Automotive Lighting
and Light Signalling Expert Group
GROUPE DE TRAVAIL "BRUXELLES 1952" (GTB)

Informal document No. WP.29-148-27
(148th WP.29, 23-26 June 2009,
agenda item 8.7)

# Contribution of the Dipped Beam to Night-time Road Safety

## The GTB / CIE Approach to Encouraging Improved Performance

Presentation to WP29 -148th session – 24 June 2009

Geoffrey R Draper, GTB, June 2009

COMMISSION INTERNATIONALE DE L'ECLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION
CIE Central Bureau Kegelgasse 27 A-1030 Wien Austria

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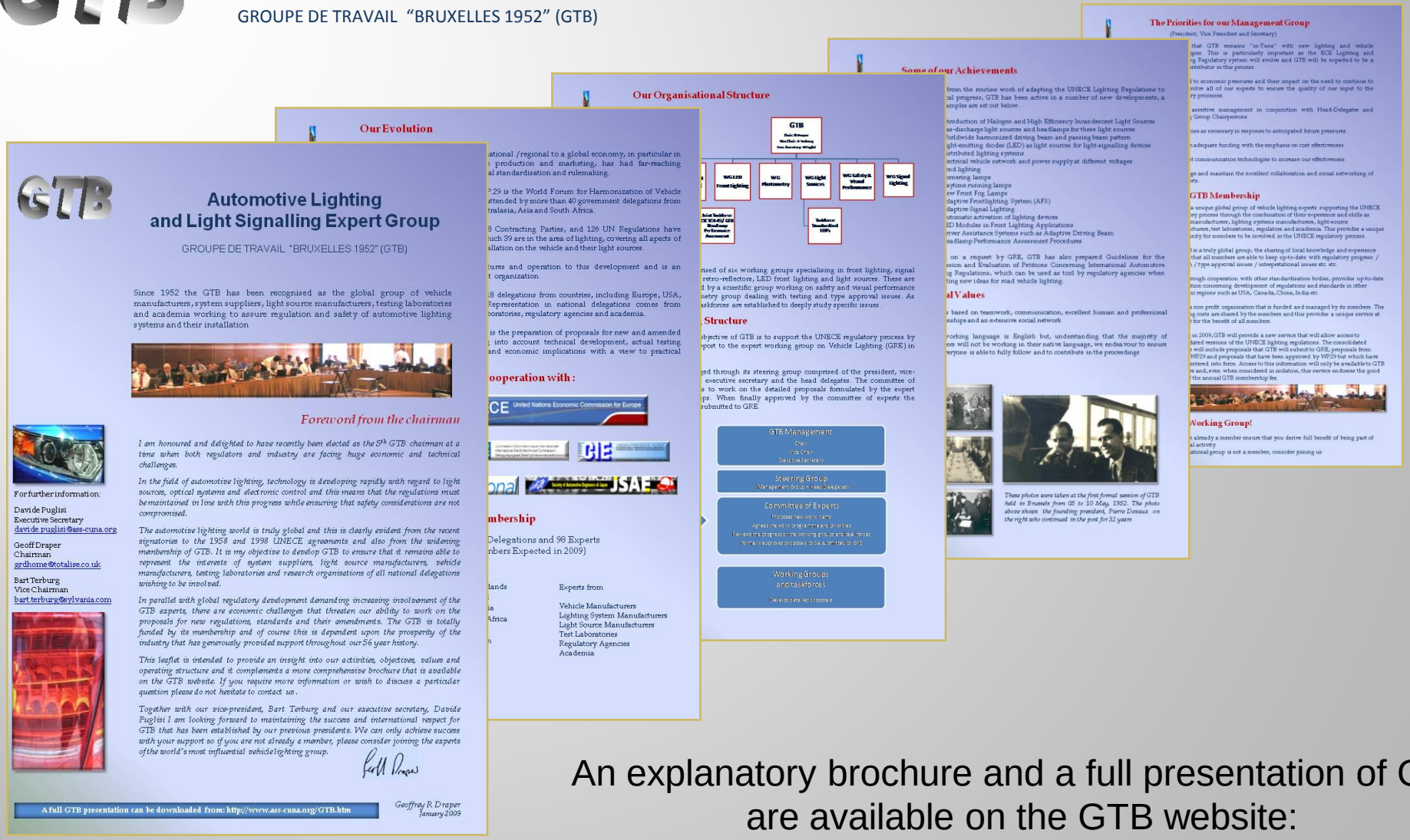



An explanatory brochure and a full presentation of GTB are available on the GTB website:

http://www.ass-cuna.org/GTB.htm

# COMMISSION INTERNATIONALE DE L'ECLAIRAGE

## (INTERNATIONAL COMMISSION ON ILLUMINATION)

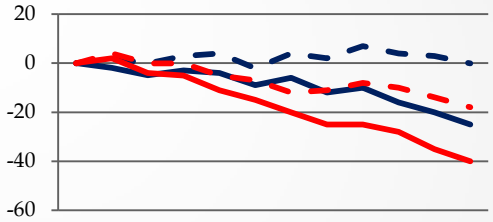
| | |
|---|---|
| 40 | National Committees (country members) |
| 7 | Technical Divisions |
| 135 | Technical Committees |
| 120 | Standards, Guides and Technical Reports |
| > 1000 | Expert volunteers |


