

Council of Energy Ministers

# On the Road to a Fuel-efficient Truck

**A Guide for Purchasing Aerodynamics  
for Heavy-Duty Tractors and Trailers**



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# 1 Introduction

## 1.1 Purpose of this guide

This guide explains the basics of aerodynamic design and outlines what to take into account when you choose aerodynamic devices for your heavy-duty tractor and trailer.

The information has been reviewed by research organizations with expertise in aerodynamic devices, fleet managers that have experience using aerodynamic devices on the road and manufacturers of aerodynamic devices.

## 1.2 Who should use this guide?

This guide is for fleet owners and managers, owner-operators, drivers and those who want to learn about:

- the basics of aerodynamic devices
- the advantages of using aerodynamic devices
- issues to consider when selecting aerodynamic devices for a tractor and trailer

## 2 Basics of aerodynamic devices

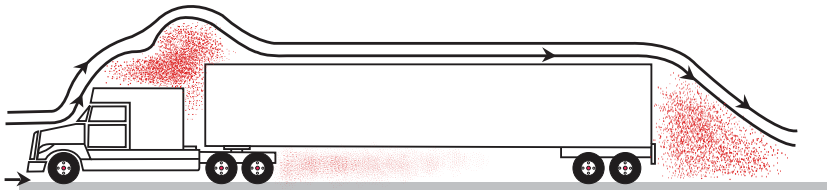
### 2.1 Why use aerodynamic devices?

At highway speeds, much of the energy used to move a truck goes to pushing air out of its way.

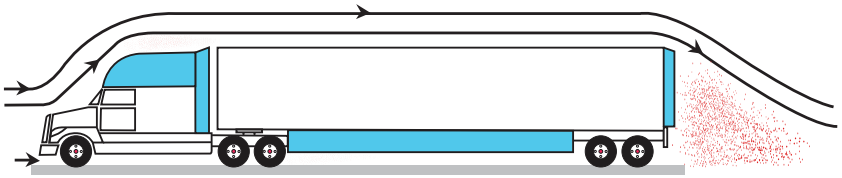
When a vehicle moves, the air exerts a force on the vehicle that resists its motion, making it more difficult to move. This force is known as aerodynamic drag and it has a significant impact on the amount of fuel a vehicle uses. Consequently, a non-aerodynamic tractor-trailer requires more power (i.e. more fuel) than an aerodynamic one. The impact of poor aerodynamics on fuel consumption increases as the speed increases.

Aerodynamic devices reduce the amount of drag by creating a more streamlined shape to the tractor-trailer. Figure 1 illustrates how aerodynamic devices can reduce the amount of drag on a tractor-trailer.

**Figure 1: Reducing drag with aerodynamic devices**



A: A tractor-trailer without aerodynamic devices installed produces a large amount of drag (shown as shaded area)



B: A tractor-trailer with aerodynamic devices installed produces less drag (shown as shaded area)

## 2.2 What are aerodynamic devices?

Aerodynamic devices improve the streamlining of the tractor-trailer. The devices reduce the surface area that the air hits, so less drag is produced, and consequently, less fuel is used.

Research on aerodynamic devices has been improving fuel efficiency in tractor-trailers for many years. These older cab over engine photographs in Figure 2 still accurately show how the air movement changes when a streamlining cab roof deflector is added. The change in the flow of the green coloured smoke indicates the improved air flow.

**Figure 2: Comparing air movement with and without a cab roof deflector<sup>1</sup>**



*(1) When the cab does not have a deflector, air hits the front of the trailer and creates drag in the tractor-trailer gap.*

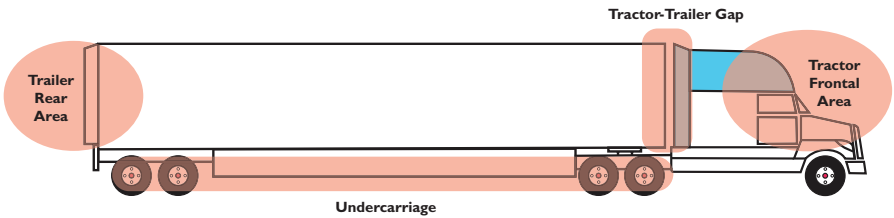


*(2) When a cab deflector is added, the air moves over the tractor-trailer gap, which reduces the area being hit by the air. (Photos: National Research Council Canada)*

<sup>1</sup> Cooper, K. R. "A wind tunnel investigation into the fuel savings available from the aerodynamic drag reduction of trucks," NRC 1976.

As a tractor-trailer moves, there are four main areas of aerodynamic drag: the tractor frontal area, tractor-trailer gap, undercarriage and the trailer rear area (see Figure 3).

