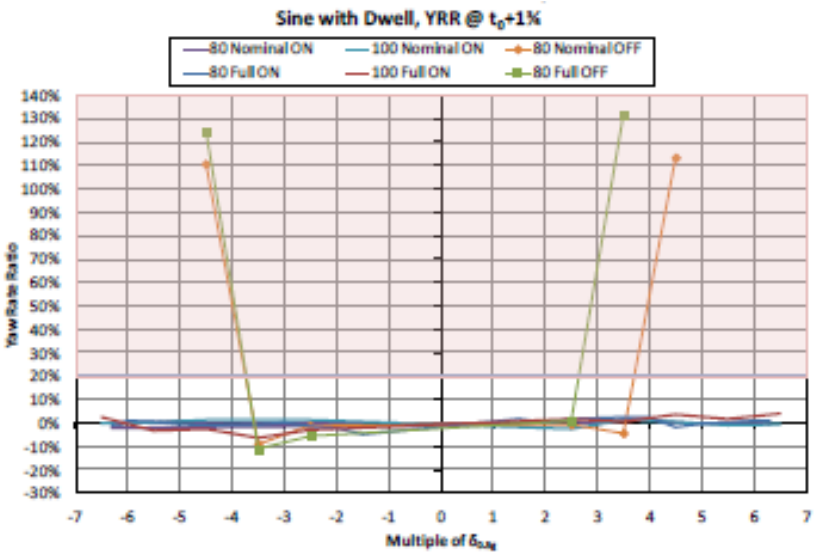


Figure 2: MFAB – Yaw Rate Ratios Measured 1 and 1 ¾ Seconds After the Sine with Dwell Manoeuvre

