

Boat Tails - Regulatory Overview

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Presentation Objectives

- Discuss issues surrounding the installation of longer boat tails on new trailers
- Explain Transport Canada's Phase I Research Study
- Discuss ways and options to permit longer boat tails on Canadian roads



Boat tails for Canada

- Important environment devices that will benefit Canadians
- Provide significant positive environmental benefits by generating gains in fuel efficiency



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Regulatory responsibilities in U.S.

National Highway Traffic Safety Administration – NHTSA:

- Safety requirements for new vehicles in U.S. – FMVSS (Federal Motor Vehicle Safety Standards)

Federal Motor Carrier Safety Administration - FMCSA:

- Establish safe operating requirements for commercial vehicle drivers, carriers, vehicles, and vehicle equipment

Federal Highway Administration – FHWA:

- Prescribe national policies that govern truck and bus size and mass

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Regulatory responsibilities in U.S.

Environmental Protection Agency – EPA :

EPA SmartWay programme:



- Collaboration between EPA and freight sector
- To improve energy efficiency and reduce greenhouse gases

- U.S. EPA Certified SmartWay tractors and trailers
 - Tractors and trailers are outfitted with equipment that significantly reduces fuel use and emissions
 - Including low-rolling resistance tires and aerodynamic devices

Source: www.epa.gov/smartway/

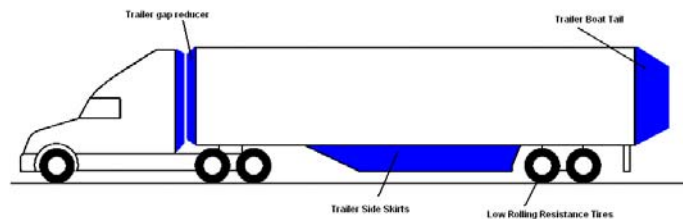
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Boat Tails in the U.S. - SmartWay

SmartWay Certified aerodynamic devices for trailers:

- **Trailer gap reducer** (should be used with side skirts) — estimated fuel savings 1% or greater:
- **Trailer Boat Tail** (this or the gap reducer should be used with side skirts) — estimated fuel savings 1% or greater:
- **Trailer Side Skirts** (should be used with gap reducer or boat tail) — estimated fuel savings 4% or greater:



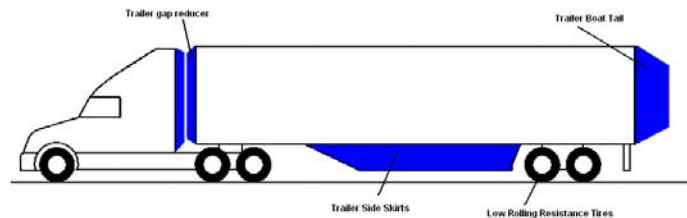
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Boat Tails in the U.S. - SmartWay

SmartWay Certified aerodynamic devices for trailers:

- **Advanced Trailer End Fairing** (this can be used with or without other fairings) — estimated fuel savings 5%:
ATDynamics TrailerTail® rear trailer fairing (4-foot boat tail)
- **Advanced Trailer Skirt** (this can be used with or without other fairings) — estimated fuel savings 5%:



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Boat Tails in the U.S. - California

- California legislation requiring SmartWay certified fuel saving devices
 - Beginning January 1, 2010 for MY 2011
 - Applying to 53-foot trailers
- Carriers have options of various SmartWay certified aerodynamic products including certified boat tails
- Canadian carriers will need to comply with California regulation if they want to operate in the state

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Boat Tails in the U.S. - FHWA

- Boat Tails must meet FHWA requirements to be exempted from length measurement : (Title 23, Part 658, § 658.16)
 1. The device must not be capable of carrying cargo
 2. The device does not extend beyond 5 feet from the rearmost point of the trailer/semitrailer end
 3. The device does not “obscure tail lamps, turn signals, marker lamps, identification lamps, or any other required safety devices, such as hazardous materials placards or conspicuity markings ”
 4. The device has “neither the strength, rigidity nor mass to damage a vehicle, or injure a passenger in a vehicle, that strikes a trailer so equipped from the rear”
- FHWA exemption is provided on an individual basis

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Boat Tails in the U.S. - ATDynamics Trailer Tail®

- Length: 4 feet when open, 2.75 inches when closed
- Weight: 200 lbs.
- Compatibility: available for most swing-door, reefer and drop-deck trailers
- Safety: streamlined rear airflow reduces “sway and spray” during wet and windy weather
- Trailer Tail® is SmartWay certified
- Approved for aftermarket



Source: <http://www.atdynamics.com/>

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Boat Tails in the U.S. - ATDynamics Trailer Tail®

- Currently, ATDynamics Trailer Tail® is the only approved boat tail meeting FHWA exemption requirements
- Due diligence - Evidence included a crash test of a van into the rear of a trailer equipped with Trailer Tail® at 56 km/h (Karco Engineering, LLC)



Source: Figure 12, Karco's report



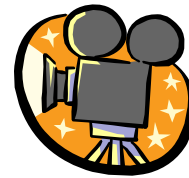
Source: Figure 22, Karco's report

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Boat Tails in the U.S. - ATDynamics Trailer Tail®