More information at: http://www.cie.co.at

| SAE International | SURFACE VEHICLE INFORMATION REPORT | SAE J2829 FEB 2009<br>Issued 2009-02 |
|---|---|---|
| PEDESTRIAN VISIBILITY – LOW BEAM OPTIMISATION TO REDUCE NIGHT-TIME FATALITIES | | |

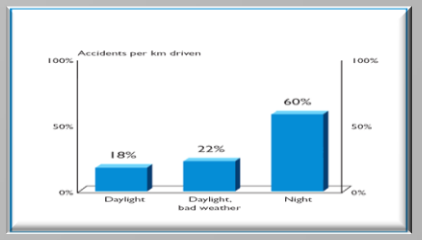
The SAE Pedestrian Visibility taskforce reviewed the recent research concerning pedestrian fatalities and investigated possible approaches to define the minimum requirements, both in terms of visibility and glare, of a headlighting system operating under actual vehicle conditions.

More information at: http://www.sae.org




# Accident Data

- Extremely large numbers of pedestrians are killed in collisions with vehicles because of darkness.
  (2,300 fatalities in USA, 150,000 worldwide)
- The risk of having a road accident at night is 3-7 times higher than in the daytime
- Night-Time Accidents are more severe in terms of critical injuries
- In Germany the number of accidents at night declined more strongly in the last decade compared to daytime

