THE BRIGHT WAY TO SAVE LIVES!

It’s not just at night you need to turn on your lights.

Dipped headlights are an effective way to reduce the number of collisions on our roads.
DAYTIME RUNNING LIGHTS (DRL) – Consultation

The Road Safety Authority is considering the policy options available to promote the use of Daytime Running Lights (DRL), including the possibility of mandating the use of DRL on all vehicles. An EC Directive\(^1\) would make DRL mandatory for new vehicles from 2011 onwards and by 2024 it is predicted that due to the natural replacement of the national fleet, almost all vehicles would be equipped with DRL. The RSA is inviting views on introducing DRL measures earlier, whereby all road vehicles would be required to use either dipped head lights during hours of daylight or dedicated DRL from next year onwards. The use of DRL has been found to enhance the visibility of vehicles, thereby increasing road safety by reducing the number and severity of collisions. This paper explores the benefits of DRL and the implications for all road users including pedestrians, cyclists and motorcyclists. In order to ensure a comprehensive consideration of all the issues, the Road Safety Authority is seeking the views and advice of interested parties.

1. **Introduction**

   Daytime Running Lights (DRL\(^1\)) involves vehicles having forward facing lamps turned on during the hours of daylight in an effort to make vehicles more conspicuous and increase road safety. DRL makes motor vehicles more noticeable, and research shows that DRL reduces the likelihood of multi-party daytime collisions, therefore helping to save lives, prevent serious injuries.

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\(^{1}\) In this document, the term DRL is used to describe the concept of using any lighting devices during daylight, in particular existing headlamps or dedicated lights. If the text refers to the use of either existing or dedicated lights, this is mentioned explicitly.
and reduce the societal and economic cost of collisions. There are two types of DRL: dipped headlights or dedicated lights that automatically switch on when the engine is started. Dedicated DRL may be either factory fitted or can be retrofitted to an existing vehicle.

Dipped head light DRL – the dipped headlights are lit at all times whilst driving. Whilst dipped headlights are more powerful than dedicated DRL's they are designed and focused for use when meeting oncoming traffic so other road users are not dazzled or suffer from glare.

Dedicated DRL – these lights are of lower power than dipped headlamps but are focused differently so that they can provide sufficient illumination to alert other road users. Dedicated DRL typically use LED (Light Emitting Diode) bulbs which are more energy efficient and last longer when compared to normal filament bulbs.

EC Directive 2008/89/EC² requires dedicated Daytime Running Lights (DRL) on all new types of passenger cars and small vans from February 2011 onwards, and on all other new types of road vehicles (including trucks and buses but excluding motorcycles and agricultural tractors) from August 2012 onwards. These lights are switched on automatically by the vehicle when the engine is started. When it is dark the driver has to switch on the (full and dipped) head-lights manually and this automatically turns off the dedicated DRL. Eventually as the national fleet is renewed over time all vehicles would have DRL.

As part of this consultation, the RSA is assessing the possibility of extending the scope of DRL to all vehicles already in use on Irish roads. It is the view of the RSA that such a requirement would help save lives and prevent collisions on our roads by increasing the conspicuity of motor vehicles and helping to prevent multi-party daytime collisions. There are two options for implementing DRL in Ireland and further details of each option are set out in this document;

Option 1. All vehicles including new and existing to use DRL.

Option 2. The minimum European requirements to be implemented in Ireland, thus only affecting new vehicles from the dates set out in EC Directive 2008/89/EC.

2. The Effects of DRL
Leading theoretical and observational research shows that DRL provides two main road safety benefits. Firstly, DRL creates a greater contrast between vehicles and their surroundings. It increases the visibility of vehicles and makes them easier to identify. Secondly, road users estimate that vehicles with DRL are closer than they really are. Because of this, drivers take less risk while overtaking and when crossing at junctions. Figures 2 and 3 that follow, demonstrate the increased conspicuity of a vehicle using DRL when compared to the same vehicle with no lights on in Figure 1.

