

Wide Base Single (WBS) Assemblies



2013: A Holistic View

Purpose

- Review and quantify the 2013 status and impact of WBS assemblies.

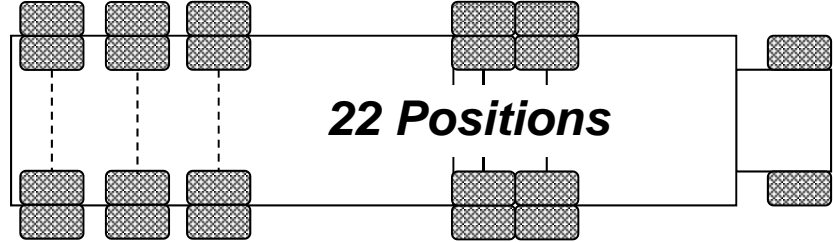
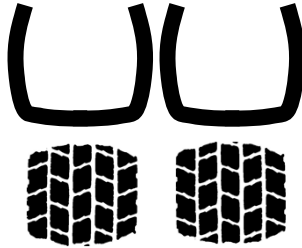
Agenda

- (Re)introduce WBS.
- Key performance and status review.
- Pavement loading focus.
- Economic analysis.
- When restrictions are overcome...

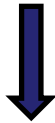


Wide Base Single Assemblies

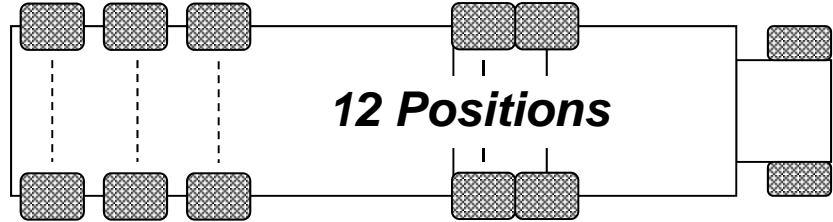
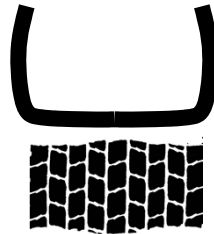
Duals



22 Positions



WBS
(X One[®])



12 Positions

Equivalent Sizes

11R22.5 → 455/55R22.5

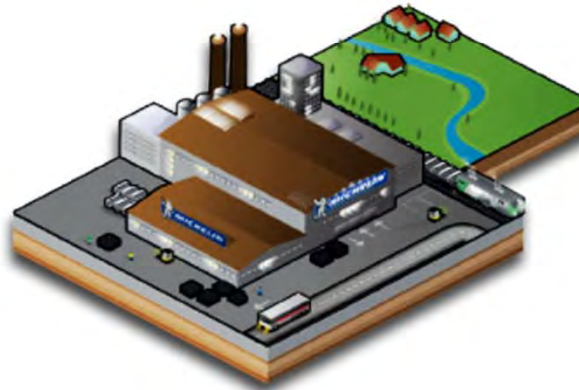
275/80R22.5 → 445/50R22.5



+~3% Fuel Economy
+~425 kg Payload

Equivalent traction and wear.

WBS Life Cycle Benefits



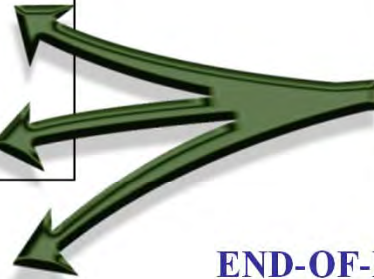
PRODUCTION
Savings of 9 gallons of oil per tire



TIRE USE
~3% fuel economy improvement, all else equivalent. ~700 gal. / truck / year saved.



