Summary of benefit-cost analysis of side guards on trucks

May20, 2024

Bicyclist & Pedestrian Fatalities that Could Be Mitigated by Side Guards

CT = combination truck
SUT= single-unit truck

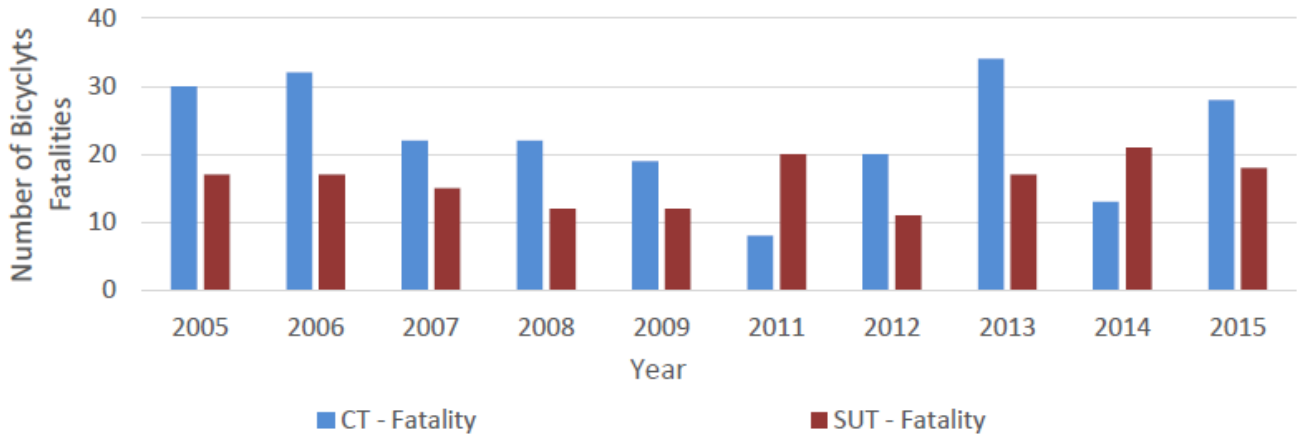


Figure 11: Side Guard-Relevant Bicyclist Fatalities by Truck Category from 2005 to 2015