**Figure 3: Four main areas of aerodynamic drag**



You can achieve significant fuel savings by streamlining the tractor-trailer's aerodynamics. Technologies that target these problem areas:

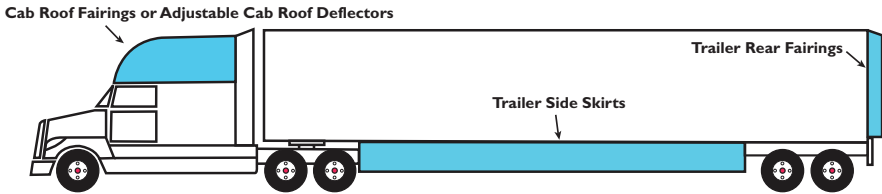
- are mounted on or are components of the tractor, such as fuel tank side skirts, aerodynamic mirrors and rounded grills and bumpers
- improve the aerodynamics of the tractor-trailer gap, such as cab roof fairings and deflectors, trailer gap reducers and cab extenders
- are mounted on the trailer, such as trailer rear fairings and trailer side skirts

*Reducing aerodynamic drag saves fuel!*

Although there are many aerodynamic devices in the aftermarket, this guide focuses on the following technologies because they offer the most proven fuel savings and can be used by anyone who owns a tractor or a trailer (see Figure 4):

- cab roof fairings
- adjustable cab roof deflectors
- trailer side skirts
- trailer rear fairings

**Figure 4: Aerodynamic devices described in the guide**





## 3 Fuel savings from aerodynamic devices

### 3.1 How much fuel can I save by using aerodynamic devices?

The following table provides approximate fuel savings that can be achieved for the devices highlighted in the guide.

**Table 1: Aerodynamic devices and their fuel savings**

Device	Fuel Savings	Affected Area
Cab Roof Fairings	6-8 percent	Tractor-trailer gap
Adjustable Cab Roof Deflectors	2-4 percent	Tractor-trailer gap
Trailer Side Skirts	4-7 percent	Trailer undercarriage
Trailer Rear Fairings	At least 1 percent	Trailer rear area

The amount of fuel you will save by using aerodynamic devices depends on your operation, the devices you select and other factors that are discussed in Section 3.2.

## 3.2 *Other factors that affect aerodynamic performance*

### **Speed**

Aerodynamic devices affect fuel consumption at all speeds. However, the faster a vehicle travels, the more energy it requires to overcome the forces of aerodynamic drag. Therefore, at typical highway speeds, the potential for fuel savings is especially large.

### **Initial aerodynamic design**

The amount of fuel savings that result from adding aerodynamic devices is influenced by how aerodynamic your vehicle was before the devices were added. If you have an old tractor that is not aerodynamic (for instance it has square edges, a large grill and external exhaust), adding a cab roof fairing or deflector can result in 2 to 6 percent fuel savings. However, if you are already driving an aerodynamic tractor, your focus for fuel savings should be on increasing the aerodynamics of the trailers that you are pulling.

Additional cosmetic components can increase the frontal area of the cab and increase aerodynamic drag on the vehicle. Some common accessories for tractors include horns and lighting on the top of the cab. Additionally, trailers that have rigid guards around the tires and mud flaps can add drag to the trailer. Consider cosmetic add-ons carefully because they will increase your fuel costs.

### **Device installation**

The aerodynamic equipment must be installed correctly to give you the best fuel savings. Your supplier can help you ensure that the equipment installation is done correctly. Some dealers will install the device for a fee.

## Device breakage and maintenance

For aerodynamic devices to work at their maximum potential, the equipment must be in good working condition. An aerodynamic device that has cracks or fractures will not achieve the same level of performance and its effect on fuel savings will be reduced. To reduce the risks of breakage, drivers need to be aware that new equipment may change the way they dock the trailer and turn in tight spaces.

*To achieve optimal fuel savings from the aerodynamic device, be sure to:*

- *install the aerodynamic device on tractors and trailers that travel at high speeds*
- *properly install the device according to the manufacturer's instructions*
- *inspect the vehicle regularly and replace parts if they are damaged*

### 3.3 How do manufacturers measure fuel savings?

Any product you purchase to save fuel and money should have been tested by independent third parties to verify its performance. It is important to find out how the manufacturer determined the fuel savings for their device.

Wind tunnel testing is often used in the development of aerodynamic devices. Scale model and full-sized vehicles are tested to show the optimum drag reduction from a device under average wind conditions. This drag reduction value is used to calculate an estimate of fuel savings. When manufacturers report results from wind tunnel testing, they are probably providing their best results.