END-OF-LIFE PROCESSING



~65 lbs. less material to process

LANDFILL

MATERIAL & ENERGY RECOVERY

RETREADING
X One Casings &
X One Retreads

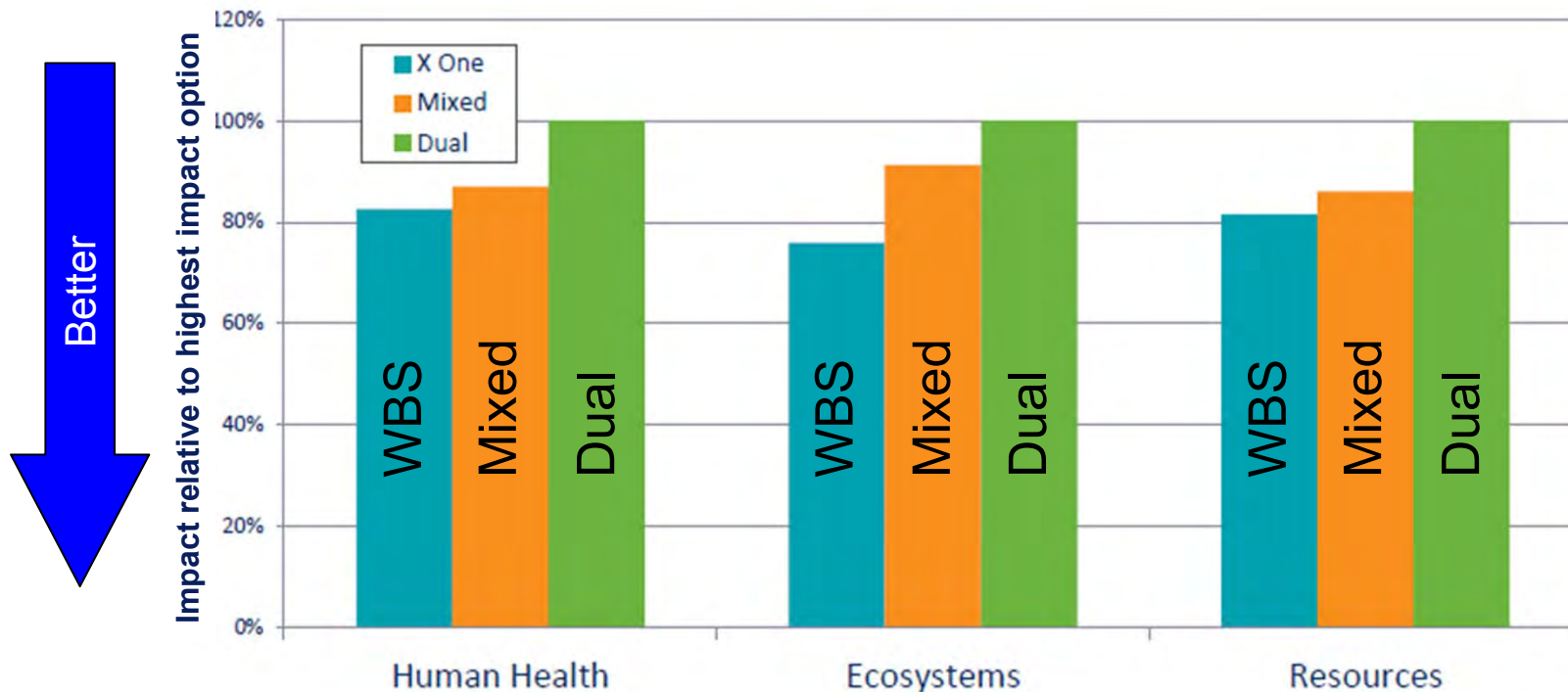


WBS Life Cycle Analysis



Summary of findings:

X One tire system shows better environmental performance than dual tires among all impact categories examined



WBS Summary of Attributes



Wide
Base
Single

	Duals		WBS
Fuel Economy			+~3%
Payload			+~425 kg
GHG Emission Reduction			-2.4 g / t-m
Natural Resource Conservation			~30% Red'n
Wear			
Retreadability			
Stability			
Pressure Maintenance			+++



	Duals		WBS
Traction			
Traffic Reduction			+

# Suppliers			7
Vehicle Design Freedom			+
Driver Fatigue			+
Ease of Service			+

Context: 6 – axle vehicle heavily loaded in long – haul operation.

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Ease of Service			+

Context: 6 – axle vehicle heavily loaded in long – haul operation.

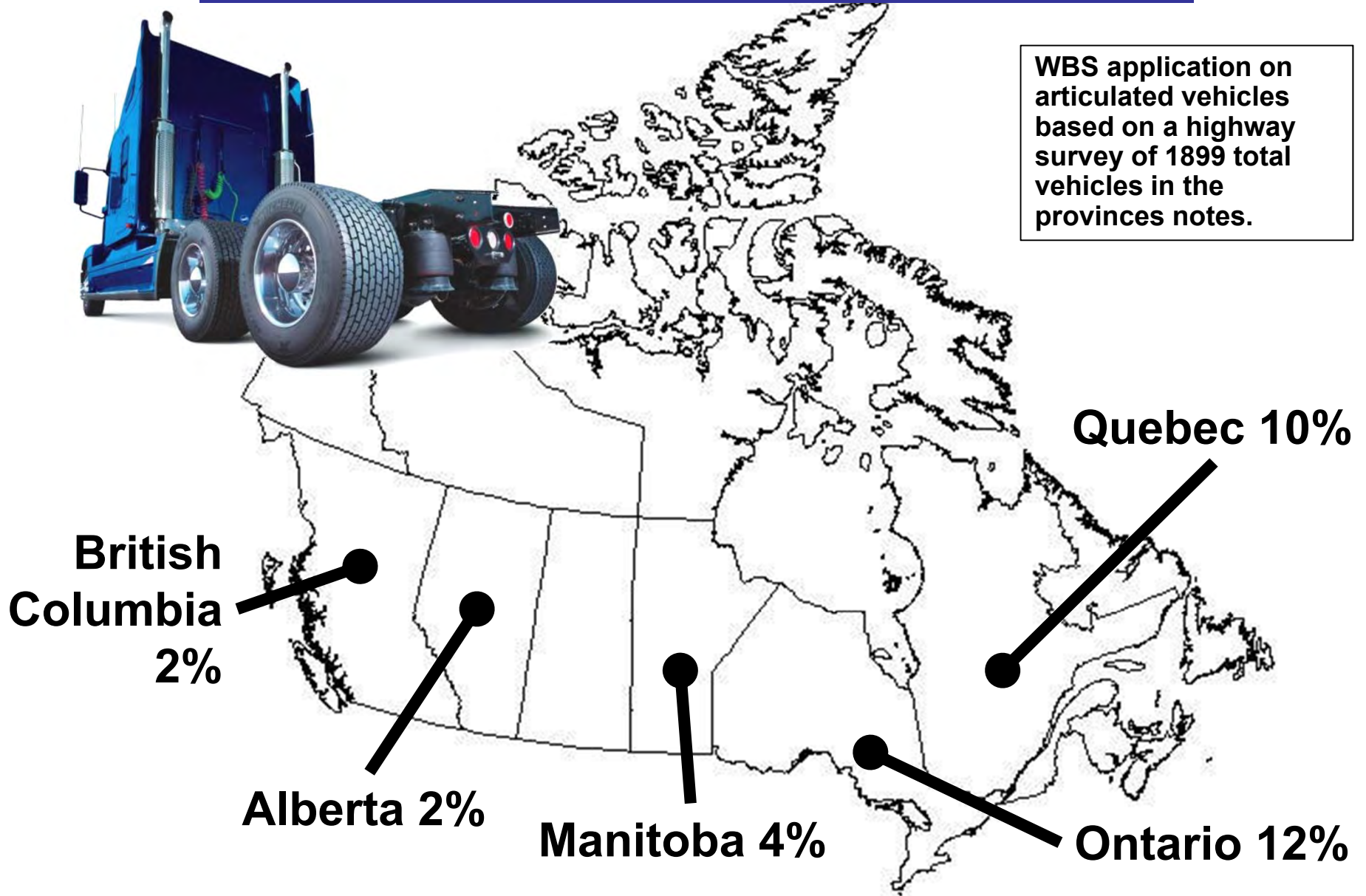
WBS on USA Highways 2Q13



Average USA: 19%

WBS application on 5-axle vehicles based on a highway survey of 2974 vehicles throughout USA.