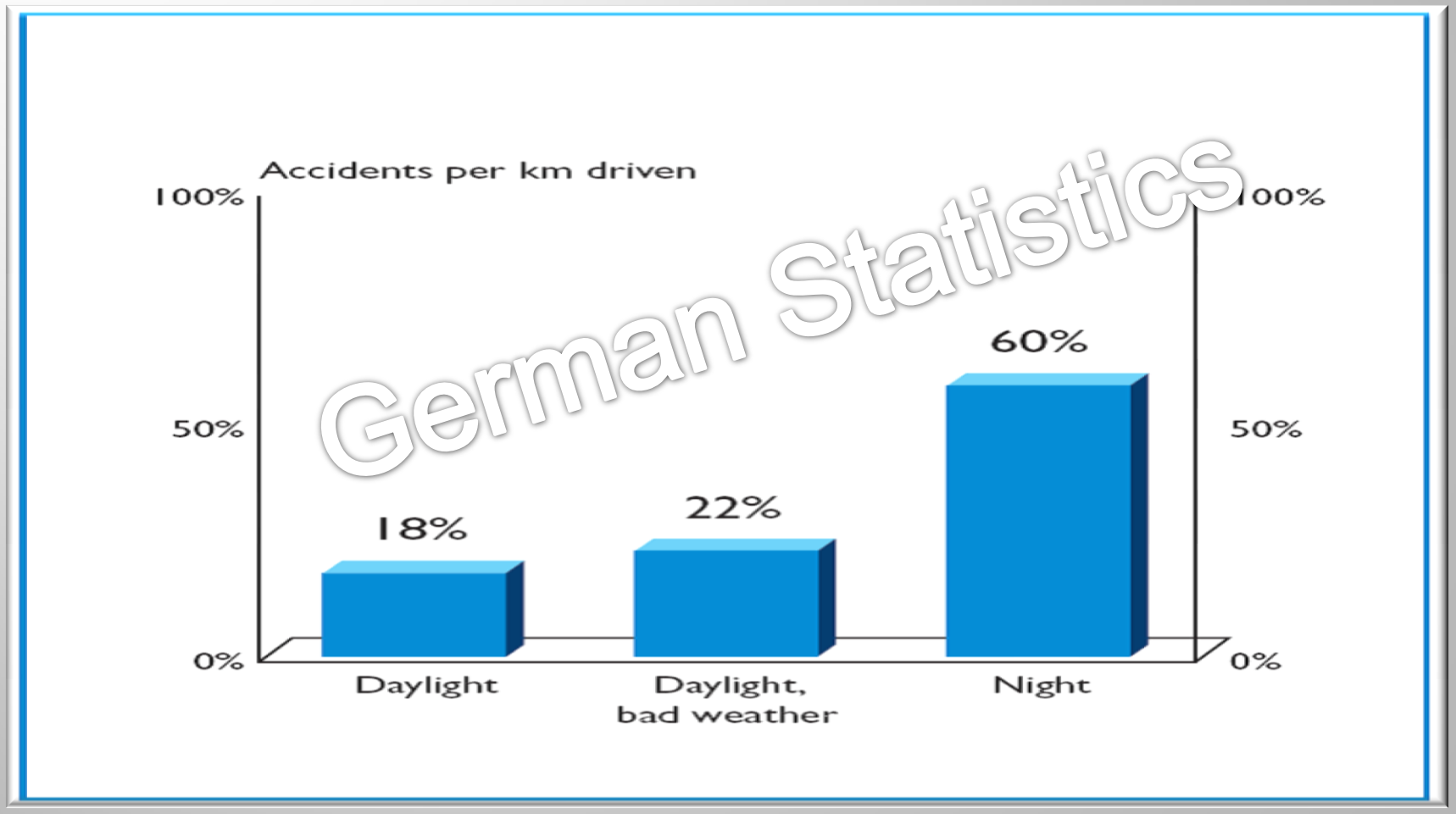


# The risk of having a road accident at night is 3x higher

## Night-Time Accidents are more severe

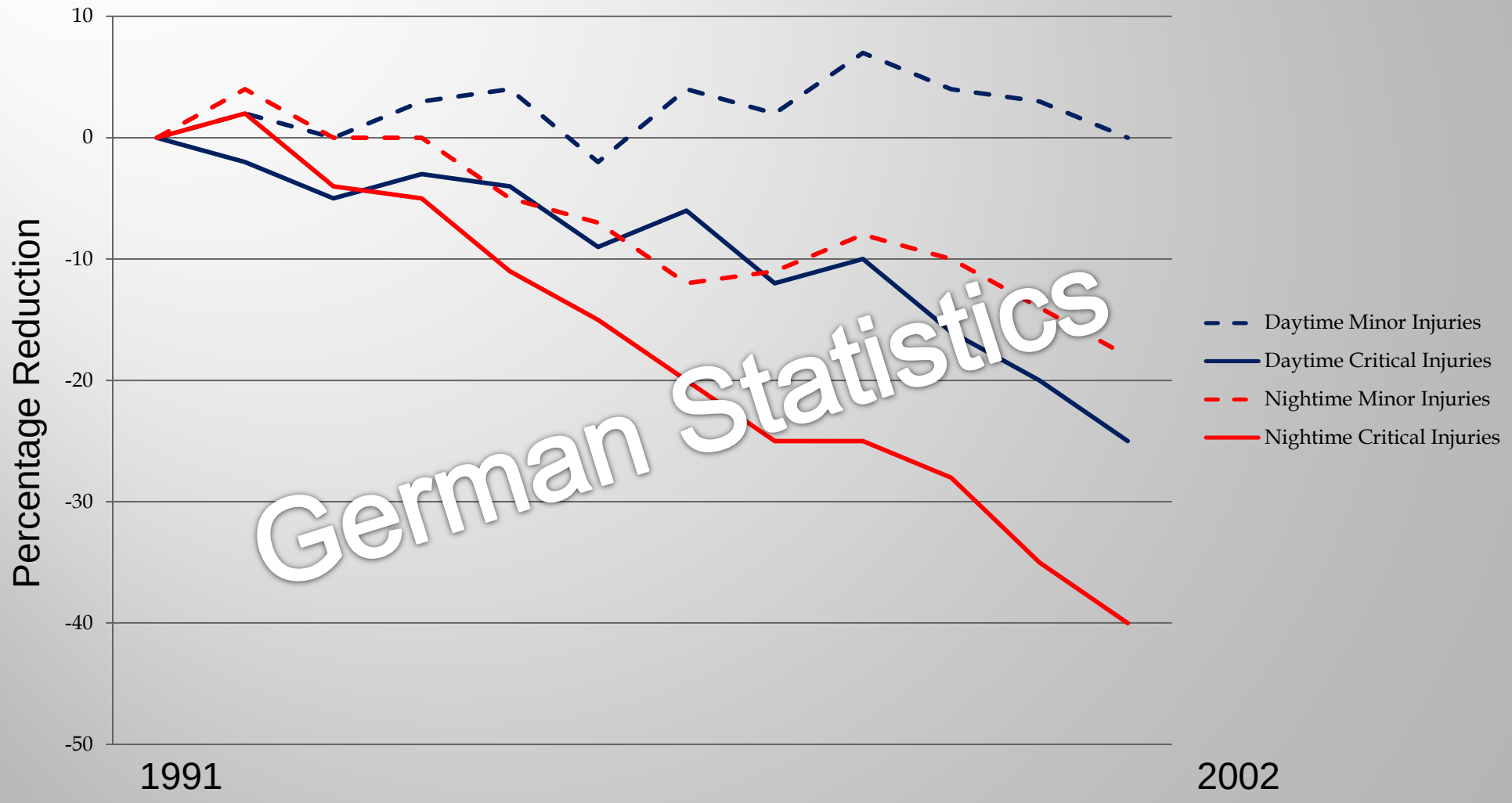
Proportion of night-time injuries on all injuries:

27,4% for slightly injured but 42,2% for fatalities (in 2002)




BASt report, „Das Unfallgeschehen bei Nacht“ (187), 1988

# The number of accidents at night declined stronger in the last decade compared to daytime.




BASt report, „Das Unfallgeschehen bei Nacht“ (M172), 2005

Extremely large numbers of pedestrians are killed in collisions with vehicles because of darkness.