- ATDynamics Trailer Tail® operation:



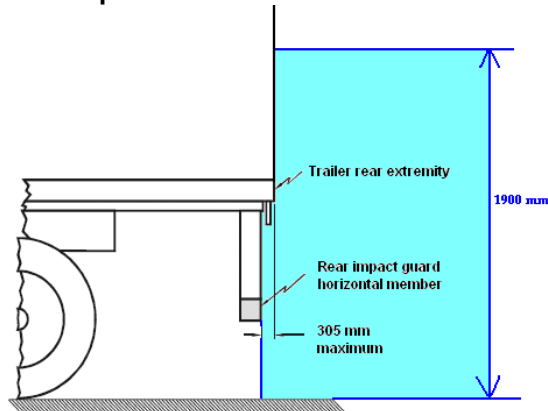
Source: <http://www.atdynamics.com/>

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Boat Tails on new trailers in U.S. - NHTSA

- New trailers must meet FMVSS 224 - Rear impact protection
 - Rear extremity definition and 1 foot (305mm) allowance
- Same dimension requirements in Canada



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Boat Tails on new trailers in U.S. - NHTSA

- FMVSS 224 contains exemption allowing non-structural protrusions - such as lights and bumpers
- To date not aware of any request to NHTSA for an interpretation if boat tails would be exempted from FMVSS 224
- Thus installation of boat tail on new trailer, at first retail, would appear to not be permitted in the U.S.

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Boat Tails in Canada- Background

- In April 2008, VW&D agreed to allow rear aerodynamic devices on semi-trailers with extension up to 0.61 m (2 ft)
- Followed by industry request to allow rear aerodynamic devices extending up to 1.5 metres (5 ft)
- VW&D requested Transport Canada input prior to decision of allowing up to 5-foot boat tails
- New trailers must meet CMVSS 223 - Rear impact Guards
 - Same Rear Extremity definition and 305mm allowance as in the U.S. FMVSS 224

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Boat Tails in Canada- Background

- CTA requested TC Compliance/Audit Group to allow any boat tail up to 5 ft meeting FHWA exemption requirements
- TC Compliance/Audit Group replied to CTA that boat tails do not fall under CMVSS 223 non-structural protrusion exemption
 - A blanket exemption for meeting CMVSS 223 was not provided
 - Thus not possible to install boat tails without 1.9 m height clearance on new trailers and meet CMVSS 223
- TC Regulatory Division has been tasked to review boat tail safety and compliance with CMVSS 223

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Phase I Research Study Overview

- Being carried out by the NRC
- Goals:
 - Assess aerodynamic efficiency between various boat tails prototypes
 - Assess the potential of amending the current CMVSS 223
- Tasks:
 - Wind tunnel testing
 - Computer simulation
 - Vehicle Dimensions Analysis
 - Optimization model

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Wind Tunnel Testing

Evaluation of Environmental Benefits - Experimental

- Scale 1:10 representative truck and trailer model with medium side skirts and gap sealing
- Calculate fuel savings and emissions benefit to compare different boat tail configurations

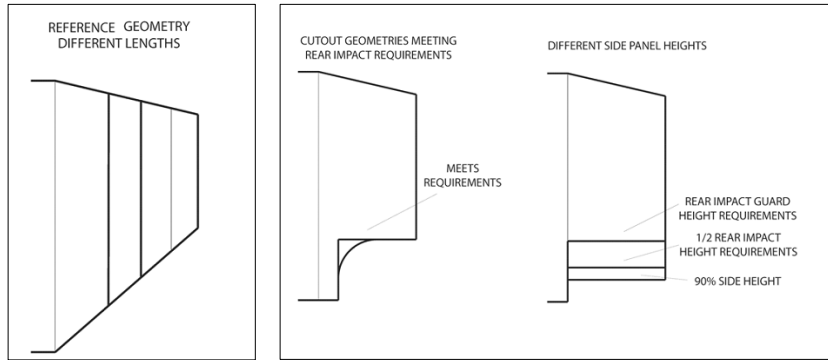


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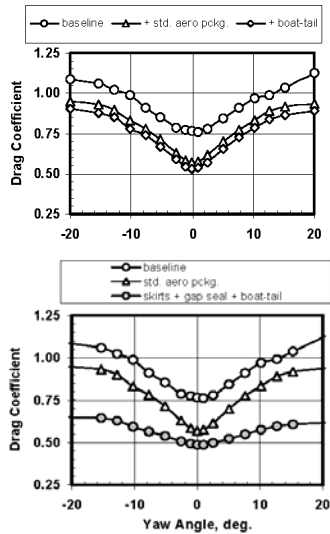


Wind Tunnel Testing

- Determine if panels with length of 2 ft and longer provide improved aerodynamics
- Determine the effect of different side panel geometries (height and shape design)
- Examine the effect of the bottom panel in different configurations