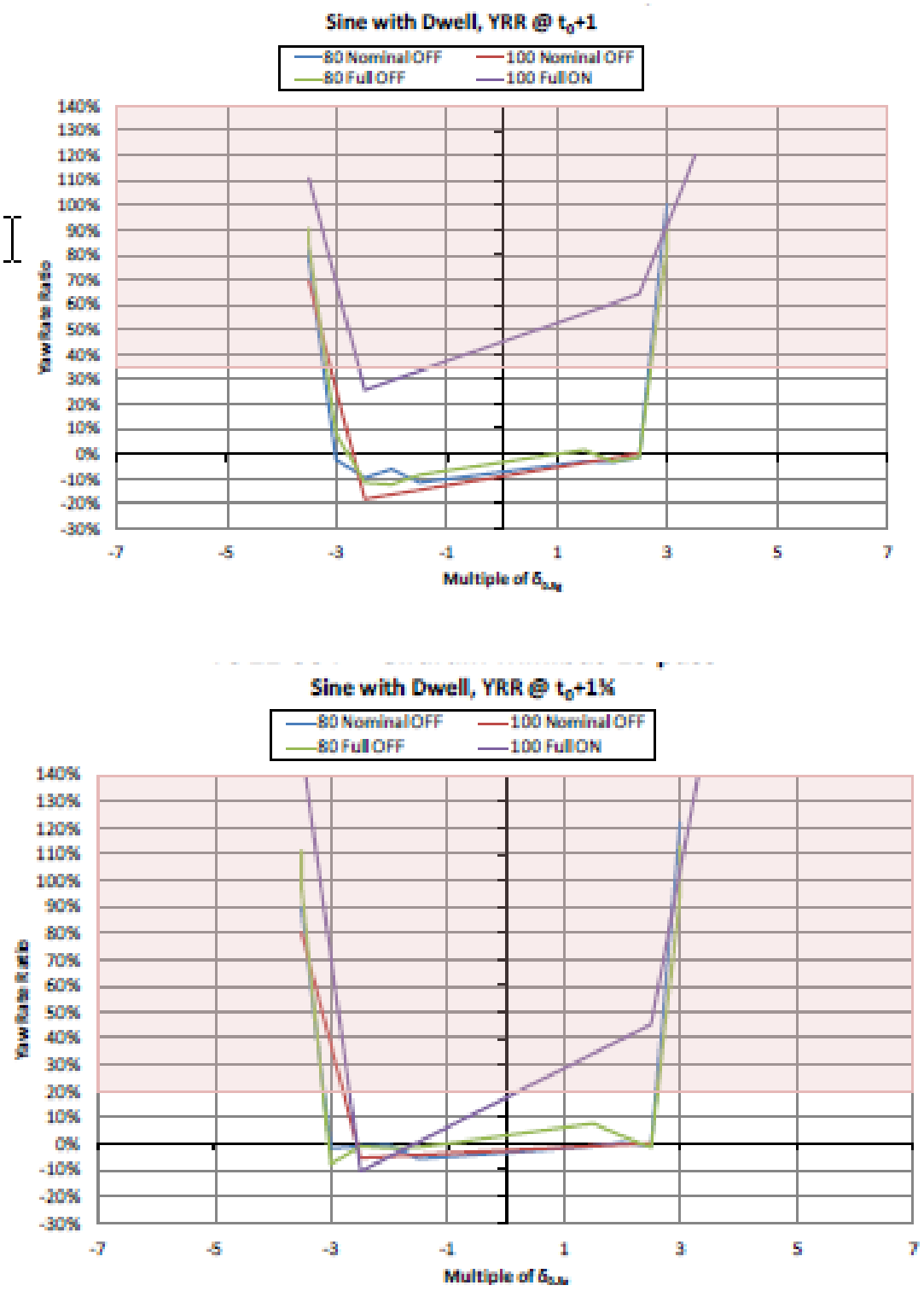
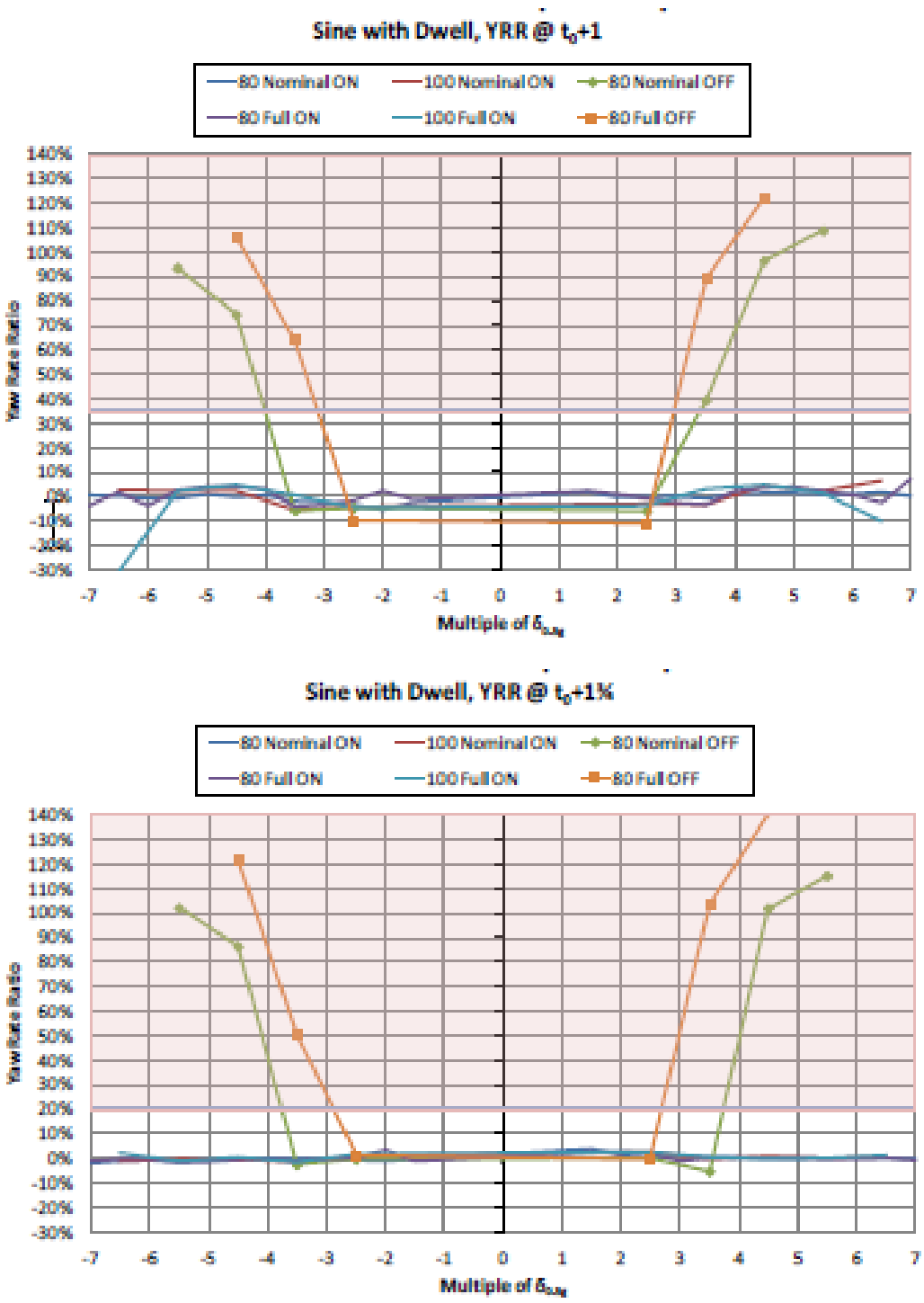


