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Aerodynamics

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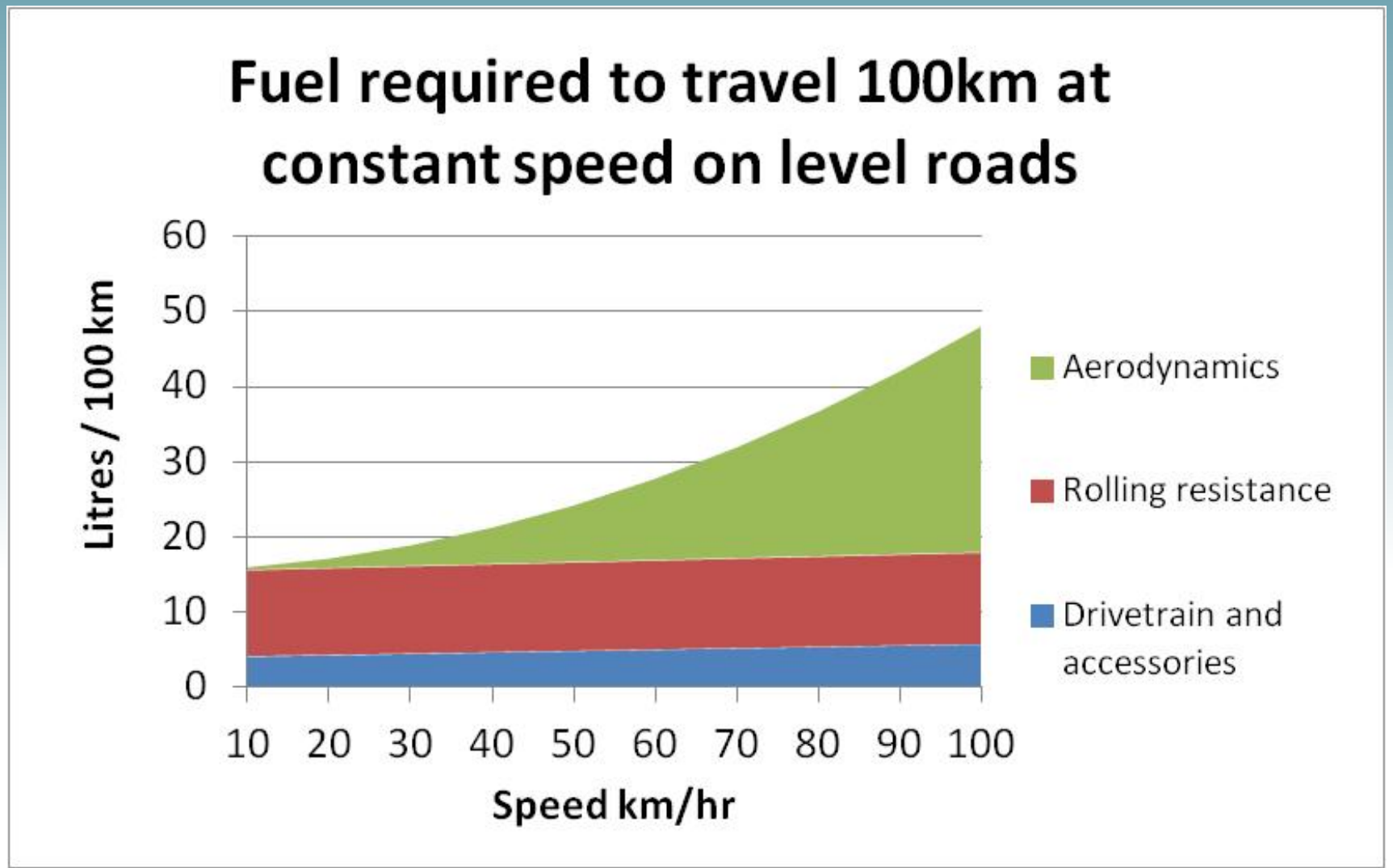
TRANSPORT RESEARCH