WBS on Canadian Highways 4Q13





 **WBS assemblies provide clear advantages in:**

- **Fuel efficiency.**
- **Payload.**
- **Environmental impact.**

 **So why is the use so low in western Canada and the Maritimes?**

WBS Summary of Attributes



Wide
Base
Single

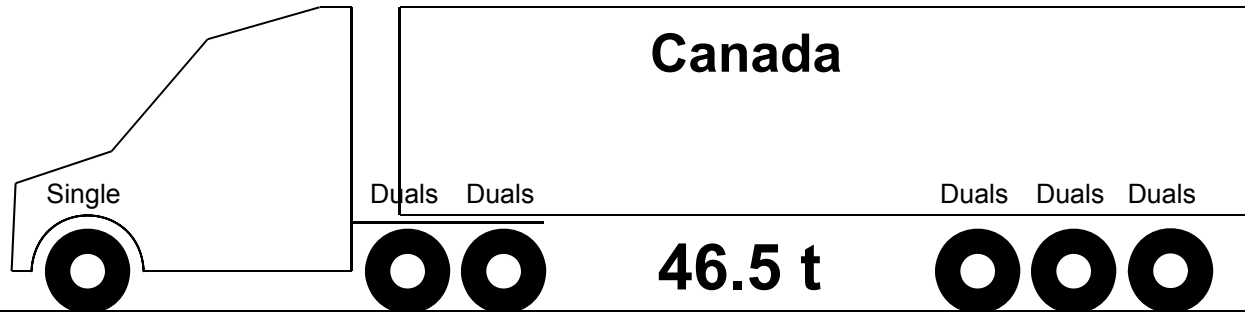
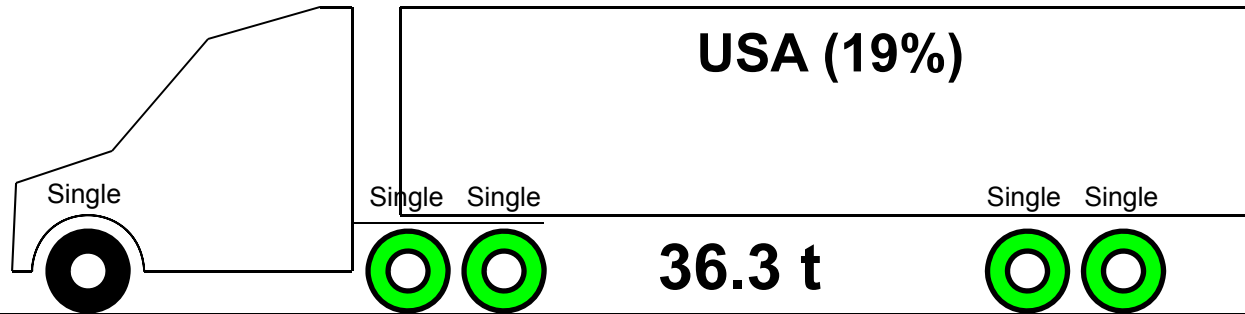
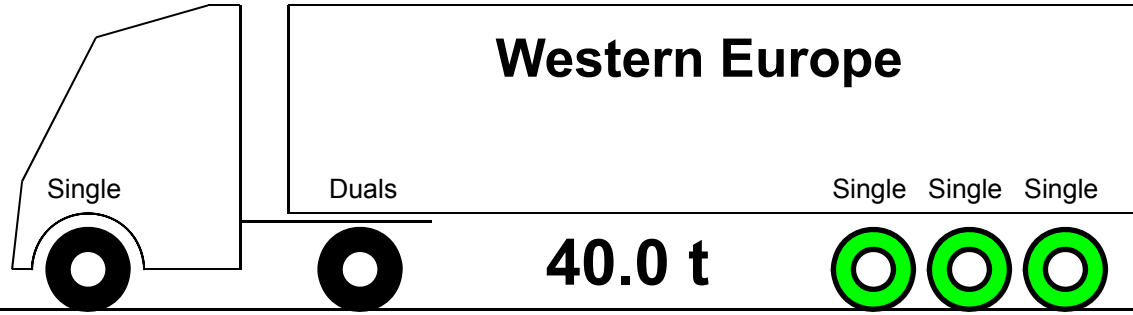


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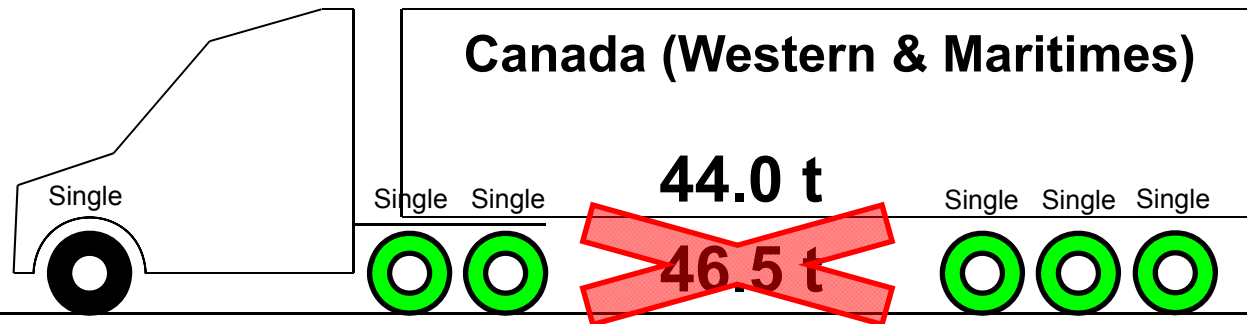
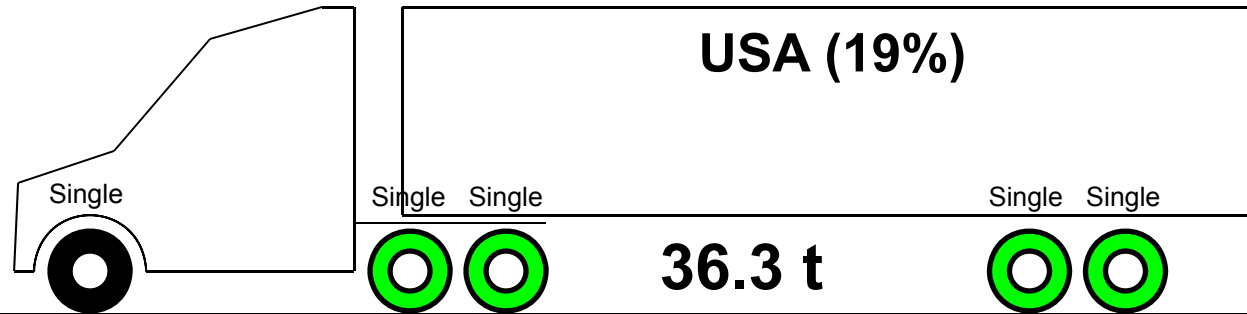
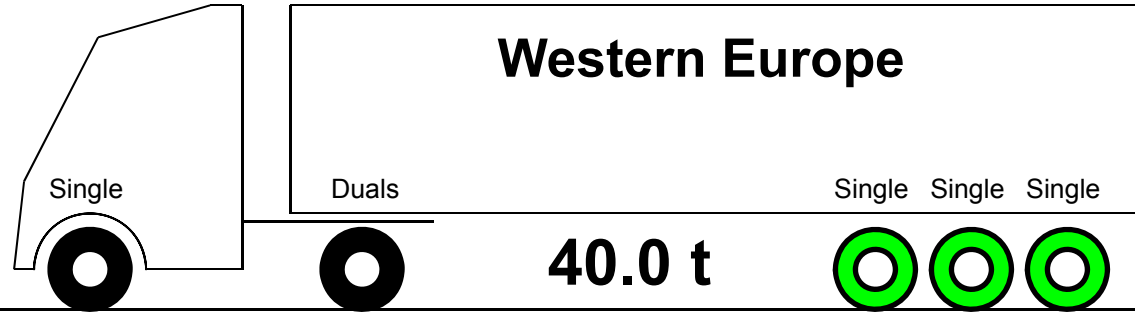
	Duals		WBS
Traction		<input type="checkbox"/>	
Traffic Reduction			+
Pavement Impact		+/-	
# Suppliers			7
Vehicle Design Freedom			+
Driver Fatigue		<input type="checkbox"/> +	
Ease of Service			+