3. Safety Benefits
There have been many studies on the effects of DRL on collisions and casualties. In 2003, the EC commissioned Elvik and colleagues to carry out a thorough review of existing studies regarding the effects of daytime running lights on road safety. The authors reviewed 41 separate studies and concluded that the mandatory use of DRL influences the numbers of daytime collisions involving two or more users (multi-party) and is associated with a:
• reduction of 15% in multi-party daytime collisions leading to fatal injury.
• reduction of 10% in multi-party daytime collisions leading to serious injury.
• reduction of 5% in multi-party daytime collisions leading to slight injury.
• no reduction in multi-party daytime collisions leading to property damage only.

In 2006, the Transport Research Laboratory (TRL), on behalf of the Department for Transport in the UK, carried out a critical review of Elvik’s research\(^i\). TRL found substantial evidence that the use of mandatory DRL would provide a net accident reduction and estimated that approximately 5.9% of all multiparty daytime collisions would be prevented. Although TRL’s estimated reduction of fatal and serious collisions was less than those of Elvik, the economic and societal savings achievable are still very significant.

Both Elvik’s and TRL’s results have been arrived at based on estimates that once DRL legislation is introduced, the amount of vehicles using DRL would rise from 10% to 90% (the 10% baseline figure used in the EC studies are consistent with measurements for Ireland\(^ii\)). The studies also estimate that multi-party daytime collisions make up 40% of all fatal or injury collisions in the European Union.

4. DRL in Ireland

In 2008, the RSA ran a safety campaign in order to encourage drivers to use dipped headlights while driving during the day to increase the visibility of their vehicle. This campaign, which was endorsed by the Minister for Transport\(^iii\) proved to be highly successful and has been supported by various local authorities and the IRHA\(^iv\) (Irish Road Haulage Association).

Visibility of vehicles is particularly important in Ireland as a large portion of our road network is single carriage way, twisty, in rural areas and has no hard shoulder. The use of DRL helps road users see and prepare for oncoming traffic earlier.

Certain organisations have already incorporated DRL into their fleet and have embraced it as part of their policy. These organisations include Dublin City Council, who mandate the use of DRL on all of their contracted vehicles. An Garda Síochána and the HSE advise their drivers to use dipped headlights at


\(^{iv}\) http://www.irha.ie/index.php?option=com_content&task=view&id=67&Itemid=123
all times. The ESB’s vans and trucks are all fitted with automatic DRL systems (where technically possible).

Certain vehicles imported into Ireland have DRL fitted as standard, including types of Volvo, Saab, Volkswagen, Suzuki, General Motors, Audi and BMW.

Studies have been carried out by Fuller and colleagues at Trinity College, Dublin whereby the effects of a brief, intensive campaign of DRL for voluntary use in Dublin city traffic were investigated. From direct observations of vehicles, the authors demonstrated that DRL use rose from a baseline of 10% prior to the RSA campaign, to 19% afterwards. The authors also carried out surveys which showed that 75% of those polled believe that DRLs would reduce collisions and, under conditions of poor visibility over 90% consider DRLs would make roads safer. Following the campaign, 87% of those surveyed were of the opinion that DRLs have the effect of making approaching vehicles more conspicuous and the authors pointed out that this view was particularly endorsed by motorcyclists. It was also shown that a significant proportion (over 65%) of the respondents were of the view that DRL enabled safer judgments of vehicle speed and distance.