Why do operators need to know more about aerodynamics

- Random survey
- Apologies to the fleets shown

Twice as much fuel used at 100km/hr than at 50km/hr

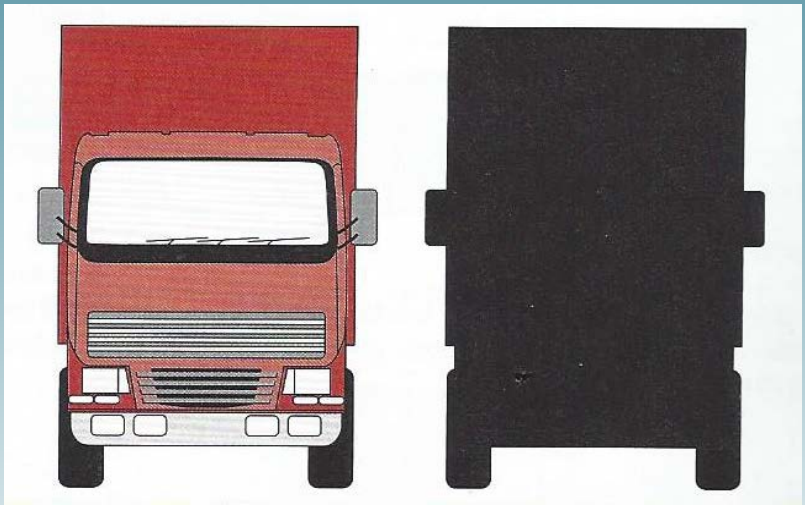


Back to basics

Force and hence power and fuel required to push vehicle through the air

1. frontal area (m^2) times
2. drag coefficient (C_D) times
3. vehicle and wind speed (squared)