Context: 6 – axle vehicle heavily loaded in long – haul operation.

Common Configurations & Maximum Loads



Common Configurations & Maximum Loads



Pavement Strains

Grellet, Doré, Bilodeau and Gauliard

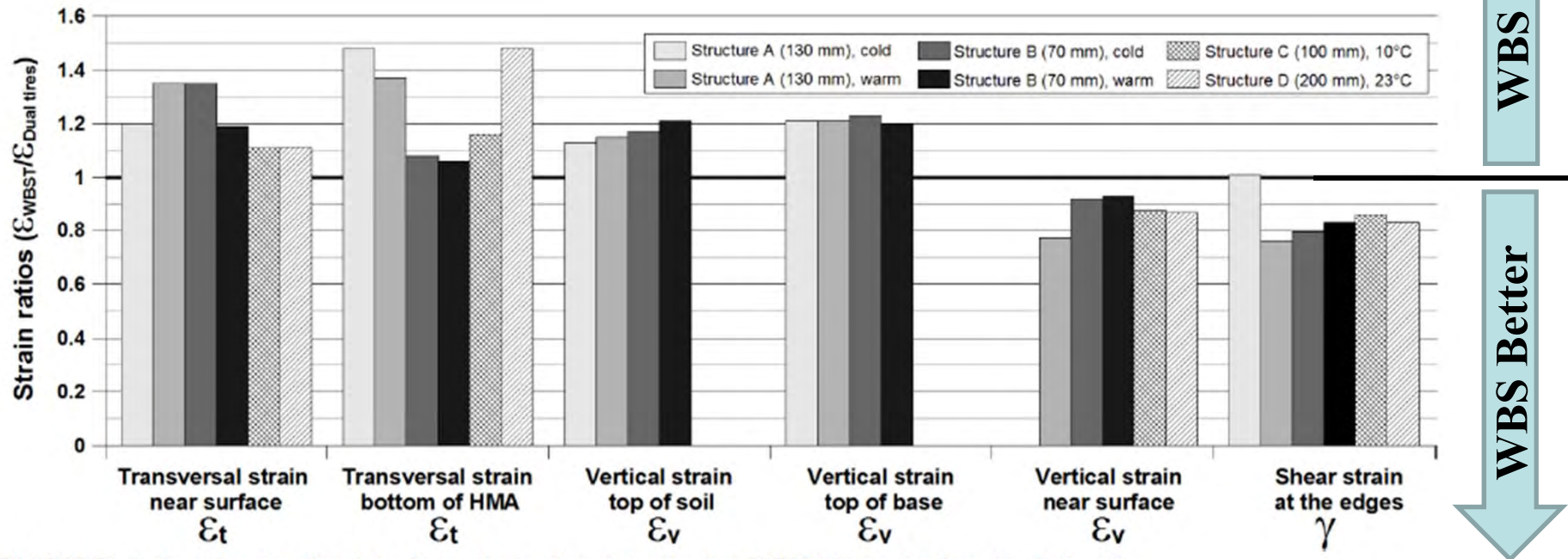


FIGURE 4 Synthesis of critical strain ratios (strain for WBST/strain for dual tires).