5. **Situation in other Member States**
Since the 1970’s DRL has been mandatory in Scandinavian countries and today there are fourteen European countries which have compulsory DRL for vehicles. The table below presents a summary of the Member States of the EU where DRL is mandatory, the roads which are affected and the times of the year when DRL is applicable. In Belgium and Spain dipped head lights are compulsory for motorcycles during daytime hours. In Switzerland DRL is recommended. Outside of Europe, DRL is compulsory in Israel during the winter months on rural roads and in Canada new vehicles entering the fleet since 1990 have been required to be equipped with dedicated DRL systems.
### 6. Costs implications associated with DRL

DRL slightly increases fuel consumption for vehicles because more power has to be generated by the engine in order to power the DRL. A car with dedicated DRL uses approximately 1% more fuel. Based on the average distance travelled per car per year, the additional annual fuel cost is estimated at €9.51. Where dipped headlights are used, a car would use around 1.6% more fuel at an estimated annual cost of €15.34. Similarly, heavy vehicles use approximately 0.4% more fuel when fitted with dedicated DRL and 0.7% more fuel when using dipped headlights. Further details on fuel consumption can be found in Appendix I.

The additional fuel consumption associated with the use of DRL leads to a corresponding increase in the emission of air pollution. Based on analysis carried out by Elvik on the costs of air pollution for various European countries, €0.04 per kilometre of driving can be used as an estimated cost of air pollution. Therefore, the increased fuel consumption due to DRL has an associated air pollution cost of €4.73 when using dedicated DRL and €7.63 when using dipped headlights. Further details on the environmental impact associated with increased fuel consumption can be found in Appendix II.

DRL means that headlamps burn out more often, because they are switched on for longer. The increased cost of light bulbs due to the use of DRL is
estimated at approximately €6 per vehicle per year. More detail is available in Appendix III. Vehicle owners may wish to consider fitment of a dedicated DRL kit which uses energy efficient LED bulbs which also last longer and in turn would reduce running costs. For more detail refer to section 11.

Whilst the use of DRL has financial implications the resultant reduction in multi-party daytime collisions can quickly offset these costs. The average cost to the state for a fatal collision is circa €2.9m. This is a substantial figure and an avoidance of 14 fatal collisions alone per year would offset the cost of DRL usage on the entire national fleet of vehicles. Please refer to Appendix IV for more details.

7. Possible Exemptions

Technically, it may be difficult for certain classic/collectable vehicles to have their dipped headlights turned on at all times. Therefore, their inclusion in possible DRL regulation would require further consideration. Also certain agricultural vehicles which are only used during daylight hours are not required to be fitted with lights, hence they may be outside the scope of DRL legislation.

8. How visible are other road users?

The EC commissioned a study in 2004 which was carried out by the Dutch research laboratory TNO⁴ entitled “Do other road users suffer from the presence of cars that have their daytime running lights on?” As part of the experiments carried out, subjects were shown slides with pictures of traffic situations in daylight circumstances. The slides contained a car with or without DRL and another road user: a pedestrian, a cyclist, or a motorcyclist with or without lights. The subjects were instructed to determine as quickly as possible if there was another road user present. The time needed to do this was registered. The results were that subjects were able to identify the traffic situation of cars with DRL more accurately and quicker than that of cars without DRL. The authors found no evidence that the conspicuity of road users in the vicinity of a DRL-vehicle, as measured by the speed with which their presence was detected, suffered from a car having its Daytime Running Lights on. In fact, the evidence pointed in the opposite direction – other road users actually benefiting from the lights being on –, although the effect was small. TRL carried out a critical review of the TNO’s findings and found that the experiment was well controlled, but expressed concern that the photographic methods used may not reflect real world environments.
sufficiently. For example it was pointed out that experiments involving
motorcycles at a junction, showed the motor cycle positioned at the side of
the car rather than the more realistic scenario where the motor cycle is in
front of the car. In this situation the motorcycle is less conspicuous.