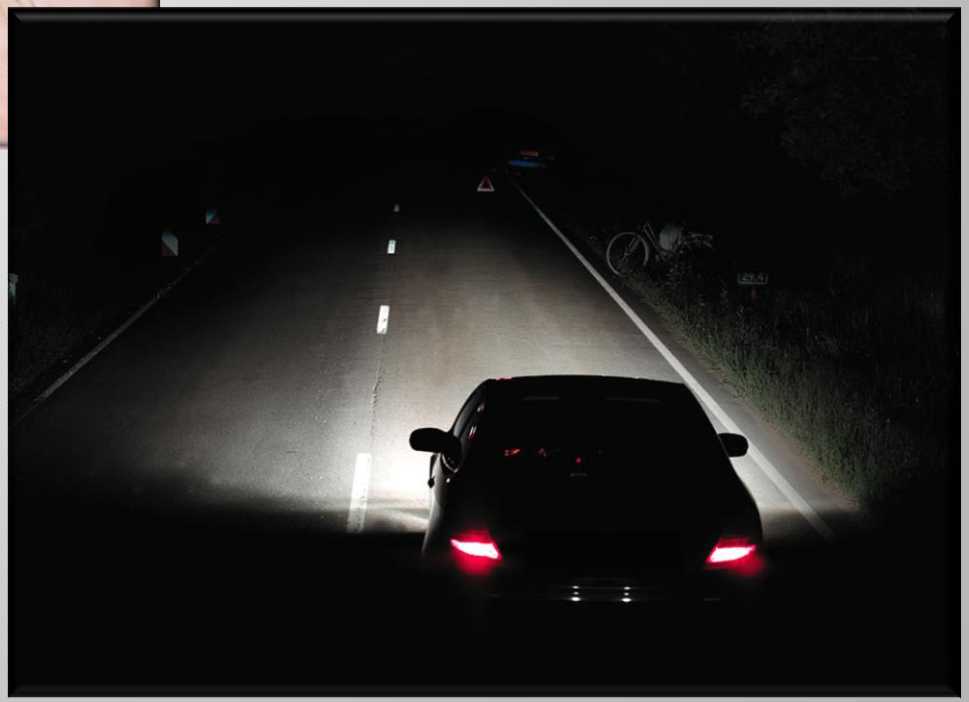
(2,300 fatalities in USA, 150,000 worldwide)

# USA Statistics

In the US, the risk of a pedestrian fatal crash in darkness is on average almost seven times greater than in daylight

UMTRI 2006 –1 Implications of Fatal and Nonfatal Crashes for Adaptive Headlighting John M. Sullivan and Michael J. Flannagan April 2006