Fuel savings from aerodynamic devices can also be measured on a test track by using a standard procedure developed by the Society of Automotive Engineers.<sup>2</sup>

This procedure tries to limit the effect of cross-winds by operating on an oval track that has a smooth driving surface. The fuel savings are calculated based on a comparison between a control vehicle (that has no aerodynamic devices) and a test vehicle (equipped with specific aerodynamic devices). The fuel tanks of the vehicles are weighed before and after the test to determine how much fuel was used. This test track procedure provides a more accurate estimate of the potential fuel savings.

*Remember to ask the manufacturer how their fuel saving claims were determined because:*

- *Wind tunnel testing results probably reflect a best case scenario of potential fuel savings*
- *Track testing provides a more accurate picture of the potential fuel savings*
- *Testing should be done by an independent third party*

### **3.4 Monitoring and calculating fuel savings**

The tests that are conducted by the manufacturers may not resemble the conditions of your trucking operation. You can conduct your own monitoring to verify how much fuel you are saving by using the aerodynamic equipment. To get an accurate result, it is important to compare the vehicle under similar conditions before and after the aerodynamic device is added to the vehicle.

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<sup>2</sup>The test is known as the SAE J1321 Type II Fuel Consumption Test Procedure

There are key considerations to take into account to collect the most accurate information:

- Fuel consumption data are required before the aerodynamic device is added to compare the fuel saving performance.
- Keep your fuel receipts to record the date, price and the amount of fuel purchased. This information is used to calculate your fuel savings.
- The fuel savings performance of an aerodynamic device can be influenced by weather conditions. Certain seasons and times of day have stronger prevailing winds, humidity and fuel consumption impacts on the vehicle (i.e. snow). For these reasons, it is important to compare data from similar seasons and weather conditions.
- Driver behaviour is the largest determinant of fuel consumption. Therefore, to get the most accurate evaluation, it is important to compare the fuel consumption from the same driver, if possible.
- The route affects fuel consumption (i.e. hilly versus flat routes, distance travelled). Therefore, a comparison on the same routes is recommended.
- Compare similar payloads, because the larger the payload, the greater the fuel requirements of the vehicle.

*Natural Resources Canada's FleetSmart offers Fuel Management 101 workshops that help trucking operations prepare a fuel management plan.*

*For more information, visit the FleetSmart Web site ([www.fleetsmart.gc.ca](http://www.fleetsmart.gc.ca)).*

### 3.5 Calculating the payback period

The payback period is the amount of time required to recover the cost of purchasing an aerodynamic device from fuel savings. The payback period for specific aerodynamic devices will depend on your operation.

It is easy to calculate the payback period of your aerodynamic device if you keep accurate fuel cost data. The basic formula for calculating the payback period is:

$$\text{Payback Period (Years)} = \frac{\text{Total Aerodynamic Equipment Costs}}{\text{Annual Fuel Cost Savings}}$$

$$\begin{array}{l} \text{Total aerodynamic} \\ \text{equipment costs} \end{array} = \begin{array}{l} \text{purchase price} \\ + \text{installation cost} \\ + \text{maintenance cost} \end{array}$$

#### Payback calculation example

A company is deciding if it should purchase advanced side skirts for its tractor-trailer combinations.

- The total purchase and installation cost of a pair of advanced side skirts is \$2,300 per tractor-trailer.
- The recorded annual fuel use before installing the advanced side skirts is 40 000 L per tractor-trailer.
- The advanced side skirts will result in an estimated fuel savings of 7 percent.
  - The annual fuel savings would be 2 800 L per tractor-trailer (40 000 L x 7%).
- Assume the price of diesel is \$1 per litre.

The payback period calculation is as follows:

$$\text{Payback Period} = \frac{\$2,300}{40\,000 \times 7\% \times \$1}$$

$$\text{Payback Period} = \frac{\$2,300}{2\,800 \times \$1}$$

$$\text{Payback Period} = \frac{\$2,300}{\$2,800}$$

= 0.82 years or approximately 10 months

Therefore it would take only 10 months for the company to recover the full cost of the advanced side skirts for its trailers. When the cost of diesel is higher, the payback will be shorter.

## 4 How to select a tractor aerodynamic device

### 4.1 Tractor aerodynamic devices

Cab roof fairings and deflectors produce fuel savings by reducing air flow in the tractor-trailer gap.

Depending on your trucking operation, one device may be more beneficial than the other. Cab roof fairings are typically offered as part of an aerodynamic package, which include cab extenders for additional fuel savings. These fairings are not adjustable after installation so they are suitable for tractors that always pull trailers of the same height. For operations that pull trailers of varying heights, adjustable cab roof deflectors may be a better choice.