Since 2003, ACEM (the European Association of Motorcycle Manufacturers),
the manufacturers of almost all the motorcycles sold in Ireland, have wired
motorcycles (including mopeds) so that when the ignition is switched on the
headlamp is switched on at the same time. This is known as AHO (Automatic
Headlights On). As Fuller\textsuperscript{iii} points out, about 50% motorcyclists in Ireland
already use DRL and sometimes motorcyclists express the fear that their
conspicuousness lessens if cars also have their lights on during daytime. The
EC commissioned study\textsuperscript{iv} by TNO showed that the subjects saw both
motorcycles with their lights off and motorcycles with their lights on sooner if
cars also had DRL. However, motorcycles with DRL were spotted faster.
TRL have concluded that whilst DRL would provide a net accident reduction,
motorcycles will be less conspicuous if all vehicles are using DRL.
They recommended that consideration be given to only low intensity DRL (i.e.
dedicated DRL) being used on all vehicles other than motorcycles so that the
conspicuity of motorcycles using headlights as DRL is maintained.

9. Cyclists
In the previous section it was shown that research indicates DRL probably
reduces the number of car collisions involving cyclists, however it was shown
that this effect is thought to be small. Apart from the research, cyclists may
express concern that if all other road users are required to have their lights
turned on during the daytime, that their conspicuity may be reduced, thus
increasing their vulnerability. If DRL is made mandatory for all mechanically
propelled vehicles, there are options which could be examined in an effort to
increase the relative conspicuity of pedal cyclists and the RSA invites
comments in relation to the development of any DRL policy with regard to
cyclists.

10. Type Approved Dedicated DRLs
In line with Directive 2008/89/EC, Daytime Running Lights fitted to vehicles
would be required to be type approved to the requirements of UNECE
Regulation 87. Type approved DRLs would have fulfilled specific test
requirements including requirements for intensity and colour of light, light
distribution angles and light source module. The DRL may be illuminated by
energy efficient LED bulbs or conventional filament bulbs. Every daytime
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running lamp conforming to type approval would have an approval mark which is indelible and clearly legible even when the lamp is mounted on the vehicle. This approval mark comprises of a circle surrounding the letter “E” followed by the distinguishing number of the country which has granted the approval, an approval number and the additional symbol “RL”. Fig. 5 below presents an example of a daytime running lamp approved in the Netherlands (E4). The symbol “RL” is a unique identification for the approval of daytime running lamps. Head lamps and fog-lights for example, would have alternative symbols identifying that these lamps have being type approved for that purpose on a vehicle. Such unique identifiers on both DRL and fog-lights would aid in the enforcement of Road Traffic (Lighting of Vehicles) Regulations as fog-lights can be “used only in fog or while snow is falling” (S.I. No. 189 of 1963, Regulation 49(8)) while DRL lighting should be used during daylight hours.

Fig. 5 Example of arrangement of DRL type approval mark (a = 12 mm min)

11. Options for DRL Implementation
In accordance with EC Directive 2008/89/EC, dedicated Daytime Running Lights (DRL) are required on all new types of passenger cars and small vans from February 2011 onwards, and on all other new types of road vehicles (including trucks and buses but excluding motorcycles and agricultural tractors) from August 2012 onwards. In addition to these measures, there are options open to Ireland by which the scope of DRL can be extended to include all vehicles used on Ireland’s roads (Option 1) or that the minimum European requirements are introduced, thus only affecting new vehicles (Option 2).

Option 1
New vehicles would be required to comply with EU measures (after mandatory dates) and the use of DRL would be required by all road vehicles from a certain date. Drivers of vehicles which are not equipped with dedicated
DRL would be required to turn on their dipped head lights during daytime hours. Note that spot lights, fog lamps or park lights may not be used as DRL. Compulsory DRL, if implemented from a particular date onwards, would apply to all:

- mechanically propelled vehicles registered for use on the road
- agricultural motor vehicles that are also using public roads

For vehicles not equipped with dedicated DRL retrofit kits are available. The cost varies but starts from approximately €200 for a type approved kit. These dedicated DRL’s usually employ LED bulbs instead of normal filament bulbs and as LED’s consume less energy the additional fuel consumption and associated CO2 emissions are reduced. The vehicle owner may consider fitment of such kits in view of the possible payback when considered over the life of the vehicle. It must also be noted that not all vehicles can have these DRL kits fitted due to physical constraints.