# Improving Night-Time Road Safety

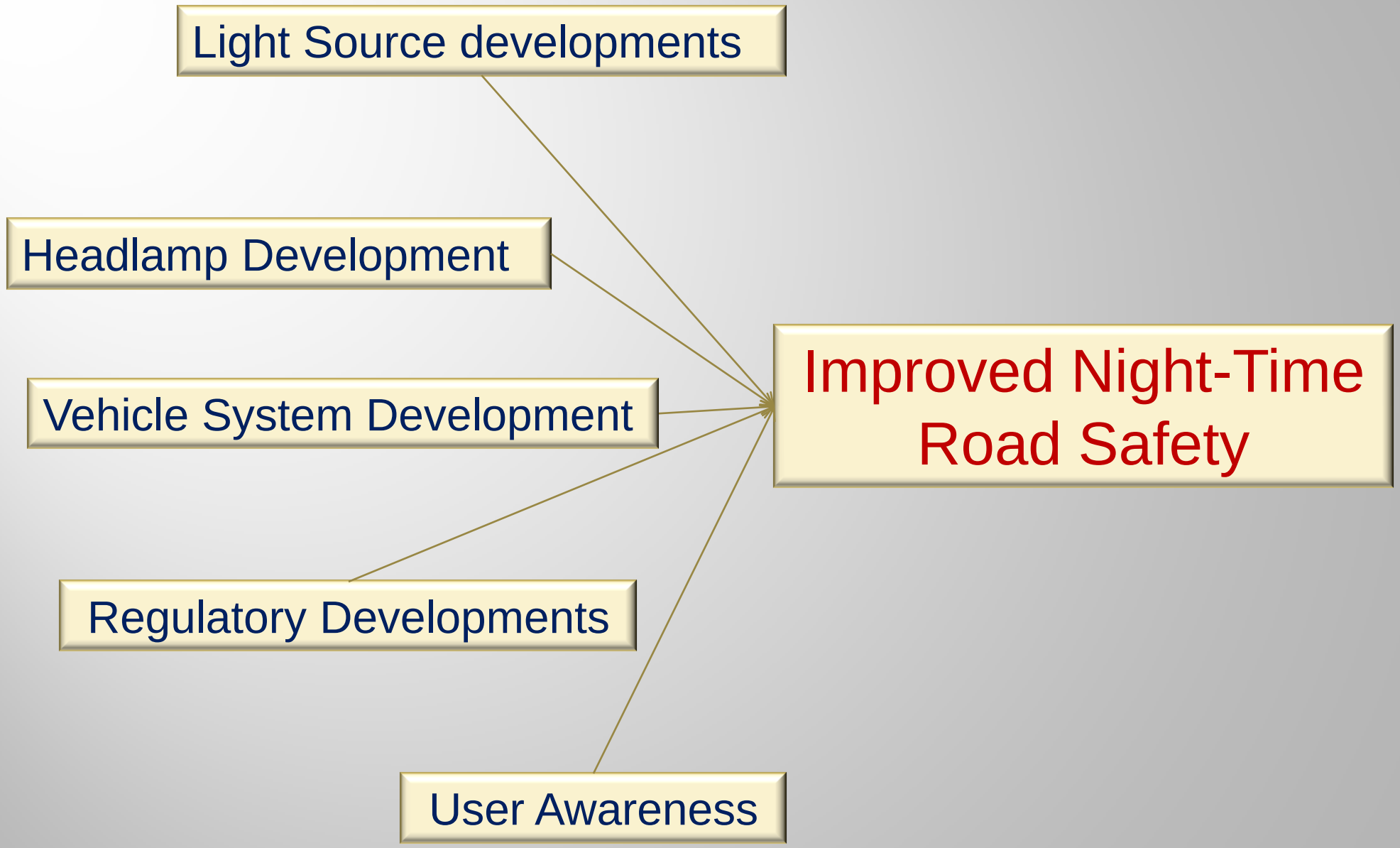


90% of information is perceived by the visual channel

M. Eckert, “Lichttechnik u. optische Wahrnehmungssicherheit im Strassenverkehr”; Verlag Technik GmbH, Germany, 1993


Basic Performance Halogen Headlamp

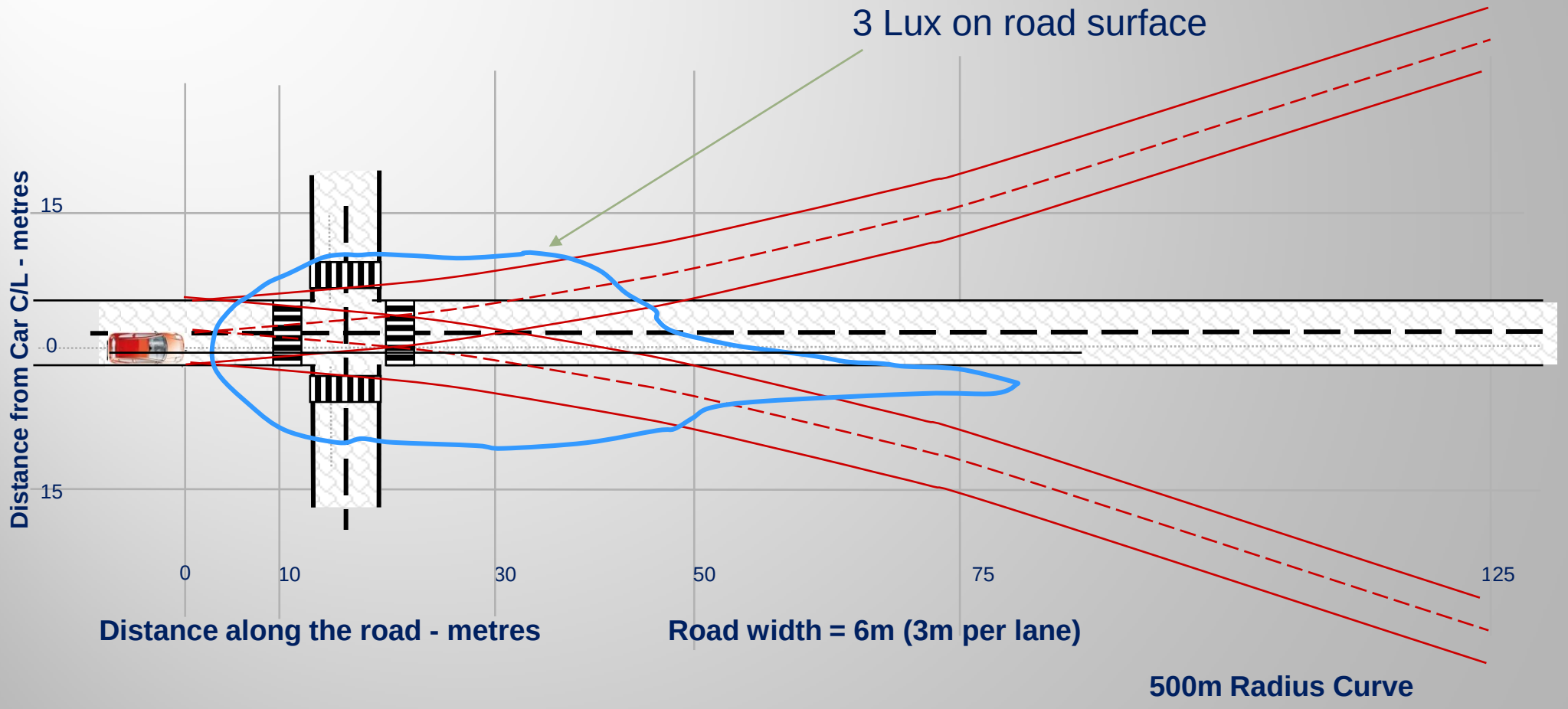

High Performance HID Headlamp
29,4


Light Source developments
Headlamp Development
Vehicle System Development
Regulatory Developments
User Awareness
Improved Night-Time Road Safety