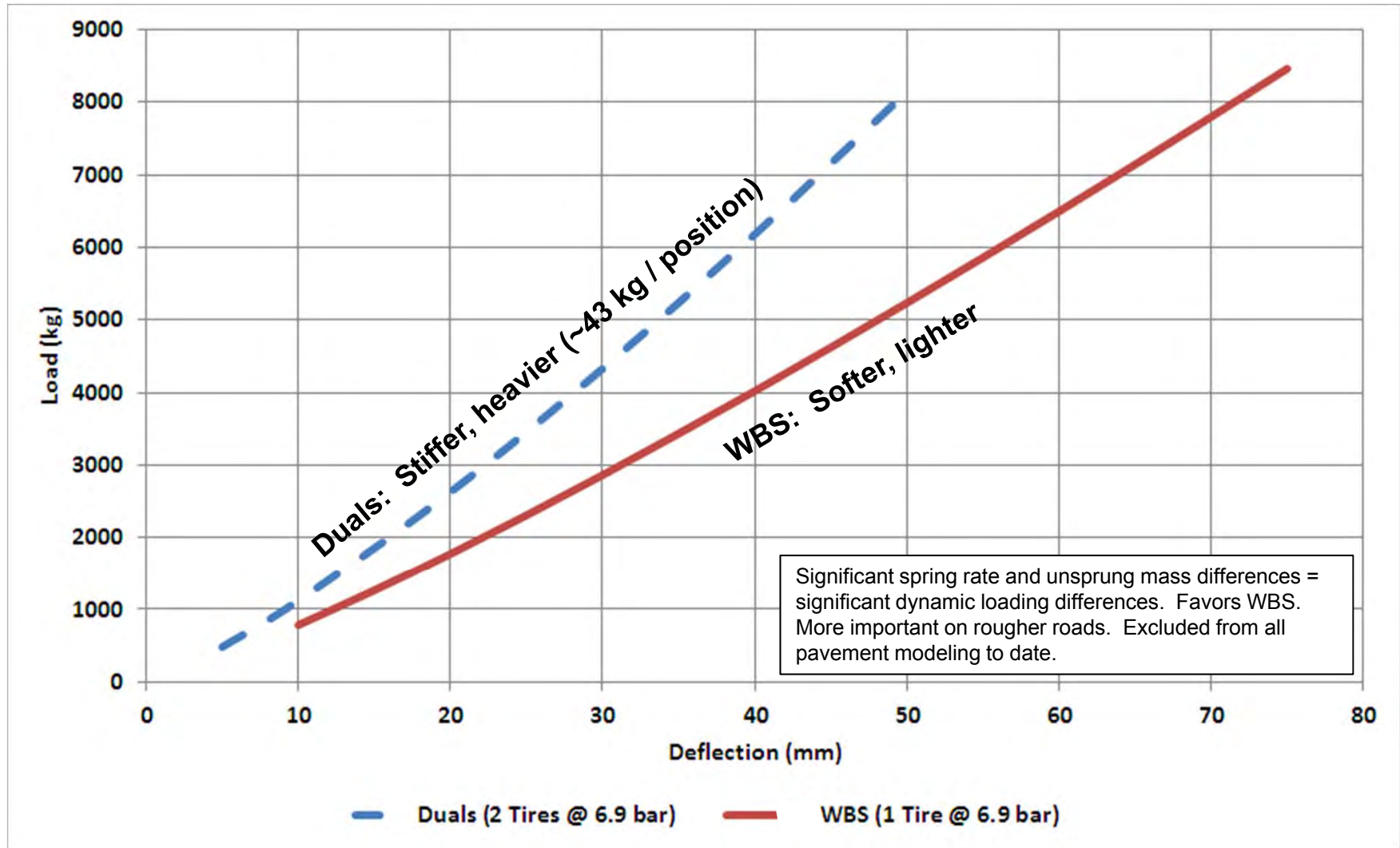
Smooth rolling
 Limited speed
 Equal pressures / loads

➔

Excludes advantages for WBS:

- Spring rate difference ~20%
- Unspring mass difference ~43 kg / position
- Pressure maintenance

Vertical Static Load vs. Deflection

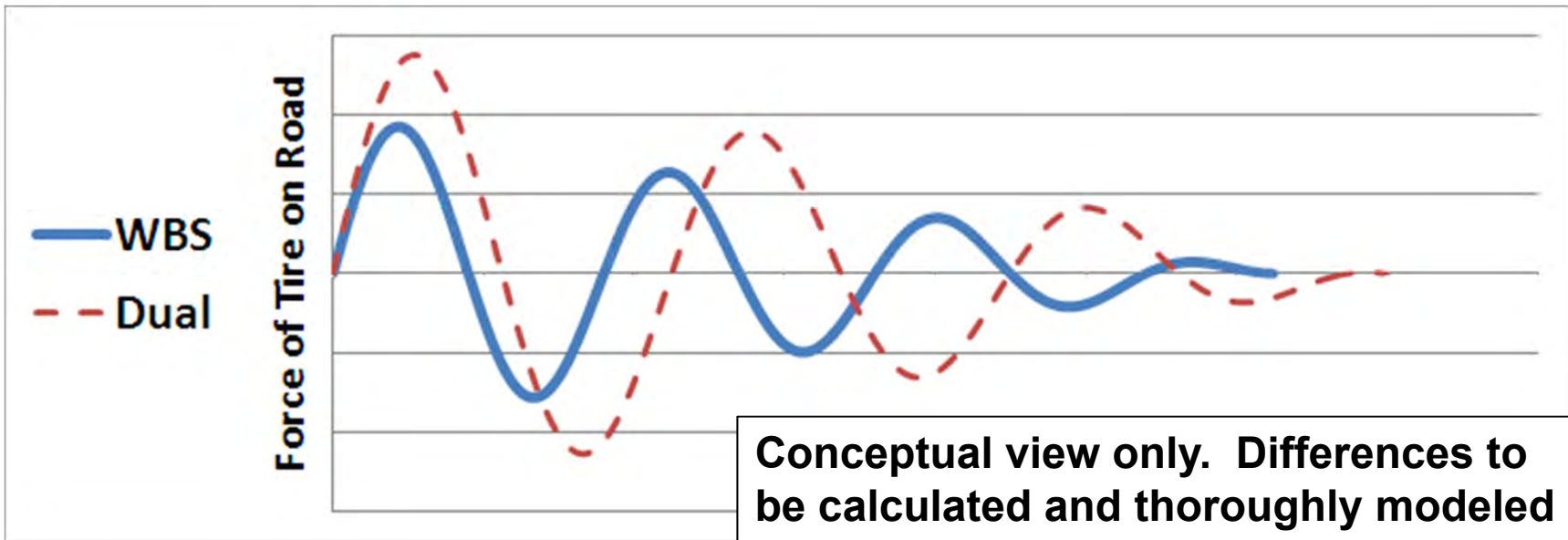
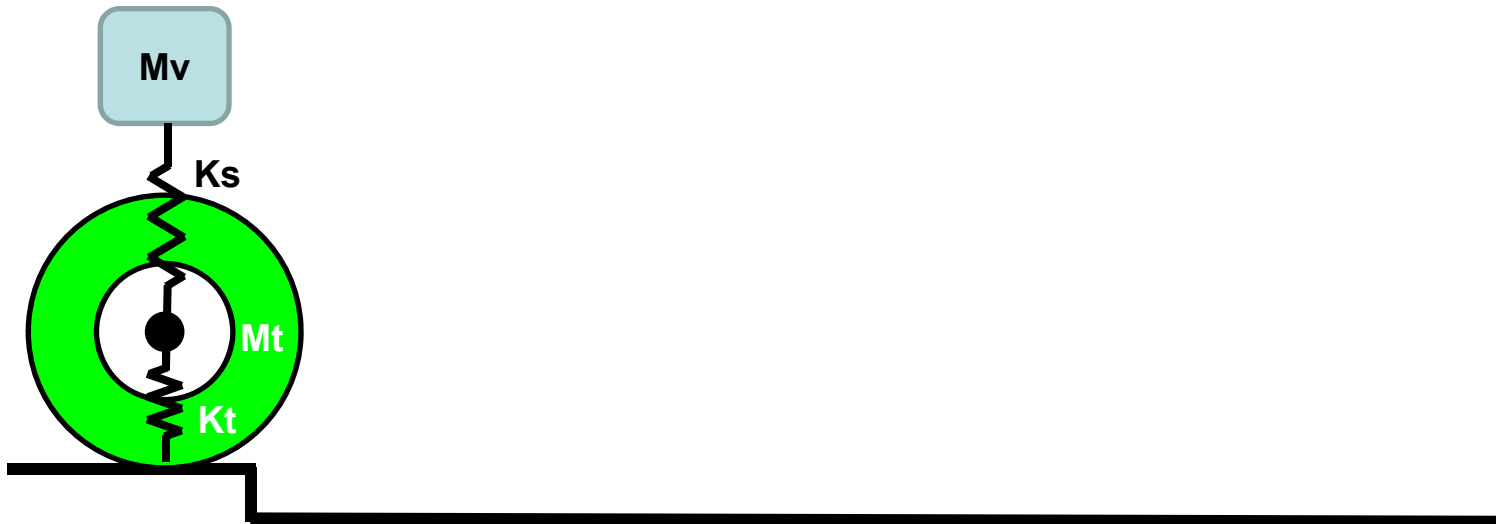