**Option 2**

In accordance with Directive 2008/89/EC, new types of cars and light vans (M1 and N1 categories) are required to be equipped with DRL lamps from 7 February 2011 onwards. New vehicles of other types, including trucks and buses (categories N2, N3, M2 and M3) are required to be fitted with these lights from 7 August 2012. As a result, all vehicles that are equipped with dedicated DRL would always drive with these lights on, all year round and on all roads. Vehicles that do not have automatic DRLs would not be required to turn on dipped head lights during daytime hours.

Fig. 6 below presents the estimated rates of DRL-use for all vehicles if Options 1 or 2 are introduced in Ireland. There is an estimated instantaneous increase in DRL use from a base-line of 10% to 90% if DRL is made mandatory through Option 1. For Option 2, it is estimated that the fleet of passenger and goods vehicles would be renewed after 12 years. However it is estimated that the fleet of exempted vehicles and tractors would make up 10%, thus option 2 would penetrate 90% of the total fleet after 12 years.
From a road safety point of view there is a strong case for moving forward with option 1 where all drivers must use DRL. Advantages associated with its introduction are;

- The positive effects of DRL are available immediately without waiting a possible 12 years for turnover of the fleet under Option 2. This mandatory requirement for all drivers to use DRL has the potential to prevent a large amount of accidents and save many lives before the dedicated DRL through Option 2 has penetrated the fleet.

- Studies\(^1\) show that the overall effects for the use of dipped headlights outweigh the costs for this measure. In terms of results, the use of dipped headlights is as good as dedicated daytime running lights. Both solutions do not glare\(^v\) other road users during daylight and both solutions show similar performances with regard to detection and recognition.

- Tractors would be required to use DRL (they are outside the scope of Option 2). Otherwise, if option 2 is introduced and once the fleet of passenger and goods vehicles is turned over after an estimated 12 years (and 6 years for motorcycles, assuming that 50% of current motorcycles have AHO), the only road users not using DRL would be tractor drivers, thus reducing their conspicuity in relation to the rest of the fleet.
There are also negative effects associated with the introduction of DRL through Option 1, such as increased costs due to fuel and light bulb consumption for drivers and also an increase in air pollution (as presented in section 6 of this paper). However, the potential benefits resulting from a reduction in the societal and economic cost of collisions, has the potential to significantly outweigh these costs.

12. Your comments

An increasing number of vehicles on the road have dedicated Daytime Running Lights (DRL) as standard, and this will become mandatory for all new vehicles from 2011 onwards. By 2024, it is estimated that almost all vehicles will be equipped with DRL. There is an option to make DRL mandatory for all road vehicles (new and existing) within the next year or two. If this were to be done, vehicles which were not equipped with dedicated DRL would be required to turn on their dipped head lights during daytime hours.

The RSA wishes to hear from all road users, interest groups and others who have views, advice and suggestions on the policy options available in relation to Daytime Running Lights. The consultative process commences on Thursday 17th December 2009 and lasts until 29th January 2010. Comments should be e-mailed to: drlconsultation@rsa.ie or posted to the postal address below. Please mark the envelope “DRL Consultation”.

Vehicle Standards Section,
Road Safety Authority,
Moy Valley Business Park,
Primrose Hill,
Ballina,
Co Mayo.
Appendix I – Fuel Consumption

Studies carried out by Wesemann\(^6\) estimates that for cars using dipped head lights, the increased fuel consumption is 1.6% when DRL is used and that for heavy vehicles using diesel, overall consumption is estimated to increase by 0.7% with DRL. Using figures supplied by the NVDF for vehicles used on Irish roads (taxed as of December 2008) and data from the NRA\(^5\) for the average distance travelled per vehicle type, then the increased cost of fuel due to mandatory DRL per year and the average per vehicle type are estimated as shown in the table below. The total costs presented for the fleet are calculated based on the costs associated with conventional lights being used. However, dedicated DRL lamps use less fuel than standard dipped head lights and it has been estimated that dedicated DRLs consume 38% less fuel and cause 38% less fuel pollution than conventional dipped head lights (LED lamps of only a few Watts lead to an even higher reduction). Based on these estimations, the average annual increased cost of fuel for vehicles fitted with dedicated DRL are also presented below.