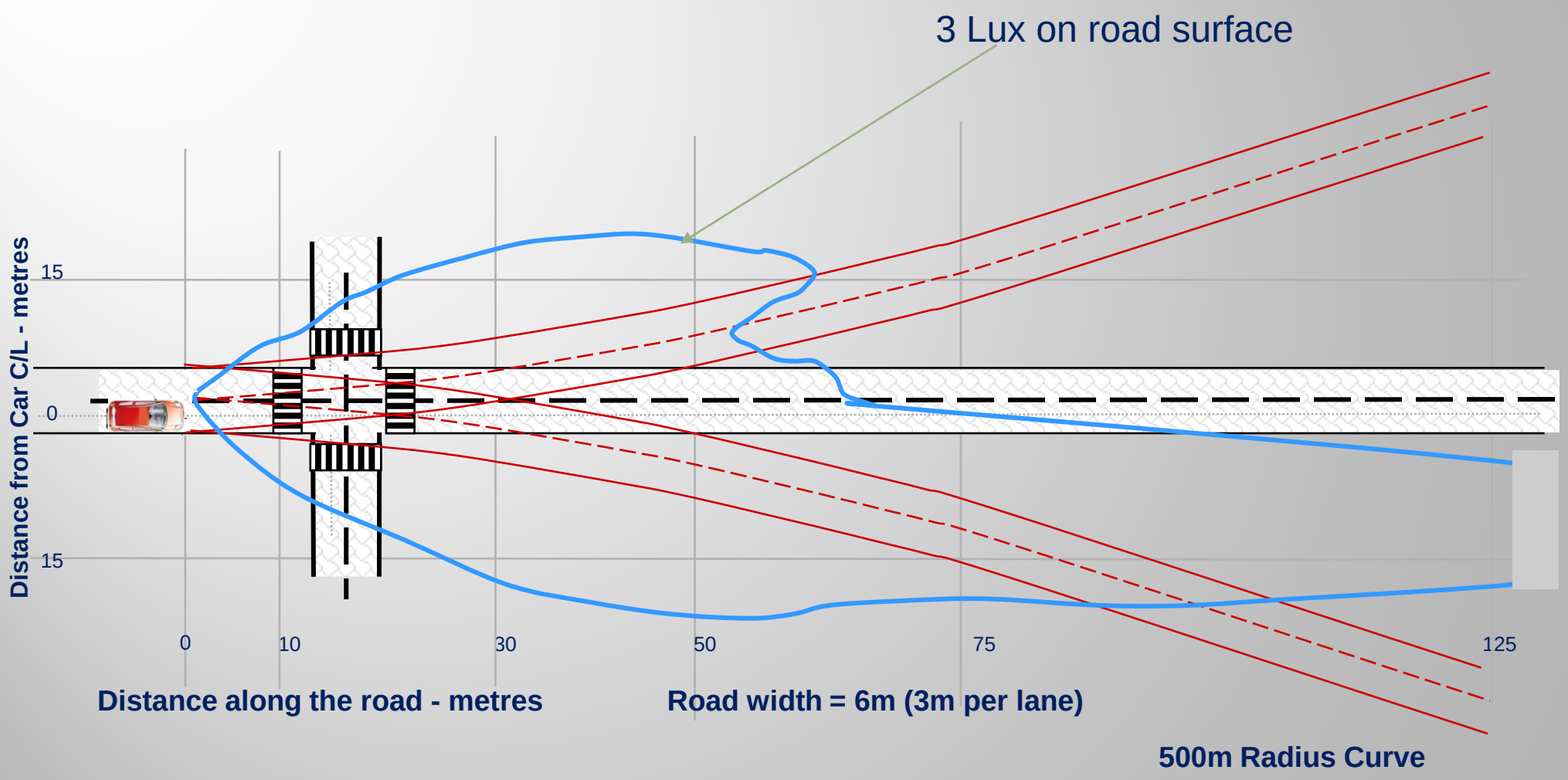
R01 R08 R20 R98 R123

- Minimum requirements for road safety
- Based upon type approval of components
- Do not address performance of the complete vehicle system
- Strict control on Glare
- Maximum freedom for improvements of forward illumination
- Revisions to enable new technologies