Figure 3: Chevrolet Express – Yaw Rate Ratios Measured 1 and 1 ¾ Seconds After the Sine with Dwell Manoeuvre



Step Input Tests – Seven step input metrics were computed as follows, with the average metrics displayed in Figures 1 to 3:

a) **Steady-state yaw velocity response gain** [s^{-1}] is obtained by dividing the yaw rate by the steering wheel angle when yaw rate reaches steady state.
b) **Lateral acceleration response time** [s] is obtained by measuring the time required for lateral acceleration to first reach 90% of the steady-state lateral acceleration.
c) **Yaw velocity response time** [s] is obtained by measuring the time required for yaw rate to first reach 90% of the steady-state yaw rate.
d) **Lateral acceleration peak response time** [s] is obtained by measuring the time required for lateral acceleration to reach its peak value.
e) **Yaw velocity peak response time** [s] is obtained by measuring the time required for yaw rate to reach its peak value.
f) **Overshoot value of lateral acceleration** [unitless] is the ratio of the difference of the peak value and steady-state value of lateral acceleration divided by the steady-state value of lateral acceleration.
g) **Overshoot value of yaw velocity** [unitless] is the ratio of the difference of the peak value and steady-state value of yaw rate divided by the steady-state value of yaw rate.

Figure 1: Ford E350 – Average of Step Input Metrics

Nominal Lateral Acceleration	Load	ESC	Lateral Acceleration	Steady-state yaw velocity response gain	Lateral acceleration response time	Yaw velocity response time	Lateral acceleration peak response time	Yaw velocity peak response time	Overshoot value of lateral acceleration	Overshoot value of yaw velocity
-6 m/s²	Nominal	ON	-5.6	0.15	0.71	0.32	1.24	0.80	0.20	0.31
-6 m/s²	Nominal	Off	-5.7	0.15	0.72	0.32	1.65	0.77	0.20	0.30
-6 m/s²	Full	ON	-5.4	0.15	0.88	0.33	1.88	1.30	0.17	0.37
-6 m/s²	Full	Off	-5.4	0.15	0.88	0.34	2.02	0.86	0.18	0.35
6 m/s²	Nominal	ON	5.6	0.15	0.70	0.30	1.46	0.73	0.21	0.36
6 m/s²	Nominal	Off	5.6	0.16	0.71	0.31	1.50	0.75	0.20	0.36
6 m/s²	Full	ON	5.6	0.16	1.92	0.33	1.96	1.35	0.20	0.34
6 m/s²	Full	Off	5.7	0.16	0.95	0.34	2.06	0.84	0.17	0.29
-4 m/s²	Nominal	ON	-3.7	0.15	0.63	0.30	1.18	0.65	0.21	0.30
-4 m/s²	Full	ON	-3.6	0.14	0.64	0.29	1.28	0.72	0.24	0.45
4 m/s²	Nominal	ON	3.9	0.16	0.66	0.30	1.29	0.69	0.22	0.35
4 m/s²	Full	ON	3.9	0.16	0.73	0.33	1.46	0.86	0.20	0.32
-2 m/s²	Nominal	ON	-2.1	0.15	0.61	0.31	1.05	0.65	0.22	0.30
-2 m/s²	Full	ON	-1.8	0.14	0.58	0.28	1.00	0.65	0.29	0.47
2 m/s²	Nominal	ON	1.9	0.15	0.61	0.31	1.05	0.67	0.23	0.32
2 m/s²	Full	ON	1.9	0.14	0.63	0.32	1.13	0.61	0.23	0.35

Figure 2: MFAB – Average of Step Input Metrics

Note: Only one test was performed for -6 m/s2 lateral acceleration under full load condition because the vehicle was spinning out during the test.