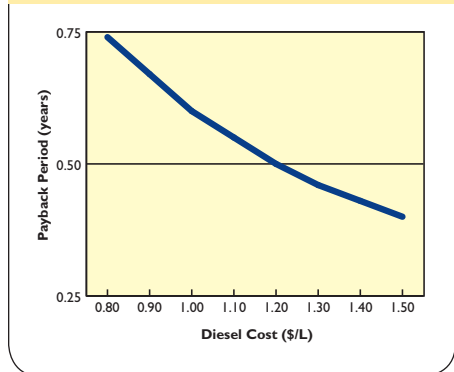
### 4.2 Cab roof fairing

A cab roof fairing provides a 4 to 6 percent fuel savings by streamlining the air flow between the tractor-trailer gap. It is a three-dimensional moulding that attaches to the tractor roof

**Figure 5: Cab roof fairing**



**Figure 6: Estimated simple payback period range for a cab roof fairing<sup>3</sup>**



<sup>3</sup> Assumptions for the payback period calculation were: an average purchasing and installation cost of \$1,765; 7 percent fuel savings, as the trailer travelled more than 102 000 kilometres at highway speeds; and an original fuel efficiency of 41 L/100 km.



and angles up toward the trailer. It is widely used on trucks throughout North America and is provided by the original equipment manufacturer or as an add-on device. A cab roof fairing is the preferred device for tractors that haul box-style trailers of similar heights over long distances at highway speeds.

**Table 2: Frequently asked questions – cab roof fairing**

Question	Answer
How to spec?	<ul style="list-style-type: none"> <li>• The model of your tractor determines which device is appropriate. Consult the supplier to select the correct equipment for your truck.</li> <li>• Choose a fairing that matches the height of the trailer you typically haul. View the tractor from the front and ensure that the fairing covers as much of the trailer front as possible.</li> <li>• Choose a fairing with rounded edges.</li> <li>• If the fairing height cannot match the trailer height, it is preferable for the fairing to be a bit higher rather than lower, which will cause a greater amount of force between the tractor and trailer.</li> <li>• Metallic devices may rust and non-metallic devices may degrade through exposure to the environment. To increase the lifetime of the device, inquire about protective coatings, the material's composition and the means of attachment.</li> </ul>
How to install and maintain?	<ul style="list-style-type: none"> <li>• It is recommended that you purchase the cab roof fairings when you order your tractor from the manufacturer. For used tractors, look for mounting brackets that are already installed.</li> <li>• Install the fairings according to the manufacturer's specifications, which vary depending on the make of your tractor.</li> <li>• Ensure that the fairing is secured at the proper structural points on the cab and that the fittings are secure, because the air forces acting on the cab roof fairing will be large.</li> </ul>
What is the purchasing price range?	<ul style="list-style-type: none"> <li>• \$750 to \$2,500</li> </ul>
What is the range of fuel savings?	<ul style="list-style-type: none"> <li>• 6 to 8 percent</li> </ul>
What is the estimated payback period range?	<ul style="list-style-type: none"> <li>• 8 to 16 months</li> </ul>

### 4.3 Adjustable cab roof deflector

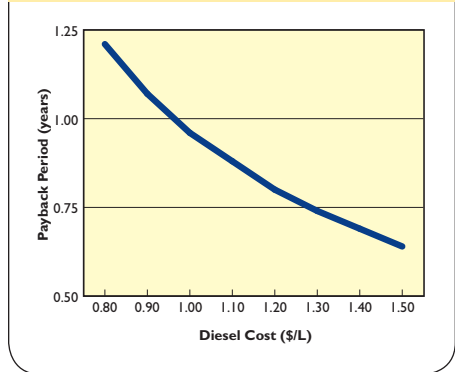
A cab roof deflector provides a 2 to 4 percent fuel savings by streamlining the air flow over the tractor-trailer gap. It is an adjustable flat or curved plate that attaches to the tractor roof and angles toward the trailer. A cab roof deflector is the preferred device for tractors that haul box-style trailers of various heights or frequently travel without a trailer for long distances at highway speeds.

**Figure 7: Cab roof deflector**



(Photo: Laydon Composites)

**Figure 8: Estimated simple payback period range for an adjustable cab roof deflector<sup>4</sup>**



<sup>4</sup> Assumptions for the payback period calculation were: an average purchasing and installation cost of \$1,215; 3 percent fuel savings, 102 000 kilometres as the distance travelled at highway speeds; and an original fuel efficiency of 41 L/100 km.