# Basic Performance Halogen Headlamp

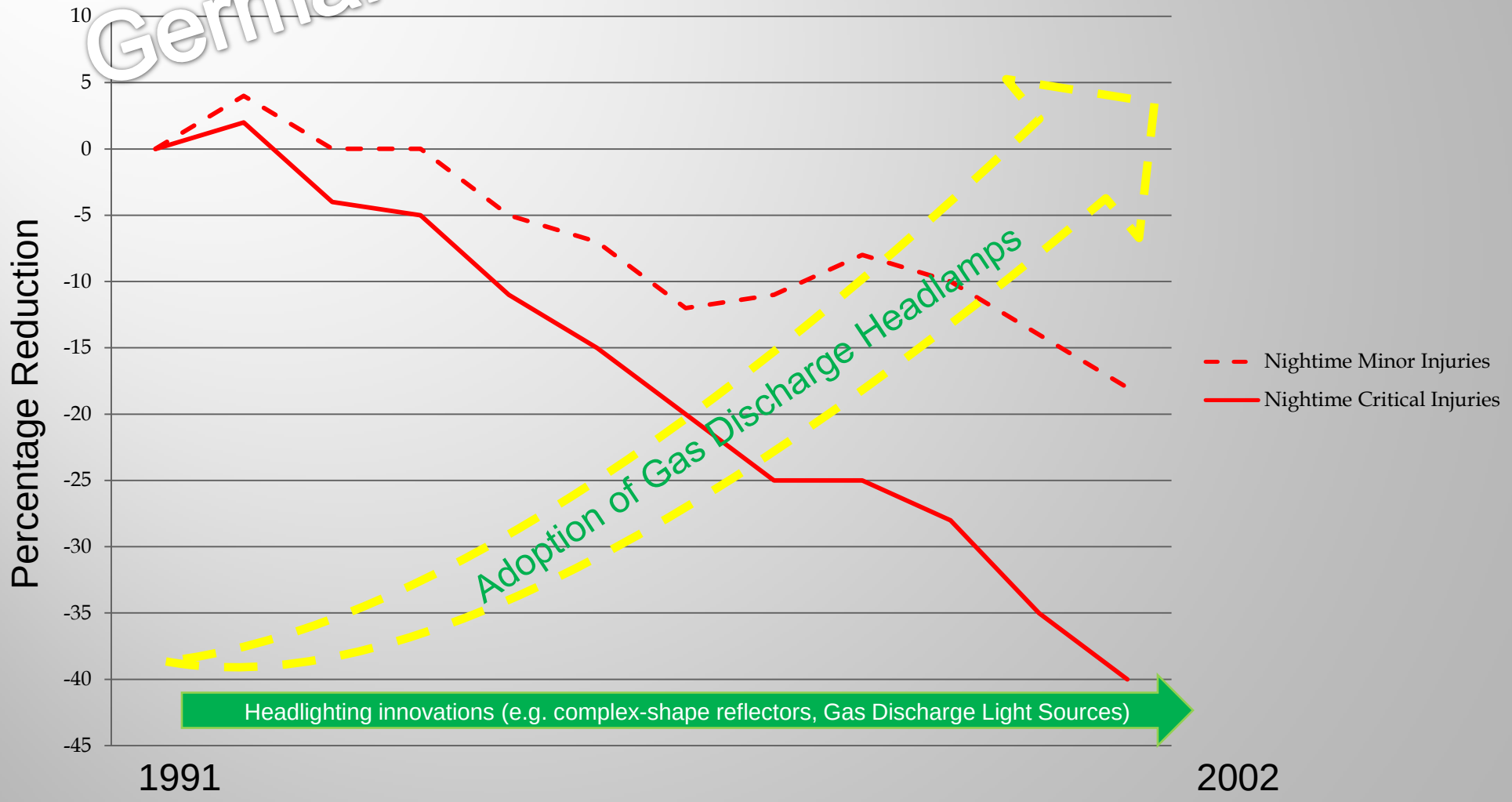


# High Performance HID Headlamp



# Improved Night-Time Road Safety

German Statistics




BASt report, „Das Unfallgeschehen bei Nacht“ (M172), 2005

# Improved Night-Time Road Safety

Car buyers not so willing to invest in optional safety devices

Gas Discharge Headlamp “take up rate” less than 10% in Europe

# Encouraging Improvement of Passing Beam Performance

- Vehicle manufacturers working closely with suppliers to define performance objectives according to market segment
- Suppliers investing in new technologies
- Motoring Press reporting on comparisons of vehicle lighting performance
- New Car Assessment Programmes (NCAP)

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# Standardised Performance Assessment Method

2003 EuroNCAP announced intention to rate headlamp performance.

GTB Established a Taskforce to support EuroNCAP and produced an initial recommendation for an assessment system.

2005 EuroNCAP concluded that more research would be required to define the relative priorities of glare and visibility before a rating system could be introduced

GTB decided to continue working to define a standard assessment method and transferred the activity to CIE TC4-45

2009 CIE TC4-45 has produced a Technical Report and a Standard to be published by end 2009

GTB

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## Participation / Investment

GTB Taskforce + CIE Technical Committee

## 52 Organisations

Including
18 Car Manufacturers
16 Lighting Suppliers
3 Government Organisations
5 Test Laboratories
3 Universities

More than 6000 man-hours

## 32 meetings

between August 2003 and March 2009

## 5 Validation Testing Events

1st Validation (2004)
- 16 Pairs of Headlamps – Motor Transport Institute - Poland

2nd Validation (May 2005 IDIADA Spain)
- 16 pairs of Headlamps – Renault / IDIADA / LTIK

3rd Validation (March 2006 Hella Germany)
– Re-evaluation of a Selection of Headlamps from 2nd Event

4th Validation (February 2007 – Koito Belgium)
- Validation of Revised Method to Calculate Glare

5th Validation (May 2007 – Fiat Balocco)
-Validation of Revised Method to Calculate Range