Nominal Lateral Acceleration	Load	ESC	Lateral Acceleration	Steady-state yaw velocity response gain	Lateral acceleration response time	Yaw velocity response time	Lateral acceleration peak response time	Yaw velocity peak response time	Overshoot value of lateral acceleration	Overshoot value of yaw velocity
-6 m/s²	Nominal	No ESC	-6.1	0.22	0.76	0.36	2.24	1.51	0.21	0.47
-6 m/s²	Full*	No ESC	-6.1	0.30	1.23	1.04	3.72	4.41	0.22	2.37
6 m/s²	Nominal	No ESC	5.2	0.20	0.72	0.31	1.75	0.84	0.24	0.67
6 m/s²	Full*	No ESC	5.6	0.29	1.06	0.97	2.89	2.68	0.19	2.04
-4 m/s²	Full	No ESC	-4.7	0.26	1.06	0.51	2.36	1.83	0.19	0.45
4 m/s²	Nominal	No ESC	3.4	0.19	0.63	0.30	1.75	0.64	0.23	0.61
4 m/s²	Full	No ESC	4.0	0.24	0.96	0.45	2.25	1.93	0.20	0.52
-2 m/s²	Nominal	No ESC	-2.2	0.17	0.54	0.29	1.87	0.55	0.24	0.57
-2 m/s²	Full	No ESC	-2.2	0.20	0.79	0.40	1.51	0.95	0.21	0.50
2 m/s²	Nominal	No ESC	1.9	0.17	0.88	0.27	0.89	-0.21	0.33	0.76
2 m/s²	Full	No ESC	2.0	0.20	0.76	0.37	2.05	1.45	0.22	0.52

Figure 2: Chevrolet Express – Average of Step Input Metrics

Nominal Lateral Acceleration	Load	ESC	Lateral Acceleration	Steady-state yaw velocity response gain	Lateral acceleration response time	Yaw velocity response time	Lateral acceleration peak response time	Yaw velocity peak response time	Overshoot value of lateral acceleration	Overshoot value of yaw velocity
-6 m/s²	Nominal	ESC ON	-5.7	0.19	0.64	0.31	2.21	0.66	0.19	0.26
-6 m/s²	Nominal	ESC Off	-5.7	0.20	0.64	0.31	2.03	0.65	0.19	0.26
-6 m/s²	Full	ESC ON	-5.5	0.20	0.73	0.32	1.22	0.84	0.18	0.29
-6 m/s²	Full	ESC Off	-5.7	0.20	0.75	0.33	2.48	0.71	0.16	0.29
6 m/s²	Nominal	ESC ON	5.0	0.18	0.62	0.28	1.65	0.65	0.20	0.30
6 m/s²	Nominal	ESC Off	5.1	0.18	0.61	0.28	1.05	0.59	0.21	0.33
6 m/s²	Full	ESC ON	4.7	0.17	0.69	0.29	1.42	0.65	0.19	0.36
6 m/s²	Full	ESC Off	4.7	0.17	0.65	0.28	1.37	0.63	0.21	0.40
-4 m/s²	Nominal	ESC ON	-4.1	0.20	0.67	0.34	2.14	0.76	0.19	0.21
-4 m/s²	Full	ESC ON	-4.1	0.21	0.72	0.34	1.46	0.76	0.19	0.25
4 m/s²	Nominal	ESC ON	3.5	0.19	0.65	0.31	2.01	0.63	0.19	0.23
4 m/s²	Full	ESC ON	3.4	0.17	0.68	0.31	1.57	0.63	0.19	0.30
-2 m/s²	Nominal	ESC ON	-1.7	0.17	0.59	0.31	2.41	0.62	0.27	0.24
-2 m/s²	Full	ESC ON	-2.2	0.18	0.66	0.31	1.56	0.72	0.21	0.25
2 m/s²	Nominal	ESC ON	1.7	0.17	0.56	0.28	1.08	0.60	0.23	0.26
2 m/s²	Full	ESC ON	1.6	0.16	0.65	0.31	2.21	0.58	0.23	0.27

15-Passenger Van Safety Guidelines

Introduction

Given the recent incidence of collisions involving 15-passenger vans the following guidelines address the safe operation of these vans for:

- **Personal use ;**
- **Commercial use;**
- **Transportation of students.**

Personal Use of 15-Passenger Vans

Tires

It is important to inspect the van's tires before each use and to check tire pressure monthly. Tire pressure is different for each vehicle and is based on its weight and design. For some vehicles, the required tire pressure can be different for the front and rear tires. To find the required tire pressure and the best tire type for your vehicle, you can look in the following locations:

- your owner's manual;
- on the tire information label located on the driver's door;
- inside the driver's door frame, or;
- inside the glove compartment door.