Wind Tunnel Testing

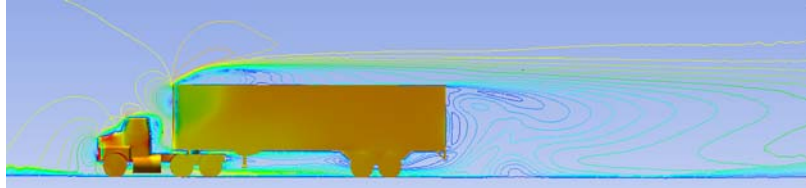


Validating learning from previous studies

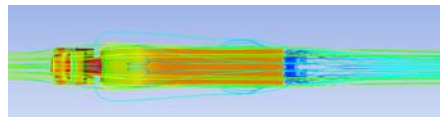
- Panels beyond ~2' do not significantly improve performance
- Both top and side panels are required – they are worth more than their individual sums
- Bottom panel improves performance, but is less important than top and sides

* Data from K. Cooper, SAE Document 850288, 1985

Computer Simulation



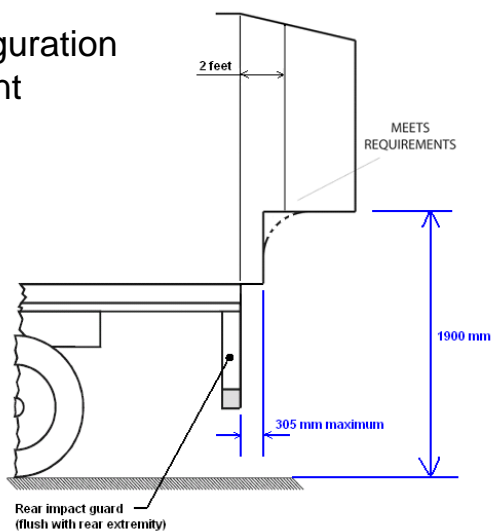
- Computer modeling (Computational Fluid Dynamics)
- Benefits & Risks due to aerodynamics:
 - Reduced road spray
 - Tailgating
 - Trailer sway
 - Snow & ice accumulation - shedding
- Qualitative data – will provide insight into areas of further study



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Vehicle Dimensions Analysis

- Boat tail configuration meeting current requirements

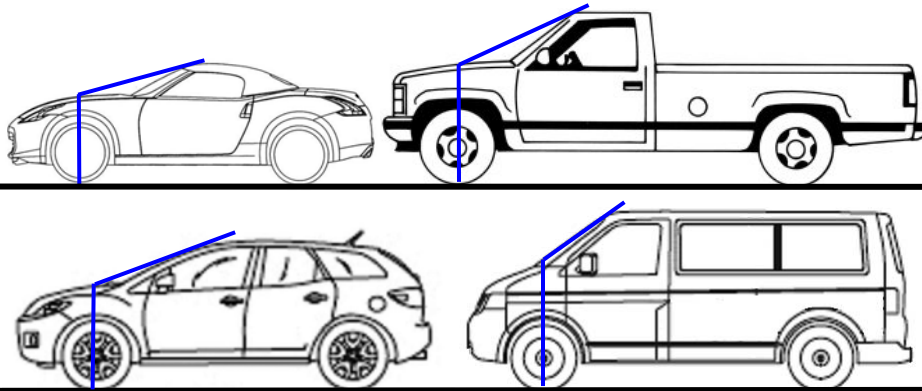


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Vehicle Dimensions Analysis

- Interference of current vehicles on the road with various boat tail geometries



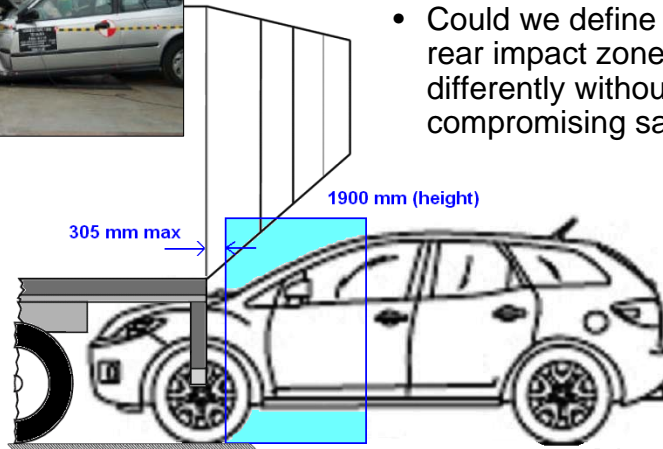
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Optimization model



- Blend analyses to determine « optimum » scenario
- Could we define the rear impact zone differently without compromising safety?



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Next steps

- Phase I is expected in early 2010
- Based on outcomes of Phase I:
 - Review the need for a Phase II
 - Review the need to potentially amend the Regulations
- Explore ways of permitting specific longer boat tails, as interim solution

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Thank you

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Possible options

1. Amend Federal Regulations:
 - Amend the rear clearance zone
 - Exemption for boat tails
 - Develop a performance test to determine non-structural protrusions
2. VW&D and Provinces/Territories permit longer boat tails on aftermarket installations (temporary or permanent)
3. Develop a 2' boat tail and certify it to have included on the SmartWay list (between 4 and 5% savings expected)
4. When travelling in Canada, boat tails over 2' must be closed