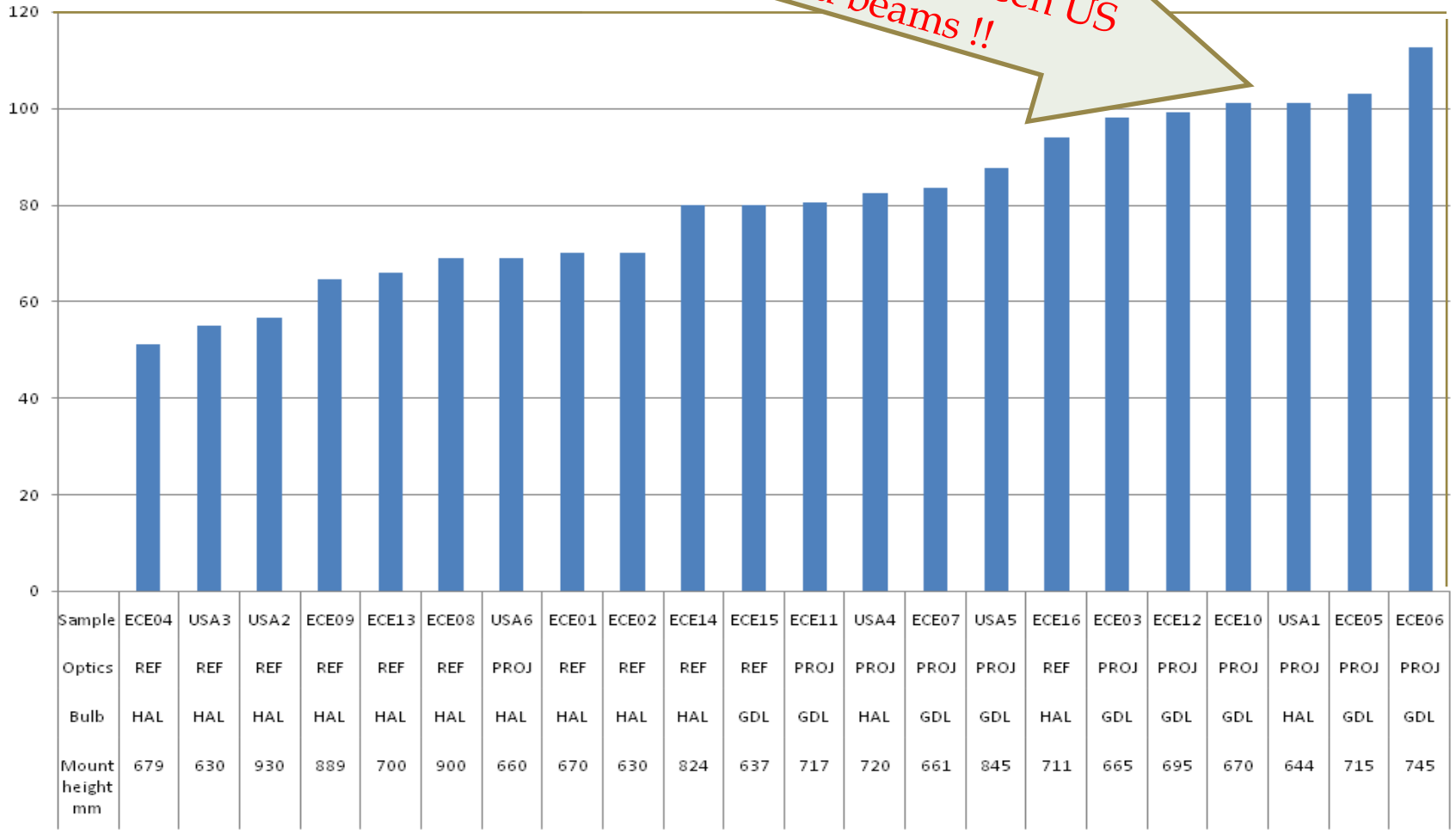
# Standardised Performance Assessment Method

## Overview of features and benefits

- Objective Method
- Validated against observation data
- Repeatable results based upon laboratory procedure and standardised software routines
- Can accept photometric simulation data to enable assessment at vehicle concept stage
- Globally accepted method independent of regulatory requirements

# Performance Scoring

No Significant differences between US and ECE dipped beams !!




| Sample | ECE04 | USA3 | USA2 | ECE09 | ECE13 | ECE08 | USA6 | ECE01 | ECE02 | ECE14 | ECE15 | ECE11 | USA4 | ECE07 | USA5 | ECE16 | ECE03 | ECE12 | ECE10 | USA1 | ECE05 | ECE06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Optics | REF | REF | REF | REF | REF | REF | PROJ | REF | REF | REF | REF | PROJ | PROJ | PROJ | PROJ | REF | PROJ | PROJ | PROJ | PROJ | PROJ | PROJ |
| Bulb | HAL | HAL | HAL | HAL | HAL | HAL | HAL | HAL | HAL | HAL | GDL | GDL | HAL | GDL | GDL | HAL | GDL | GDL | GDL | HAL | GDL | GDL |
| Mount height mm | 679 | 630 | 930 | 889 | 700 | 900 | 660 | 670 | 630 | 824 | 637 | 717 | 720 | 661 | 845 | 711 | 665 | 695 | 670 | 644 | 715 | 745 |

## Next Steps

Develop a standard CIE Performance Scoring System
(Could be an ISO Standard)

Target Groups

- New Car Assessment Programmes (Europe / USA / Japan)
- Vehicle and Equipment Manufacturers
- Consumer Groups
- Motoring Press
- End Users

# Joint GTB / CIE Technical Committee TC4-45

- Starting to develop a Standardised Scoring System
- Comments and suggestions will be appreciated
- Participation / Research data / Funding welcomed

Thank you for your attention