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WIM data for investigation of truck weights and dimensions

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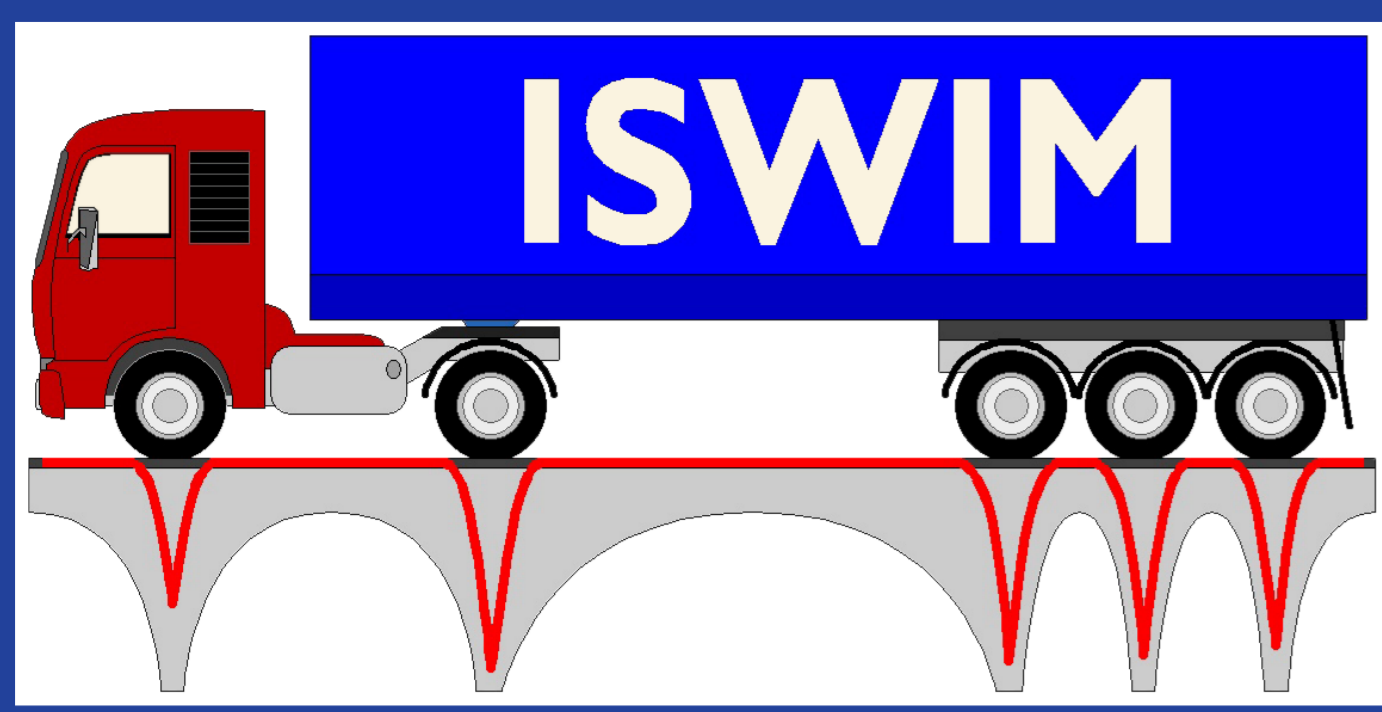
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WIM data for investigation of truck weights and dimensions



ICWIM7
Foz do Iguaçu
Nov. 7-10, 2016

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Context and objectives

Tire manufacturer's stakes

Design the right tire for end users

- Size → volume / load capacity
- Rolling resistance → fuel consumption

Design the right tire for safety

- Load capacity → safety
- Drivability → safety, truck stability

WIM data analysis to understand the trucks' loading habits ...

