Intelligent Speed Assistance: Why Do We Need It?

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“Speed remains a very important risk factor. It has a greater effect on the number of accidents and injury severity than almost all other known risk factors.”

We know a lot about speed and risk
Severity: the power model

Andersson and Nilsson, 1997; Nilsson, 2004; Elvik et al., 2004; Elvik, 2009; Elvik, 2013:

- Injury accidents go up approximately with the proportionate change in speed squared for a length of road
- Serious injury accidents approximately with speed cubed
- Fatal accidents approximately with speed to the fourth power

Source: Nilsson, 2004
UK On-the-Spot Data:
Collision speed and the risk of car driver death in frontal collisions

Source: DfT, 2010
(dashed lines show 95% confidence interval)
Impact speed and the risk of pedestrian death

Source: DfT, 2010
(dashed lines show 95% confidence interval)
Collision speed and the risk of car driver death in side collisions

Source: DfT, 2010
(dashed lines show 95% confidence interval)
Real-world trials

Finland (2001-)
ISA-UK (2001-2006)
Two projects in Belgium (2001-2002)
LAVIA in France (2002-2006)
Austria (2003-2004)
Norway (2005-?)
+
Australia (TAC SafeCar and NSW)
Canada
Japan (Soft Car)
Assisting ISA: effect on behaviour and attitudes
The ISA-UK trials

2 urban trials
(1 private motorists, 1 fleet)

2 rural trials
(1 private motorists, 1 fleet)

79 drivers with a mix of:

Younger / older
Male / female
Speeding intenders / non-intenders
An overridable assisting system

• System that limited speed to the prevailing limit (no acceleration beyond limit)
• Drivers could override at will
• Vibration on throttle pedal to prevent over-throttling
Speed distribution on 30 mph (50 km/h) urban roads

Vehicle Speed (mph)  Travel Distance (%)  
Before  During  After

0  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90  95  >95

<5  5-10  10-15  15-20  20-25  25-30  30-35  35-40  40-45  45-50  50-55  55-60  60-65  65-70  70-75  75-80  80-85  85-90  90-95  >95
Speed distribution on 70 mph (110 km/h) roads

Vehicle Speed (mph)

Travel Distance (%)
Acceptability

<table>
<thead>
<tr>
<th>Mean Score</th>
<th>Before</th>
<th>Early with</th>
<th>Late with</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usefulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Satisfaction*</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

-2 -1 0 1 2
Intention

Mean intention to speed

- At start of trial
- At end of with ISA period
- At end of after period

Mean intention to speed
Impact Prediction
Method for estimating accident reductions with ISA

• Based on models from the literature relating speed to crash risk (e.g. Kloeden et al., 2001, 2002)

• These models have been calculated from real-world data

• They are not drawn from the police reported contributory factors for accidents
## Estimated Reduction in Injury Accidents for Vehicles with ISA

<table>
<thead>
<tr>
<th>ISA Variant</th>
<th>Reduction</th>
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<tbody>
<tr>
<td>Advisory ISA</td>
<td>−2.7%</td>
</tr>
<tr>
<td>Assisting (Overridable) ISA</td>
<td>−12.0%</td>
</tr>
<tr>
<td>Assisting (Non-Overridable) ISA</td>
<td>−28.9%</td>
</tr>
</tbody>
</table>

= −50% for fatal crashes
What is the importance of regulation?
GB accidents saved over time for under the Market Driven scenario
GB accidents saved over time for the Authority Driven scenario

- Fatal
- Serious
- Slight

Accident reduction rate vs. time (2010-2070)
Comparison of predicted outcomes

GB Crashes Saved from, 2010 to 2070

<table>
<thead>
<tr>
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<th>Slight Crashes</th>
<th>Serious Crashes</th>
<th>Fatal Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Driven</td>
<td>4%</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>Authority Driven</td>
<td>15%</td>
<td>25%</td>
<td>30%</td>
</tr>
</tbody>
</table>

- Benefit to cost ratios (accidents + fuel + CO$_2$):
  - Market Driven scenario 3.4
  - Authority Driven scenario 7.4

Note that we used rather high numbers for costs
Interpretation of scenario analysis

- Both scenarios are winners
- The harder the push for ISA and the “stronger” the system, the greater the benefits
- Shows the importance of regulation
- Much of the potential of ISA, e.g. to replace traditional and costly traffic calming, was not counted
Vaa et al. (2014) examined the safety potential for Norway of a number of driver assistance systems, including Adaptive Cruise Control, alcolocks, seatbelt reminders, Electronic Stability Control and fatigue warning.

Their conclusion was:

“The most effective driver support system is ISA.”

Similar conclusions are being reached by the current review of the General Safety Regulation of motor vehicles for the European Commission.
Conclusions

• ISA is a well-proven technology with very significant safety benefits

• Regulation is necessary to maximise the impact of ISA on traffic injuries and deaths

• Requirement of the overridable assisting system provides a sensible way forward
Thank you for your attention!

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