**Table 3: Frequently asked questions – adjustable cab roof deflector**

Question	Answer
How to spec?	<ul style="list-style-type: none"> <li>• Consult the supplier to select the equipment for your tractor.</li> <li>• Choose a deflector that is easily adjustable and allows for multiple angles, because the deflector needs to be adjusted when you pull trailers of different heights and when you drive without a trailer. Choose a deflector that is made of tough material to prevent wear at the connection points.</li> <li>• Choose a deflector that has rounded edges.</li> <li>• Metallic devices may rust and non-metallic devices may degrade through exposure to the environment. To increase the lifetime of the device, inquire about protective coatings, the material's composition and the means of attachment.</li> </ul>
How to install and maintain?	<ul style="list-style-type: none"> <li>• Install the deflector according to the manufacturer's specifications, which may vary depending on the make of the tractor.</li> <li>• For used tractors, look for mounting brackets that are already installed.</li> <li>• Ensure that the deflector is secured at proper structural points on the cab and that the fittings are secure, because the air forces acting on the cab roof deflector will be large.</li> </ul>
What is the purchasing price range?	<ul style="list-style-type: none"> <li>• \$500 to \$1,100</li> </ul>
What is the range of fuel savings?	<ul style="list-style-type: none"> <li>• 2 to 4 percent</li> </ul>
What is the estimated payback period range?	<ul style="list-style-type: none"> <li>• 7 to 14 months</li> </ul>

## 5 How to select a trailer aerodynamic device

### 5.1 Trailer side skirts

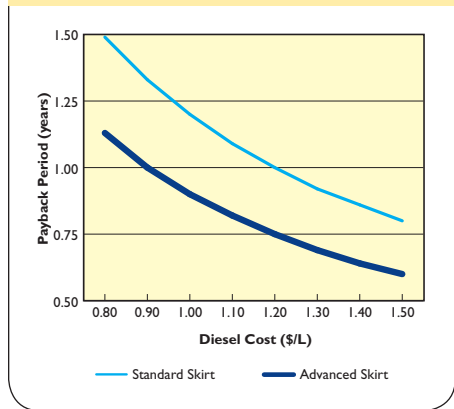
Trailer side skirts provide a 4 to 7 percent fuel savings by minimizing the air flow under the trailer and around the back axle. Trailer side skirts are a set of panels that run the length of the trailer to extend it closer to the ground. In addition to the fuel savings, drivers report better tractor-trailer stability in cross-winds with the use of trailer side skirts, and they have been shown to reduce tire spray, which can cause visibility issues for other drivers. Trailer side skirts should be used for box-style trailers that travel long distances at highway speeds.

**Figure 9: Trailer side skirts**



(Photo: Laydon Composites)

**Figure 10: Estimated simple payback period range for trailer side skirts<sup>5</sup>**



<sup>5</sup> Assumptions for the payback period calculation were: an average purchasing and installation cost of \$2,515; 5 percent fuel savings for the standard skirt and 7 percent for the advanced one, 102 000 kilometres as the trailer distance travelled at highway speeds; and an original fuel efficiency of 41 L/100 km.

**Table 4: Frequently asked questions – trailer side skirts**

Question	Answer
<p>What issues should you consider when selecting a device for your vehicle?</p>	<ul style="list-style-type: none"> <li>• Height and length strongly affect the effectiveness of the device.</li> <li>• Side skirts made of different materials have different weights (the pair of skirts can weigh between 70 and 160 kg). Because the additional weight affects your payload weight allowance, find out the weight of the aerodynamic device you are considering purchasing.</li> <li>• Some styles come as panels so that they can be adapted to a variety of trailers and so individual panels can be replaced if damaged.</li> </ul>
<p>How to spec?</p>	<ul style="list-style-type: none"> <li>• Choose a device that comes as close to the ground as possible without causing clearance issues. The distance between the side skirt and the ground averages between 25 and 50 cm. The closer they come to the ground, the more effective they are at reducing aerodynamic drag.</li> <li>• For trailer side skirts that extend close to the ground, look for materials that are flexible and not easily broken, or that have lower flexible edges to avoid damage. Side skirts can be bent if drivers go over high curbs or snow banks. This can result in dents, which can interfere with the streamlining of the trailer and therefore reduce their effectiveness.</li> <li>• Select fairings that are longer, which are more effective at reducing aerodynamic drag.</li> <li>• Metallic devices may rust and non-metallic devices may degrade through exposure to the environment. To increase the lifetime of the device, inquire about protective coatings, the material's composition and the means of attachment.</li> </ul>
<p>How to install and maintain?</p>	<ul style="list-style-type: none"> <li>• Correct installation of the panels is critical for optimum fuel savings. Install according to the manufacturer's specifications.</li> <li>• Installation time can vary from 3 to 5 person hours.</li> <li>• Some dealers and manufacturers provide training on the installation or will install the side skirt for a fee.</li> <li>• Install the panels so that they come close to the rear axle of the trailer.</li> <li>• Regularly check that the trailer side skirts have not been damaged or accumulated snow and are securely in place.</li> </ul>
<p>What is the purchasing price range?</p>	<ul style="list-style-type: none"> <li>• \$1,500 to \$3,000</li> </ul>