Dual = 275/80R22.5 Michelin XDN2 @ 6.9 bar (2 tires)

WBS = 445/50R22.5 Michelin X One XDN2 @ 6.9 bar

Van Teeple / Global Research Program Manager / Michelin Americas Research Company

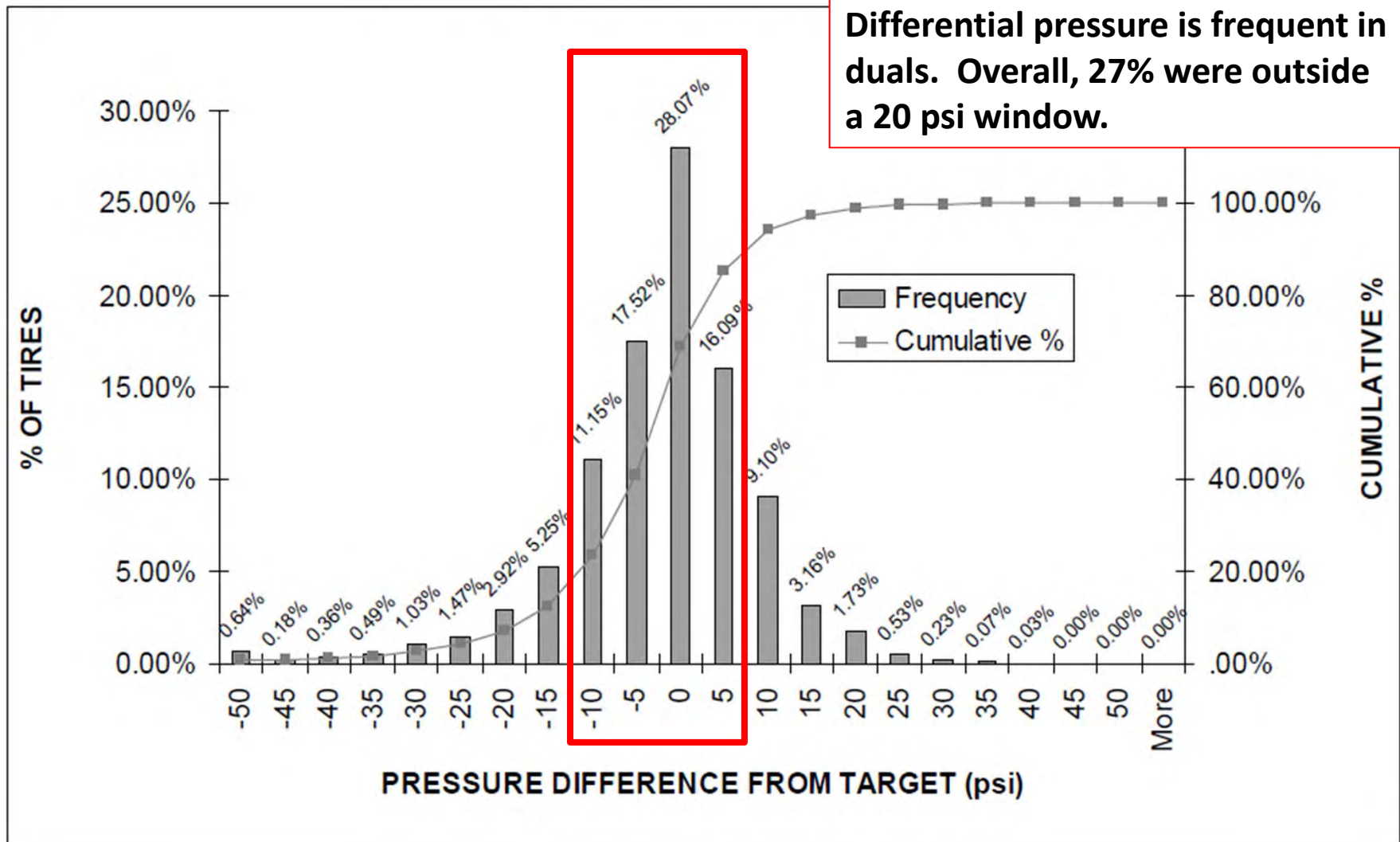
Schematic of Tire K & M Impact



Conceptual view only. Differences to be calculated and thoroughly modeled in parallel with US FHWA study.