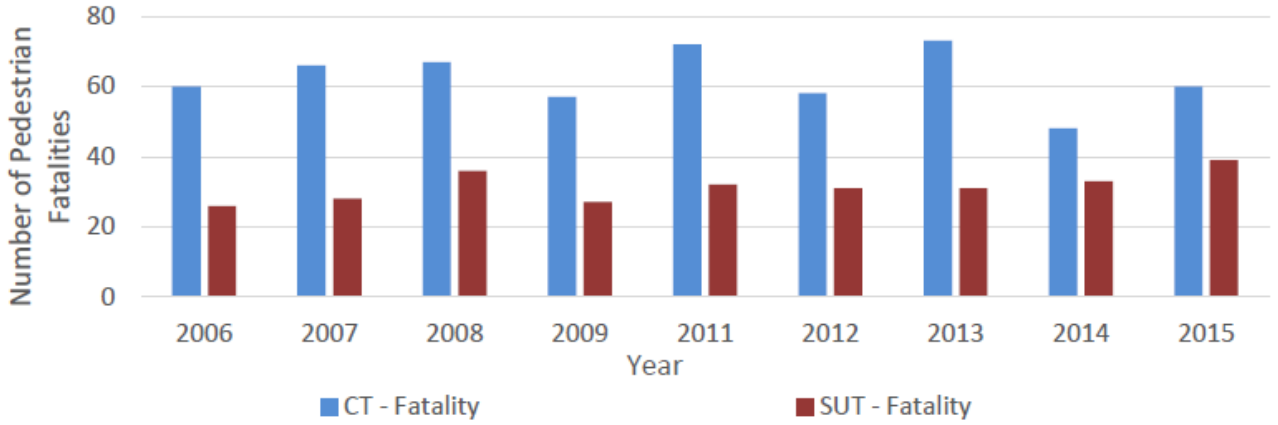
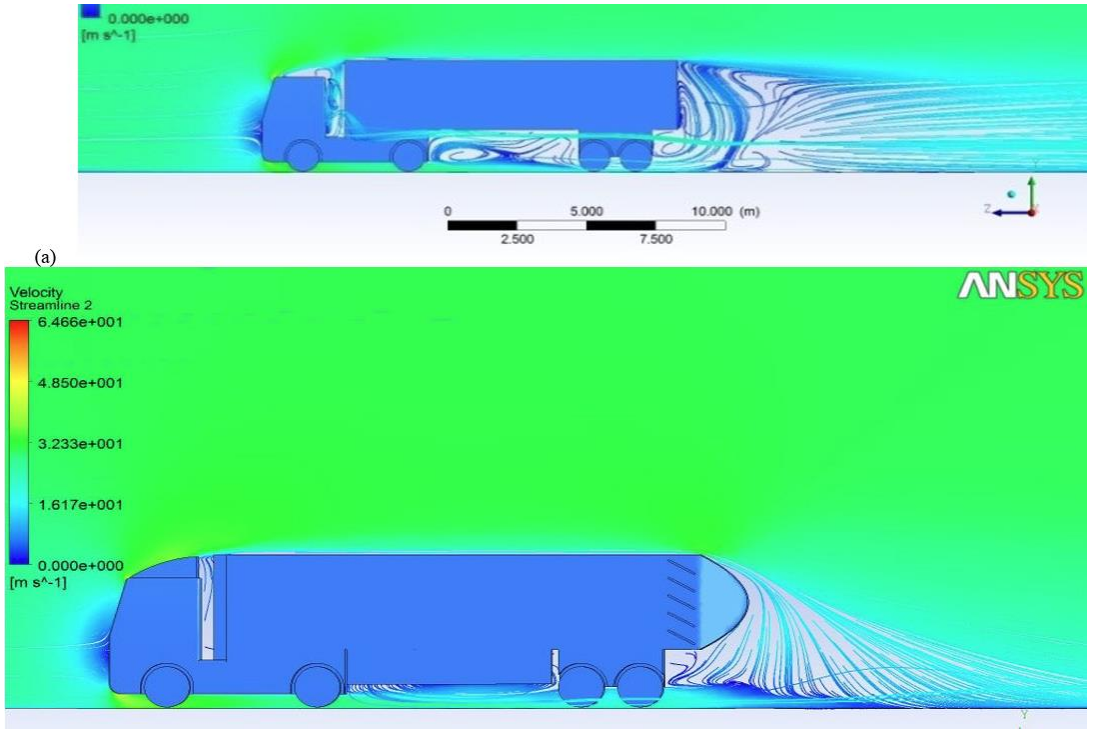


Figure 12: Side Guard-Relevant Pedestrian Fatalities by Truck Category from 2005 to 2015

Volpe conclusion on literature review of side guards

- Majority of > 50 studies of side guards on trucks shows that they are effective at mitigating crashes with bicyclists & pedestrians in the parallel travel direction
- A few of these studies were inconclusive but ***NO*** study disproved side guard safety effectiveness