... to anticipate its evolution then the impact on road and tire needs

Perspectives of new and more optimized approach of tire design:

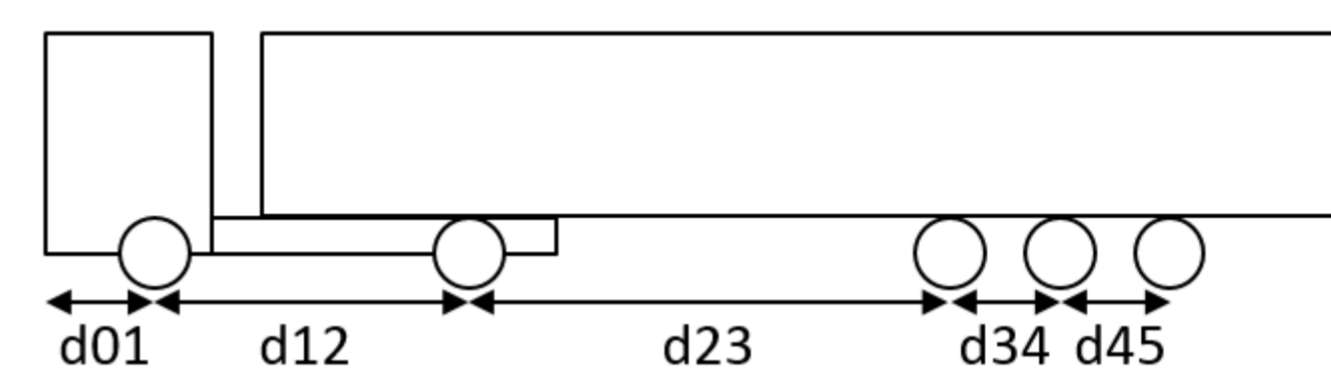
product segments based on real use to optimize fleet operations and truck safety performance

Truck classification



Truck classes

Classification of the various truck types by axle spacing, load and overhang criteria based on regulation and OEM specifications.



Truck - semitrailer

Example for tractor 4x2 and semi trailer :

- $d01 < 1.75m$
- $3m < d12 < 4.4m$
- $d23 > 4m$
- $d34 < 1.8m$ & $d45 < 1.8m$

WIM data

- WIM stations in France: 29 stations on the road network: 30 millions trucks weighted / year
- WIM data for this study: Sample of 1 year on 3 stations, a database of 3 millions trucks has been used in this study with:



WIM station

Axle load and spacing

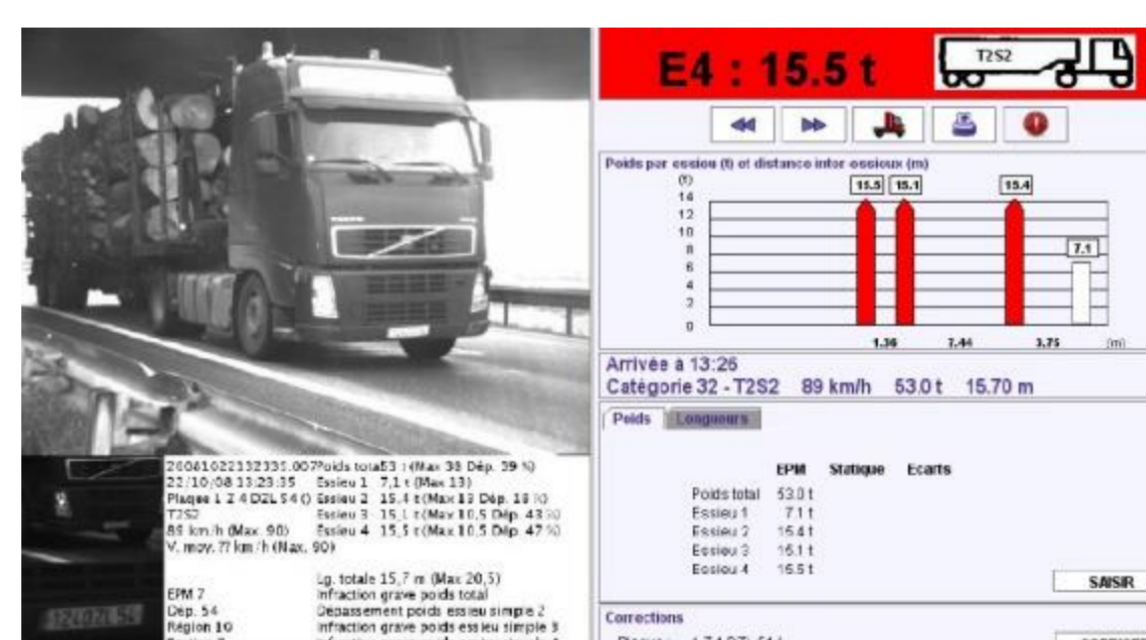
Front/rear overhang

Speed

License plate in case of infringement

Quality of WIM data:

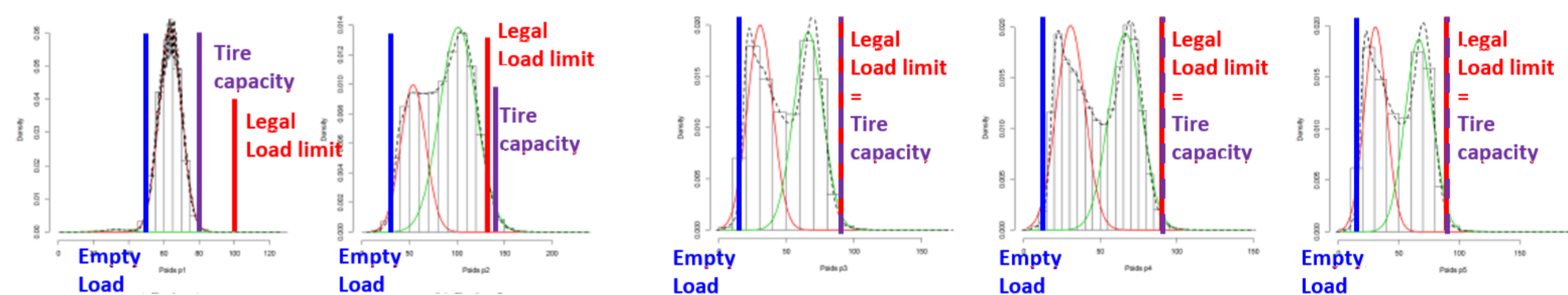
- Accuracy on GVW : $\pm 10\%$
- Accuracy on axle load: $\pm 15\%$
- Class COST323 : B(10)
- Accuracy on speed: $\pm 1\%$;
- Accuracy on total length of vehicles: $\pm 10\%$
- Accuracy on distances between axles : $\pm 1\%$
- Plate recognition : $+80\%$.