**Table 4: Frequently asked questions – trailer side skirts** (continued)

Question	Answer
What is the range of fuel savings?	<ul style="list-style-type: none"> <li>• At least 4 percent for standard trailer side skirts</li> <li>• At least 7 percent for advanced trailer side skirts</li> </ul> (The U.S. Environmental Protection Agency’s SmartWay program classifies trailer side skirts as being either a “trailer side skirt” or an “advanced trailer skirt”, based on their fuel savings. <sup>6</sup> )
What is the estimated payback period range?	<ul style="list-style-type: none"> <li>• 10 to 18 months for standard trailer side skirts</li> <li>• 7 to 14 months for advanced trailer side skirts</li> </ul>

## 5.2 Trailer rear fairing

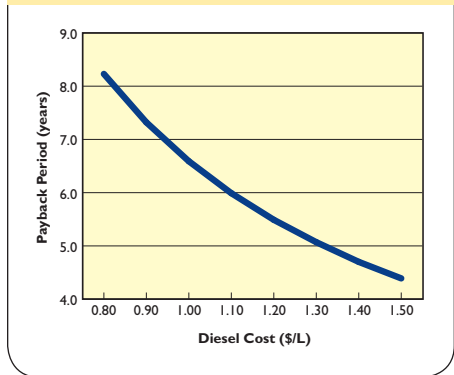
A trailer rear fairing provides at least a 1 percent fuel savings by decreasing suction at the trailer base. It is a set of panels that are curved or angled to reshape the back end of the trailer to make it more streamlined. A trailer rear fairing should be used by box-style trailers that travel long distances at highway speeds.

**Figure 11: Trailer rear fairing**



(Photo: Transtex Composite)

**Figure 12: Estimated simple payback period for a trailer rear fairing<sup>7</sup>**



<sup>6</sup> For more information, visit the U.S. Environmental Protection Agency’s SmartWay program’s Web site: [www.epa.gov/smartway/transport/what-smartway/verified-technologies.htm](http://www.epa.gov/smartway/transport/what-smartway/verified-technologies.htm).

<sup>7</sup> Assumptions for the payback period calculation were: an average purchasing and installation cost of \$2,065; 1 percent fuel savings, 102 000 kilometres as the trailer distance travelled at highway speeds; and an original fuel efficiency of 41 L/100 km.

**Table 5: Frequently asked questions – trailer rear fairing**

Question	Answer
What issues should you consider when selecting a device for your vehicle?	<ul style="list-style-type: none"> <li>• Some types of trailer fairings that are allowed in the United States might not be allowed in Canada because they are longer (more than 0.61 metres or 2 feet). Some provinces and states require a permit to pull a trailer with fairings. Refer to the end of this section for more information.</li> <li>• Trailer rear fairings may increase docking and loading time.</li> </ul>
How to spec?	<ul style="list-style-type: none"> <li>• Choose a device that allows for easy access to the trailer door.</li> <li>• Some devices self-extend only after a certain speed is reached.</li> <li>• Choose a device that is made of a rigid material that will not bend in cross-winds.</li> <li>• Because the additional weight affects your payload weight allowance, find out about the weight of the aerodynamic device you are considering purchasing.</li> <li>• Metallic devices may rust and non-metallic devices may degrade through exposure to the environment. To increase the lifetime of the device, inquire about protective coatings, material composition and means of attachment.</li> </ul>
How to install and maintain?	<ul style="list-style-type: none"> <li>• Correct installation of the panels is critical for optimum fuel savings. Install according to the manufacturer’s specifications.</li> <li>• Installation time varies from 1.5 to 2 person hours.</li> <li>• Some dealers and manufacturers provide training on the installation or will install the fairing for a fee.</li> <li>• Regularly check that the trailer rear fairing has not been damaged or accumulated snow and is securely in place.</li> </ul>
What is the purchasing price range?	<ul style="list-style-type: none"> <li>• \$1,500 to \$2,500</li> </ul>
What is the range of fuel savings?	<ul style="list-style-type: none"> <li>• At least 1 percent</li> </ul> <p>(The US Environmental Protection Agency’s SmartWay program classifies trailer rear fairings as being either a “trailer boat tail” or an “advanced trailer end fairing,” based on their fuel savings. Currently, the advanced trailer end fairing is not permitted for use in Canada.<sup>8</sup>)</p>
What is the estimated payback period range?	<ul style="list-style-type: none"> <li>• 4 to 8 years</li> </ul>

<sup>8</sup> For more information, visit the U.S. Environmental Protection Agency’s SmartWay program’s Web site: [www.epa.gov/smartway/transport/what-smartway/verified-technologies.htm](http://www.epa.gov/smartway/transport/what-smartway/verified-technologies.htm).