Some vehicles are equipped with tire pressure monitoring systems that inform the driver when the tire pressure is too low. Even if your vehicle is equipped with this technology, you should manually check your tire pressure at least once a month.

Tire condition is important for safe vehicle control and to reduce the risk of rollover. Check to ensure your tires are in good condition and have sufficient tread depth. Equip the vehicle with the appropriate tires for weather and road conditions. Some jurisdictions require the use of winter tires, so check with your provincial/territorial governments' highway traffic acts for details.

Driver Training and Licensing

When operating a 15-passenger van, it is important to recognize that these vans handle differently than passenger vehicles especially when fully loaded with people or luggage/equipment.

Appendix D

15-Passenger Van Safety Guidelines

Driver Requirements and Safety Tips

All drivers should avoid distractions from within the vehicle and be well rested when operating a vehicle. Most jurisdictions prohibit the use of handheld devices such as cell phones, wireless devices, or GPS systems. Drivers should limit conversation and distraction while driving and plan for regular breaks to keep alert.

Drivers should not exceed the posted speed limit and they should operate the vehicle at a safe speed based on the driving conditions (e.g., slow down if the roads are wet or icy). Fifteen passenger vans are large vehicles and do not respond well to abrupt steering and require additional braking time. They also require reliance by the driver on side and rear view mirrors.

Vehicle Maintenance and Inspections

All drivers and owners of 15-passenger vans should ensure that the vehicle is maintained in accordance with manufacturer's recommendations. Vehicles should be inspected regularly by a technician as well as the driver prior to operating the vehicle.

Loading Passengers and Cargo

The way a van is loaded and the distribution of the weight can change how it handles. It is important to follow the loading instructions in the van owner's manual.

The easiest way to know how much weight your van is designed to carry is to:

a. find the Gross Vehicle Weight Rating (GVWR) on the driver's door post or in your owner's manual;

b. find the weight of the empty van (net weight) in your owner's manual, then;

c. subtract b from a and the remainder is how much weight you can add (i.e., people, fuel and cargo).

If you cannot find your owner's manual, you may be able to find one online (i.e., manufacturer's website) or alternatively, you can get a new one from your local dealer.

A 15-passenger van should be loaded from the front to the back:

- never allow more than 15 people to ride in a 15-passenger van;
- when the van is not full, passengers and cargo should be loaded in front of the rear axle;
- fill the front passenger seats first and then put cargo in empty seats or on the floor to the front of the vehicle or evenly distribute it throughout the vehicle;
- roof racks, rear cargo boxes and tow trailers should be avoided as they will negatively affect the handling and control of the vehicle:

- If you do use them, ensure that the heavier cargo is inside the vehicle and never exceed the recommended weight limitations.

Electronic Stability Control (ESC)

Vehicle testing has proven that there are many benefits to the use of an Electronic Stability Control System (ESC) which can improve vehicle handling and help prevent loss of vehicle control and reduce rollovers. In Canada, 15-passenger vans have been manufactured with ESC since 2005/2006. Check your owner's manual to confirm whether your van is equipped with ESC. If your van does not have ESC, it cannot be retrofitted.

As of September 2011, all of these vans were required by federal regulation to be manufactured with ESC (as of September 2012, all vehicles under 4,535 kg GVWR that are built in two stages, such as school buses and multifunctional activity buses will also be required to have ESC). Now, if you are purchasing a new 15-passenger van or renting one, it is recommended that you get a van that is equipped with an ESC system to reduce the chance of collision or rollover.

Seat Belts and Child Restraints

Your chances of surviving a motor vehicle collision increase dramatically if you are wearing your seat belt properly and children are properly seated in child restraints appropriate for their weight and height. All seating positions within 15-passenger vans are fitted with seat belts.

In most jurisdictions, individuals 16 years or older are legally required to wear a seat belt at all times and drivers are legally required to ensure all children under 16 are properly restrained based on their height, weight and age. In Manitoba, this applies to passengers 18 years of age or under and in the Northwest Territories, Nunavut and Yukon, this applies to passengers 15 years or under. All jurisdictions have fines for non-use of seat belts and child restraints and most assign demerit points.

For more information on which child or booster seat you should use and when a child can use a regular seat belt, visit Transport Canada's website under Child Safety or your provincial/territorial Ministry of Transportation's website.

Seat Belt Tips and Facts:

- Seat belts must be in proper working condition:
  - seat belt itself is not twisted or cut;
  - buckle is in good working order, and;
  - retractors should work smoothly when pulling out the seat belt and should retract easily when not in use.