Output of WIM station

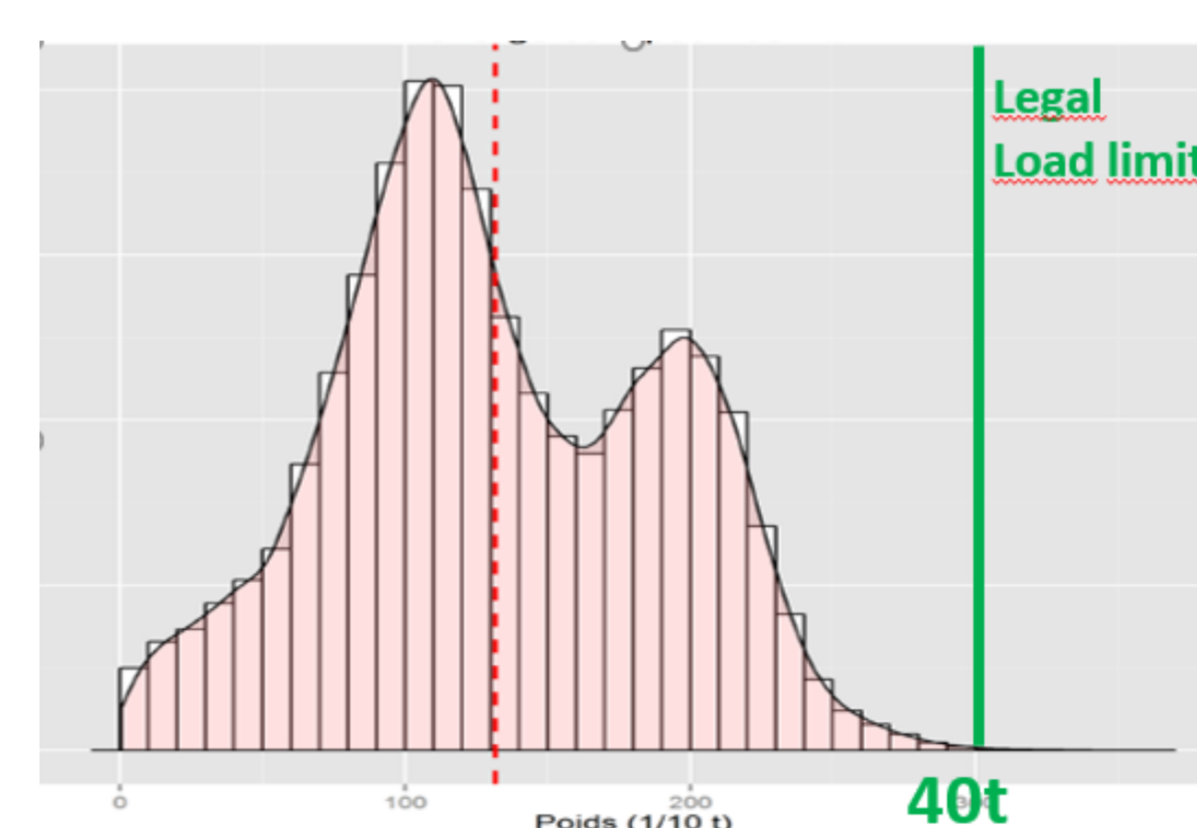
Axle load distribution

- Axle load distribution rather well comply with legal limits and tire capacity
- Nevertheless, a very limited amount of vehicle use the full tire load capacity



Load distribution for the 5 axles of the truck-semitrailer (from front axle in the graph of the left, to the last axle of the trailer in the graph on the right)

Load patterns

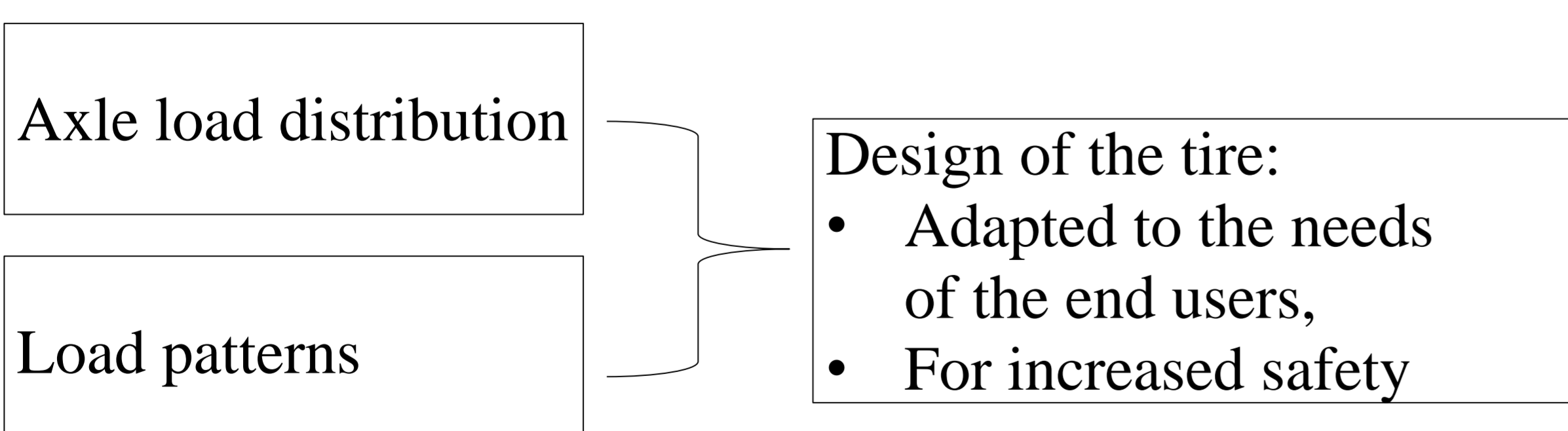


Payload probability density function for the truck-semitrailer

- Payload PDF for 14t empty convoy : a significant amount of vehicle use the max payload even if the majority of vehicles are "underloaded"
- When the payload increase, the center of gravity (CoG) is moved to the back while the load scattering is reduced
- Above 25 t payload, the CoG is at the middle of the semi-trailer

Methodology

Aim



Methodology

- Truck classification,
- For each truck class: axle load distribution (load only, which means subtracting the axle loads of the empty truck) and load patterns (determine which axle load combinations are representative of the truck population under study).
- We show here the results for the truck class "truck + semi-trailer", more results are given in (Schmidt et al., 2016).

References

- Schmidt, F., Jacob, B., Domprobst, F., Study of Truck Dimensions and Loadings using WIM data, TRA2016, 18-21 April 2016, Warsaw, Poland.

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