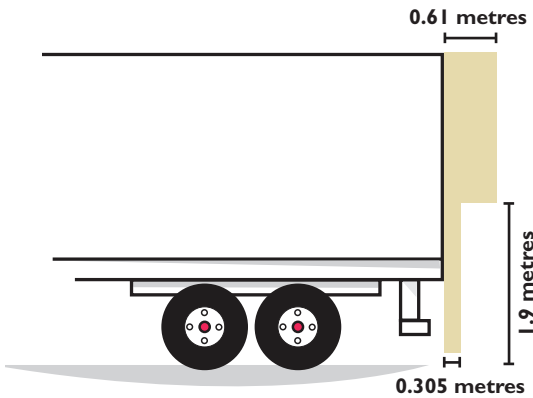
### Provincial and state regulations

Some types of trailer rear fairings are allowed in the United States but not in Canada. These fairings produce higher fuel savings, but are too long for Canadian regulations.

### Canada

Provinces and territories are harmonizing their weights and dimensions regulations. They have agreed to exclude aerodynamic devices installed at the rear of a trailer from its total length measurements, with some provisions (see Figure 13).

**Figure 13: Length allowance for trailer rear fairing<sup>9</sup>**



Above 1.9 metres from the ground, no portion of the device must protrude more than 0.61 metres beyond the rear of the vehicle.

Within 1.9 metres of the ground, no portion of the device can protrude more than 0.305 metres beyond the rear of the vehicle.

<sup>9</sup> Council of Ministers Responsible for Transportation and Highway Safety, Task Force on Vehicle Weights and Dimensions Policy. April 2008. *Heavy Truck Weight and Dimension Limits for Interprovincial Operations in Canada*.



The goal is that trailers that have rear fairings will be allowed in every province. Until the regulations change, a permit is required to travel with a trailer rear fairing in some provinces. To learn which provinces require a permit, visit the FleetSmart Web site ([fleetsmart.gc.ca](http://fleetsmart.gc.ca)).

It is important to note that some styles of trailer rear fairings that are on the market do not comply with Canadian regulations. Always consult with provincial/territorial authorities before purchasing.

### *United States*

The Federal Motor Carrier Safety Administration has excluded aerodynamic devices from length and width measurements on the National Network (which includes interstate freeways, national highways and state highways).<sup>10</sup> Provided trailers remain on the National Network, they are not subject to state size and weight regulations, which can vary from the federal regulations.

States regulate traffic on intrastate roads and the provisions that apply to rear aerodynamic devices vary from state to state, just as they do between Canadian provinces. In some states, a permit is required to travel with a truck equipped with an aerodynamic device at its rear.

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<sup>10</sup> Federal MCSA, Part 658: Size and Weight, Route Designations – Length, Width and Weight Limitations  
[www.fmcsa.dot.gov/rules-regulations/administration/fmcsr/fmcsrguidedetails.asp?menukey=658](http://www.fmcsa.dot.gov/rules-regulations/administration/fmcsr/fmcsrguidedetails.asp?menukey=658)

## 6 Case studies

### Case study: Bison Transport

Bison Transport is one of the largest truckload carriers in Canada, operating a fleet of 1000 tractors and 3100 trailers that serves Canada and the continental United States. In 2008, in collaboration with Transport Canada's Freight Technology Demonstration Fund, Bison Transport initiated a project to install standard aerodynamic trailer side skirts on 1000 of the company's 53-foot van trailers. Testing conducted by Bison Transport and several third parties has demonstrated that this technology produces fuel savings and emissions reductions of 4 to 5 percent. The fairings do not interfere with truck operation and therefore have no expected limitations.

The feedback from drivers has been positive. Most drivers find that trailers with skirts see a considerable reduction in spray when travelling in wet road conditions. During the winter months, drivers noted less build up of snow and ice underneath the trailers, as well as less snow spray. Furthermore, drivers have commented that when pulling a skirt-equipped trailer, they have increased stability in windy conditions and they have noticed an immediate improvement in fuel consumption.