Aerodynamic flow around a truck



Truck without aerodynamic treatment

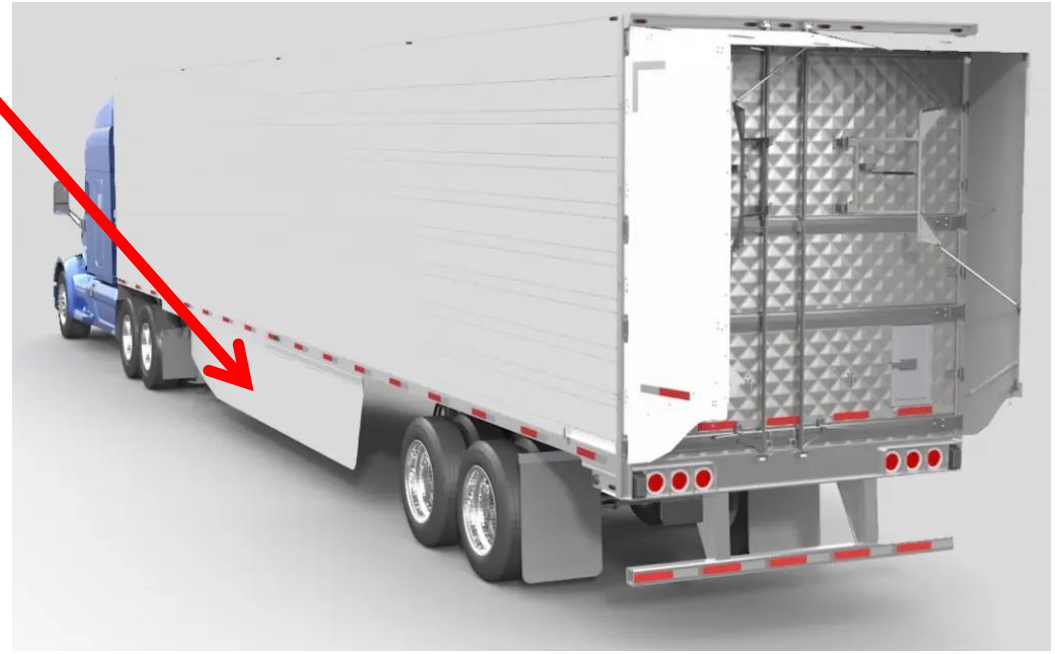
Truck with aerodynamic treatment

- A potential benefit of side guards is fuel savings when they are aerodynamically designed
- Air resistance accounts ≥ 50% power to move truck at highway speeds

Aero skirts

Aero skirts are effective in reducing aerodynamic drag on the truck, saving fuel

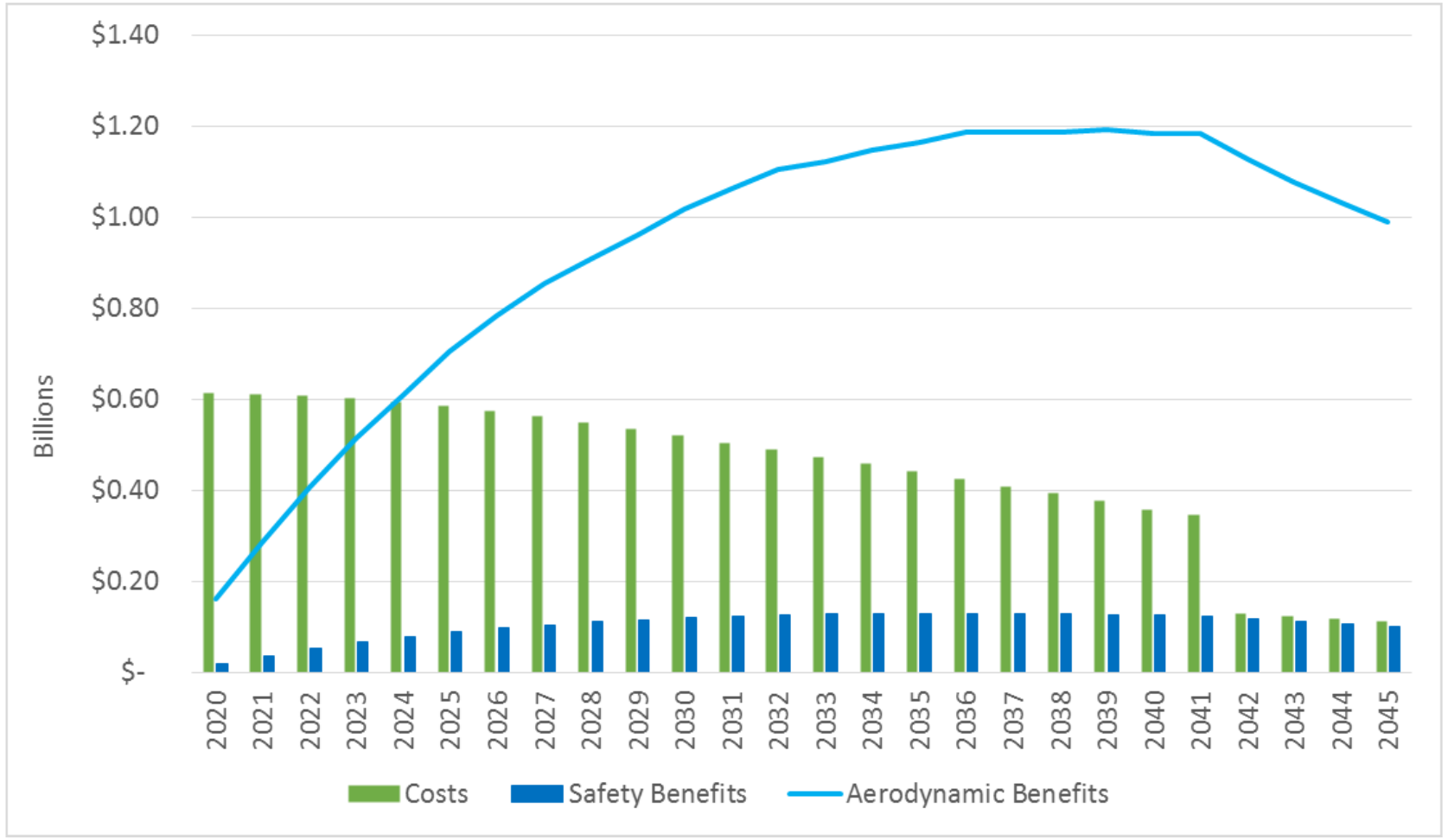
"Skirts" can be reinforced to function as side guards; then they are called "aero side guards"