Dual Unequal Inflation Impact

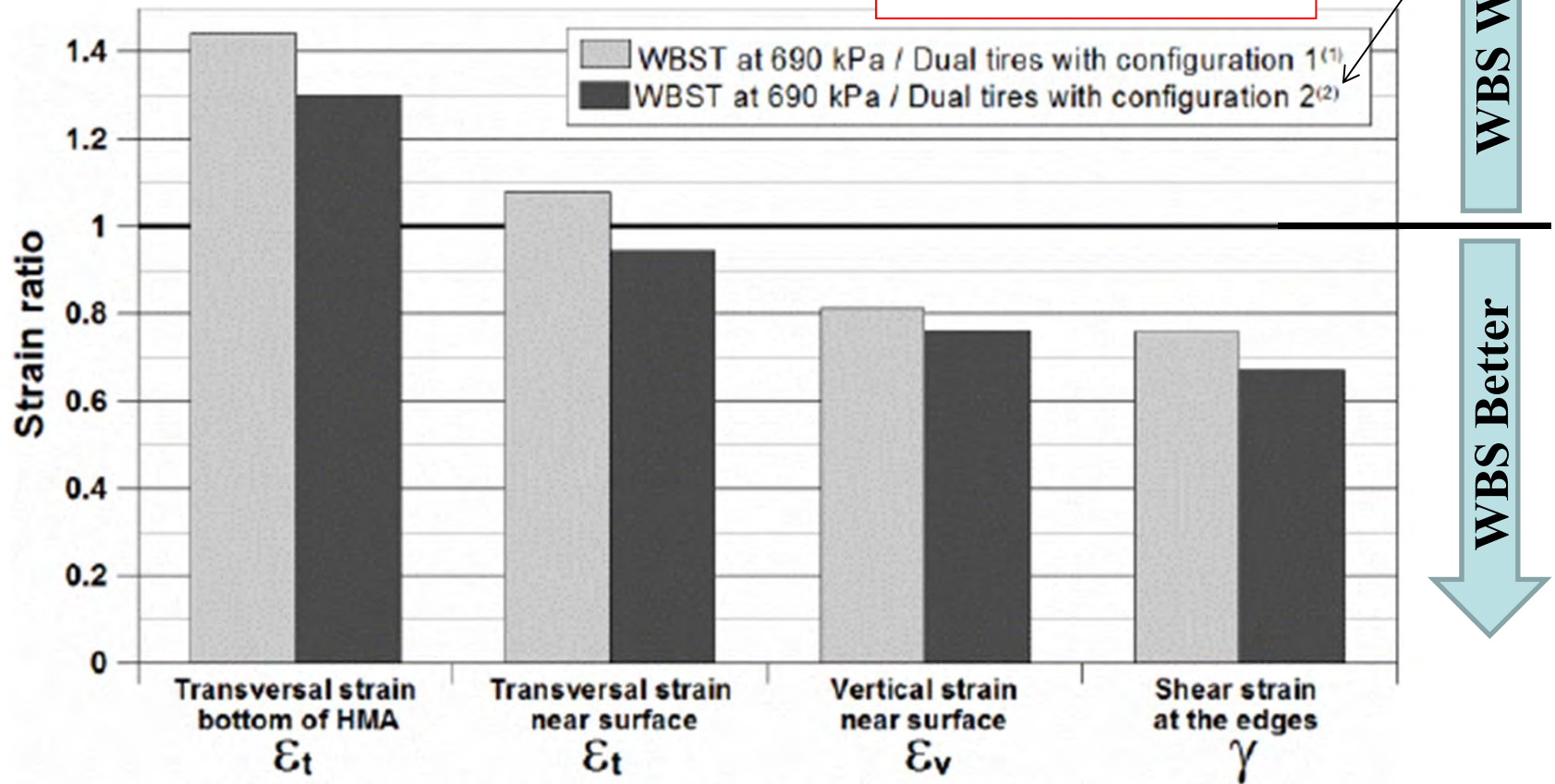
Exhibit 4.3 Distribution of All Tires Surveyed



Dual Unequal Inflation Impact

Grellet, Doré, Bilodeau and Gauliard

20 psi lower pressure
in one dual.



⁽¹⁾Configuration 1: Dual tires with tire #1 at 690 kPa and tire #2 at 690 kPa

⁽²⁾Configuration 2: Dual tires with tire #1 at 690 kPa and tire #2 at 550 kPa

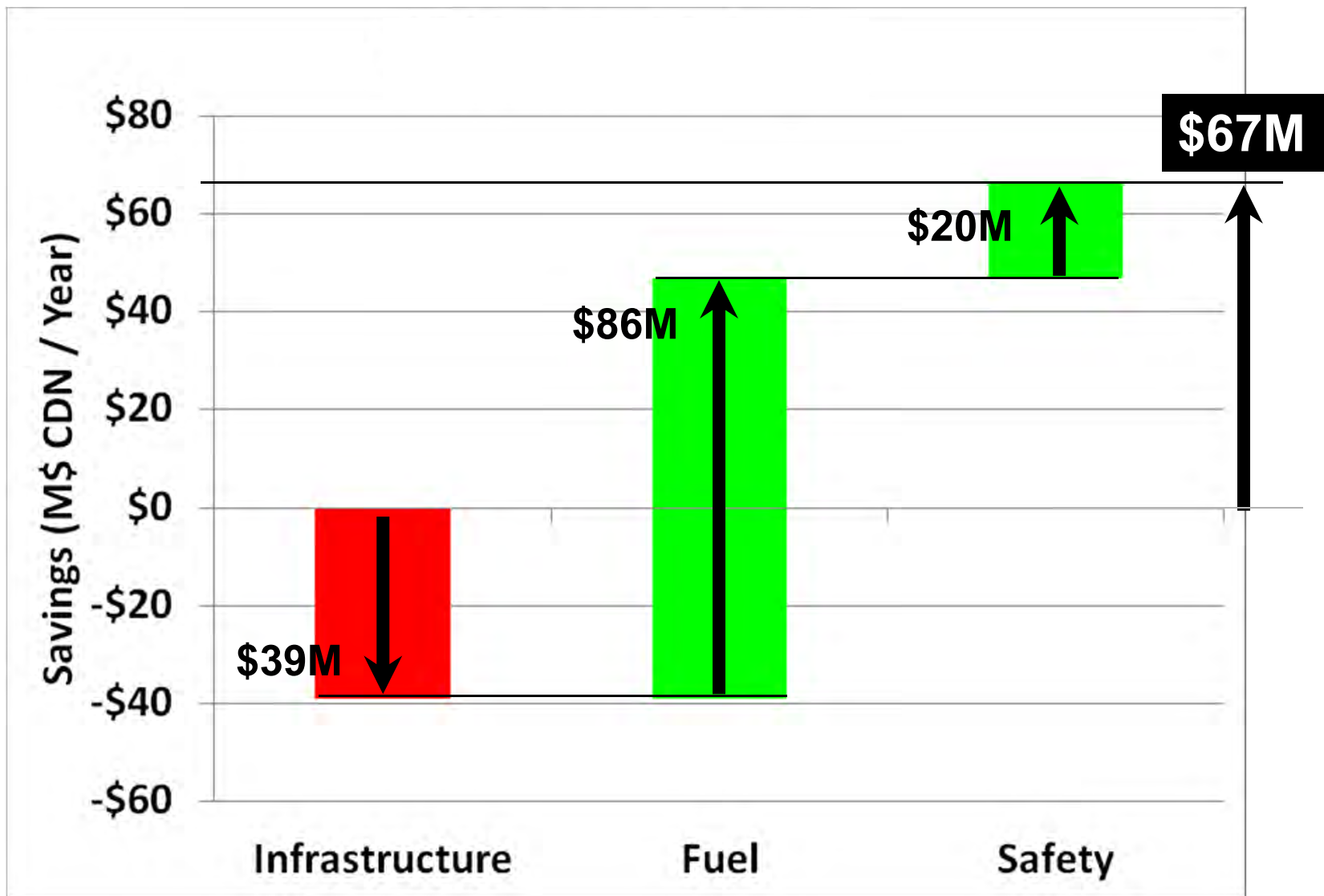
FIGURE 8 Synthesis of critical strain ratios for structure D at 23°C with differential tire pressure