- A seat belt won't protect you if it is not worn properly. Take a few seconds to position the lap portion of your seat belt snug to your body and low on the hips. Never wear the shoulder strap under the arm where it could injure your ribs during a crash;
- A seat belt keeps the driver behind the wheel and in control during a collision. It helps keep your head and body from hitting the steering wheel;
- A seat belt keeps you inside the vehicle during a collision, rather than being thrown through a windshield or door onto the roadway;
- Without a seat belt, passengers become high-speed projectiles in a collision, injuring themselves and other passengers.

Commercial Use of 15-Passenger Vans

Fifteen passenger vans are considered to be commercial vehicles when they are not used exclusively for personal use. When operated commercially, additional requirements must be followed. Please check with your provincial/territorial governments for the requirements that apply to your jurisdiction.

Driver Training and Licensing

Drivers of 15-passenger vans who are operating the vehicle commercially are required to have a minimum of a Class 4 driver's licence in most provinces/territories. You should check with your provincial/territorial government's highway traffic acts for details as to what licence is required. A list of jurisdictional websites is provided at the end of these guidelines. Drivers who are operating 15-passenger vans commercially should consider taking a recognized commercial vehicle training course prior to obtaining their licence.

Commercial Driver Requirements and Safety Tips

Commercial drivers of 15-passenger vans must comply with a number of requirements under the National Safety Code. Commercial drivers of 15-passenger vans are subject to Hours of Service requirements that limit the number of hours that they can be on-duty and driving. In some cases, drivers are required to keep a log documenting their activities to ensure that they are getting sufficient rest in order to meet the Hours of Service Requirements. For more information, see National Safety Code 9 Hours of Service on the Canadian Council of Motor Transport Administrators' website and your provincial/territorial governments' highway traffic act for details.

Vehicle Maintenance and Inspections

Commercial use of 15-passenger vans is subject to a number of vehicle inspection requirements:

1. Twice yearly inspections. Vehicles should be inspected twice a year by a licensed technician in accordance with National Safety Code 11B "Periodic Commercial Motor Vehicle Inspection";
2. Daily Inspections. Drivers are required to inspect specific features of the vehicle each day the vehicle is driven according to National Safety Code 13 "Trip Inspection". The driver is also required to record any vehicle defects and determine if the vehicle can be operated safely;
3. Roadside Inspections. National Safety Code 12 "CVSA On-Road Inspections" may require 15 passenger vans to be subject to roadside inspections by provincial and territorial commercial vehicle inspectors.

Motor carriers must obtain a Safety Fitness Certificate which permits the operation of commercial vehicles, including 15-passenger vans on public highways. This certificate acknowledges that the motor carrier maintains a safe operation and fleet of vehicle(s). The motor carriers receive a safety rating based on their performance with respect to:

- Collisions;
- convictions resulting from driver or vehicle infractions;
- vehicle inspections;
- site visits and inspections including facility audits.

Transportation of Students

School buses are the recommended vehicle for transporting students to and from school or to extra- curricular activities. Under the National Safety Code (NSC) Standards, a vehicle with 10 or more passengers is considered a bus and therefore a commercial vehicle. Operators of 15-passenger vans for the purpose of transporting students must comply with the same NSC standards included in the previous section on Commercial Use of these vehicles and follow the guidelines for the safe operation of these vehicles noted in the Personal Use section.

Driver Training and Licensing

The driver who is responsible for transporting students should be trained, experienced and have a safe driving record. Large passenger vehicles handle differently especially when fully loaded, so choose an experienced driver who operates this type of vehicle on a regular basis.

Based on the vehicle or use of the vehicle, a higher class of drivers' licence maybe required. Ensure that the driver has an appropriate and valid driver's licence. Check your provincial/ territorial government's licensing requirements for transporting students.

Develop a Plan for Transporting Students

Appendix D

15-Passenger Van Safety Guidelines

There are a number of activities that should be included in a plan for transporting students:

- School Boards should develop guidelines, policies and regulations for the safe transportation of students and monitor compliance with them;
- Each school should develop a plan to ensure that the above recommendations are followed including a process to ensure that a well maintained vehicle and qualified driver are selected;
- Weather should be monitored prior to travel, including the weather at the destination and projected weather for the trip home;
- An itinerary of the trip should be made available to parents;
- Development of contingency plans by each school board should be prepared for poor weather or other unplanned situations that require travel to be cancelled;
- Chaperones and supervisors should be equipped with a cell phone and contact information in the event a decision to cancel or suspend travel is required or if plans are changed.

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