Panel aero side guards

- Panel aero side guard
  - For longer single-unit trucks and trailers of combination trucks

Aero side guards gradually deployed (2020-2045)



Calculation of benefit-cost ratio (BCR)

- Benefit-cost ratio (BCR) is the **total benefits** divided by the **total costs** for a given scenario
- **Total benefits** = Safety benefits + fuel savings
  - Safety benefits = cost reduction in crashes between bicyclists & pedestrians and trucks with side guards
    - Value of human life: $9.2 million (US DOT)
  - Fuel savings = cost reduction in fuel consumption by % of trucks with aero side guards at an assumed speed for each category of vehicle miles traveled (Table 10)
  - **Total costs** = side guard cost + installation cost + maintenance cost

Cost of side guards

- Original equipment manufacturer costs of side guards (aero side guard panel) are ~ **$1,000**
- Costs of installation: $700-$1800 for rail side guard and $1,000-$2,700 for full panel aero side guard
  - Benefit-Cost analysis used **median** figures: **$1,250** for rail side guard retrofit and **$1,850** for full panel aero side guard retrofit
- Annual maintenance cost: **$7.27**

Meaning of benefit-cost ratio (BCR)

- When BCR > 1, benefits exceed costs (called "cost-effective")
- When BCR = 1, benefits equal costs (called "a wash")
- When BCR < 1, costs exceed benefits (called "not cost-effective")

Benefit-Cost Ratios (BCR) results by scenario (discounted at 7%)

Scenario	BCR (high)	BCR (low)	Total Net Benefits (high)	Total Net Benefits (low)
Full Deployment First-Year	4.65	3.53	$61.6 billion	$42.2 billion
Gradual Deployment	3.05	2.33	$23.5 billion	$15.3 billion
Aero side guards fully deployed	2.28	1.19	$2.70 billion	$0.40 billion

Payback period for each scenario (discounted at 7%)

Scenario	High Benefits	Low Benefits
Full Deployment First-Year	3 years	4 years
Gradual Deployment	6 years	8 years
Aero side guards fully deployed	6 years	18 years

Conclusions

- In all scenarios studied, the benefits are greater than the costs of side guards (BCR > 1)
- This means aero side guards are **cost-effective** in mitigating the severity of crashes of bicyclists & pedestrians into a truck by preventing their underriding the truck

Additional information

Volpe has ***NOT*** "back-pedaled" on the validity of its findings, analysis and conclusions

Volpe used the same data from this report funded by FMCSA to make a presentation to British Columbia Injury Research and Prevention Unit on 17 November 2022; posted on January 27, 2023 at https://www.volpe.dot.gov/our-work/policy-planning-and-environment/lateral-protective-devices-side-guards-and-vulnerable-road