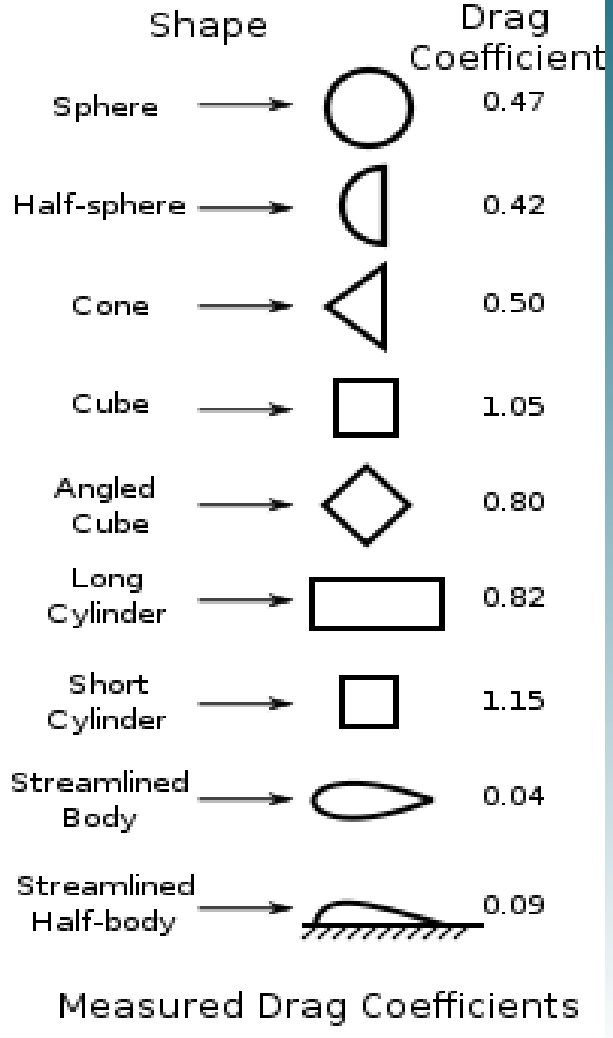
Frontal area

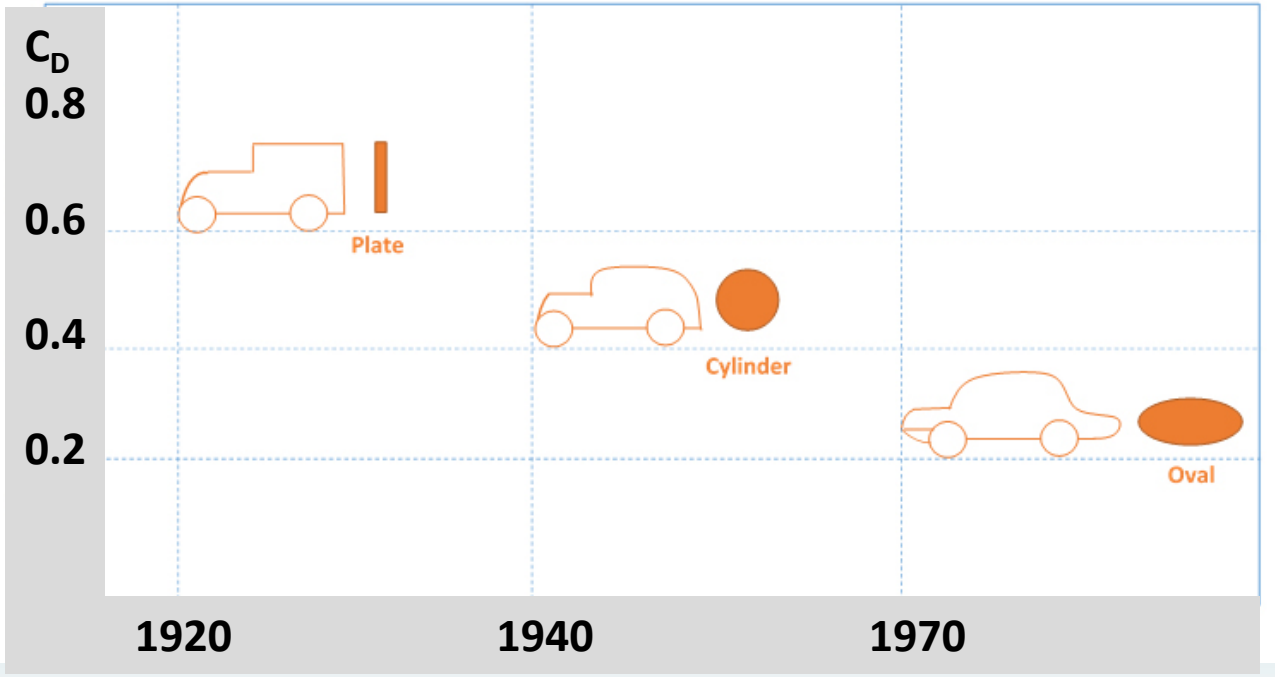


Size of hole pushed through the air

In this case the cab roof deflector increases frontal area by 25%

Drag coefficient





- Car shapes have evolved
- Trucks have some way to go

Drag coefficient

	Typical drag coefficient C_D
Car	0.3
Rigid truck	0.7
Articulated	0.85
Truck-trailer	0.9

- the smoother the airflow the better
- length of the gap between the cab and bodies makes a big difference. Air vortexes generated behind each.

Measuring Drag Coefficient

- Can be measured using coastdown test
- Coast vehicle down from 90km/hr to 20km/h while measuring speed and time using GPS
- Test on quiet, straight, flat road in windless conditions
- Repeat runs in both directions

Cab roof deflector fuel savings

	Rural / intercity truck Typical fuel saving	Mainly urban Typical fuel saving
Rigid	2.4%	1.7%
Articulated	2.4%	1.7%
Truck-trailer	1.2%	0.9%

Raised cab deflector when no container is present increases fuel consumption by double the amount saved when container is present