Pavement Damage State – of – the - Art

- Summary from existing damage models shows WBS equally penalizing vs. dual on thick surfaces, more penalizing on thin.
- But current damage models haven't accounted for dynamic loading differences, which favor WBS, especially on rougher roads.
- Significant progress in inputs and modeling is expected via USA FHWA project in 2014.



WBS Overall Economic Analysis Example



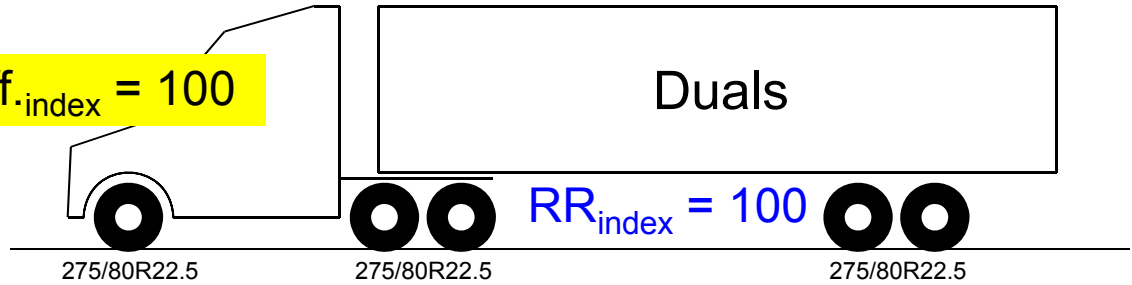
Full reference: GENIVAR (2005), *Economic Study: Use of Supersingle Tires by Heavy Vehicles Operating in Québec*, GENIVAR Consulting Group, Montreal, QC, for the Ministère des Transports du Québec, Québec City, QC, 83 pages. 100% conversion scenario

When Restrictions are Overcome...

Equivalent:

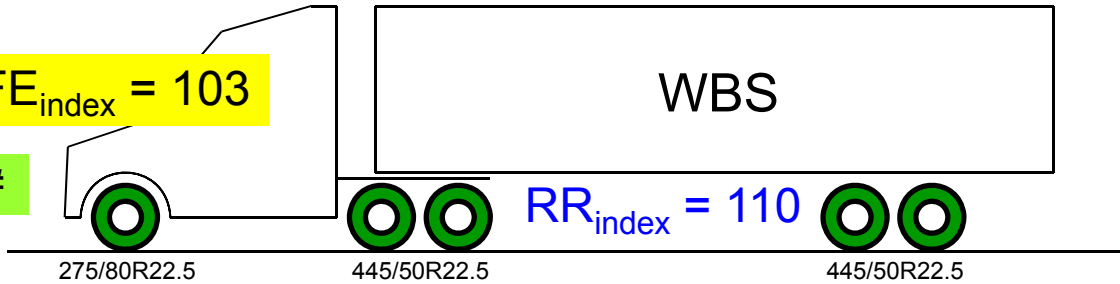
- Mass.
- Track width.
- Outside width.

Fr. Eff._{index} = 100



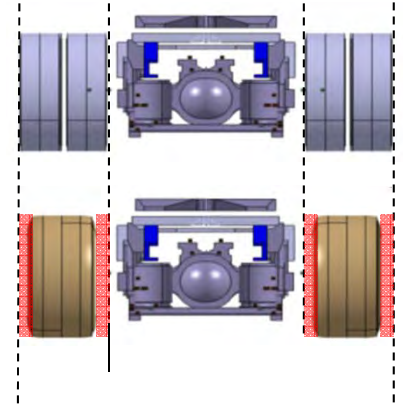
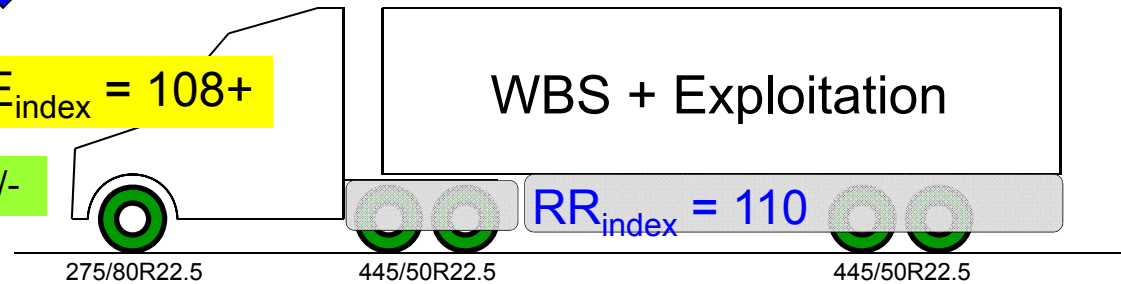
FE_{index} = 103

M_V -800#



FE_{index} = 108+

M_V = +/-





13.4 mpg
17.6 l / 100 km
www.airflowtruck.com



Imagine heavier loads, higher freight efficiency. In this example, WBS brings:

- ~1 ton payload increase.
- ~15 Horsepower decrease.

Thank you