**Figure 14: Aerodynamic Bison Transport tractor-trailer**



(Photo: Bison Transport)

Bison Transport has made significant strides towards excellence in many important areas of their business and has been recognized for its commitment to safety and dedication to environmental responsibility. In 2006, Bison Transport won the U.S. EPA SmartWay Environmental Excellence Award for special achievements in improving fuel efficiency and reducing the environmental impacts of freight transport. Bison Transport also won Canada's 50 Best Managed Companies Platinum Award, after having been identified in 1994 as one of Canada's 50 Best Managed Companies and after having since requalified every year.

*Bison Transport saved 4 to 5 percent in fuel and emissions with trailer skirts. Drivers reported:*

- *less build up of snow and ice underneath the trailers*
- *a considerable drop in spray*
- *increased trailer stability in windy conditions*

### **Case study: Sunbury Transport**

Sunbury Transport Limited operates a fleet of more than 300 trucks that transport primarily long haul full truckload freight.

During the mid 1990's Sunbury Transport launched a fuel management program centered on speed management, idling management and driver training. Not satisfied with sitting still, they re-launched the program and presented it to the public at the Premiers Conference in Moncton, New Brunswick, in August 2007. The new project added valuable tools by introducing green technologies, in particular aerodynamic trailer skirts.

Through funding provided by the New Brunswick Climate Action Plan, Sunbury Transport installed 77 aerodynamic trailer skirts. The impact of installing the first 50 skirts, using a conservative estimate of miles travelled per trailer is 35 000 L saved in fuel and 94 tonnes (t) of carbon dioxide (CO<sub>2</sub>) saved as of June 2008. For the 77 installations completed to date, the annual savings will be 107 000 L of fuel and 290 t of CO<sub>2</sub>.

A controlled test was also conducted by Sunbury Transport in February 2009 to determine the impact of the trailer-mounted skirts on fuel consumption and the resulting greenhouse gas emissions.

Travelling repeatedly over the same sections of highway, two trucks pulled two trailers with and without trailer skirts to allow for paired testing of the difference in fuel consumption between the two trucks. Results showed that the skirts reduced fuel consumption by 3 percent for one truck and 6 percent for the second – an average of a 4.5 percent improvement. These results correspond well with a National Research Council study predicting 2800 L/year of fuel savings and are lower than what was found through an oval test track test done by the Project Innovation Transport predicting a savings of 7.5 percent.

Sunbury Transport has also been acknowledged for their environmental efforts. In 2004, the company was awarded first place in the Repair Our Air Challenge and in 2007 Sunbury received the New Brunswick Environmental Leadership Award in the Business Category.

*Sunbury Transport conducted in-house testing to determine the fuel savings from installing trailer side skirts:*

- *Average annual fuel savings of 4.5 percent result from the addition of trailer side skirts*
- *The 77 installations will produce an annual fuel savings of 107 000 L*

**Figure 15: Aerodynamic Sunbury Transport Limited tractor-trailer**



(Photo: Sunbury Transport)

## 7 Additional resources

### **Government programs**

Natural Resources Canada's Fleet Smart  
[fleetsmart.nrcan.gc.ca](http://fleetsmart.nrcan.gc.ca)

U.S. EPA's SmartWay program  
[www.epa.gov/smartway](http://www.epa.gov/smartway)

Transport Canada ecoTRANSPORT  
[www.tc.gc.ca/programs/environment/ecofreight/casestudies/menu-eng.htm](http://www.tc.gc.ca/programs/environment/ecofreight/casestudies/menu-eng.htm)

California Air Resource Board  
[www.arb.ca.gov/cc/hdghg/hdghg.htm](http://www.arb.ca.gov/cc/hdghg/hdghg.htm)

### **Aerodynamic research**

Society of Automotive Engineers  
[www.sae.org/servlets/index](http://www.sae.org/servlets/index)

FPIInnovations Feric  
[www.feric.ca](http://www.feric.ca)

National Research Council of Canada  
[www.iar-ira.nrc-cnrc.gc.ca](http://www.iar-ira.nrc-cnrc.gc.ca)

### **Regulations**

Canadian Council of Ministers Responsible for Transportation and Highway Safety  
[www.comt.ca/english/vwd-e.htm](http://www.comt.ca/english/vwd-e.htm)

Federal Motor Carrier Safety Administration, U.S.-Canadian Commercial Motor Vehicle Cross-Border Operations  
[www.fmcsa.dot.gov/intl-programs/canada/index.htm](http://www.fmcsa.dot.gov/intl-programs/canada/index.htm)

## Remember to ask:

- When purchasing a tractor aerodynamic package, what components are included?
- What testing was used to verify the fuel savings?
- Was the testing conducted by an independent third party?
- Does the supplier offer installation training?
- What kind of after-sale support does the supplier provide?
- Does the manufacturer offer a warranty on the device?