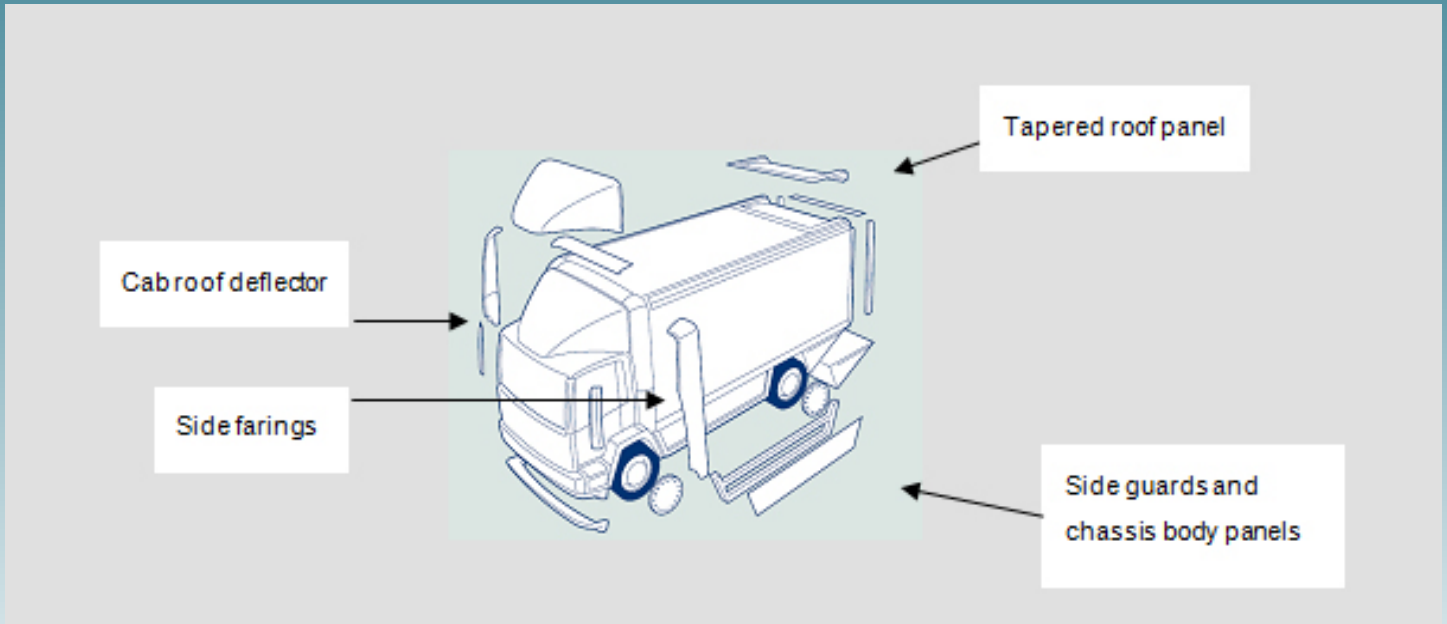
Maladjusted cab deflectors reduce the savings by as much as 20%

Convex cab roof deflectors

- Concave deflectors increases the effective frontal area by pushing the air higher

Exterior exhaust pipes, air intakes and other items increase drag

Other devices



Boat tail

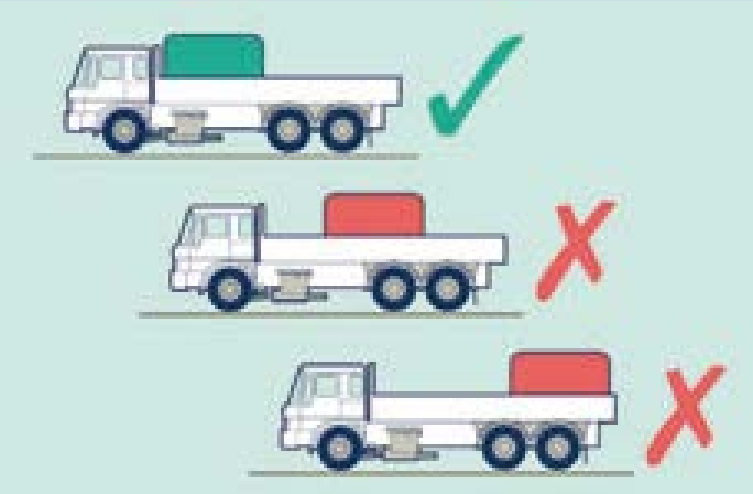
Flexible side skirts

Air tabs

Repair of curtains and body panels

Make curtains are tight and in good repair. Also repair body panels and other items that could affect the airflow

Load position



Summing up

- Aerodynamics can be very cost effective with very short payback periods if done properly
- Do your homework. There are examples out there that have probably increased fuel burn
- Be aware of indirect impacts on vehicle performance such as position of the load and gear ratios