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Increased Cost of fuel due to mandatory DRL per year(^6)</th>
<th>Increased Cost of fuel due to mandatory DRL per year(^7)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dipped Head Lights</td>
<td>Dedicated DRL</td>
</tr>
<tr>
<td>Cars</td>
<td>€8,420,026</td>
<td>€15.34</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>€27,059</td>
<td>€2.41</td>
</tr>
<tr>
<td>Goods Vehicles</td>
<td>€3,589,455</td>
<td>€29.87</td>
</tr>
<tr>
<td>Tractors</td>
<td>€139,441</td>
<td>€6.13</td>
</tr>
<tr>
<td>Public Service Vehicles</td>
<td>€233,291</td>
<td>€18.48</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>€12,409,272</strong></td>
<td><strong>€18.48</strong></td>
</tr>
</tbody>
</table>


\(^6\) The increased cost of fuel due to mandatory DRL in this column is calculated net of tax

\(^7\) The costs presented in this column are the costs for the consumer. The price of petrol used was 114.9c and the price of diesel was 103.9c. These were the average prices at the pumps measured on October 7\(^{th}\) 2009 (www.pumps.ie)
Appendix II - Impact on Environment

The additional fuel consumption discussed in Appendix I associated with the use of DRL leads to a corresponding increase in the emission of air pollution. Based on studies carried out throughout the EU, a cost of €0.04 per kilometre of driving can be used as an estimated cost of air pollution\textsuperscript{1}. The annual cost of increased air pollution as a result of mandatory use of DRL in Ireland then becomes; €16.7m in total annually, with a breakdown per vehicle type and averaged over the total number of vehicles presented below. Similarly to Appendix I, the costs presented below are calculated based on the costs associated with conventional lights being used. Dedicated DRL’s cause 38% less pollution than conventional dipped head lights and the average annual increased cost of pollution per vehicle type is also set out below.

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Increased Cost of pollution due to mandatory DRL per year</th>
<th>Increased Cost of pollution due to mandatory DRL per vehicle per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dipped Head Lights</td>
</tr>
<tr>
<td>Cars</td>
<td>€14,677,984</td>
<td>€7.63</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>€122,294</td>
<td>€3.11</td>
</tr>
<tr>
<td>Goods Vehicles</td>
<td>€1,708,756</td>
<td>€4.60</td>
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<tr>
<td>Tractors</td>
<td>€66,381</td>
<td>€0.94</td>
</tr>
<tr>
<td>Public Service Vehicles</td>
<td>€111,058</td>
<td>€2.85</td>
</tr>
<tr>
<td><strong>Total for all vehicles</strong></td>
<td><strong>€16,686,473</strong></td>
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</tr>
</tbody>
</table>
Appendix III - Light Bulb Consumption

Currently it can be estimated that drivers use their dipped head lights for 45% of the duration spent driving. If DRL becomes mandatory for all vehicles, the average increase in distance travelled per vehicle using their dipped headlights (and rear lights) turned on, can therefore be estimated at 55%. Taking account of the increased wear to the lighting element due to more frequent switching on and off of the lights, the rate of replacing bulbs due to mandatory DRL is estimated to increase of a factor of 2. Accordingly, vehicle operators would be required to change their light-bulbs twice as often. Based on research\textsuperscript{vii}, the costs associated with conventional bulb replacement due to mandatory DRL can be estimated at €6 per year per vehicle and based on these figures, the total annual cost of bulb replacement for all vehicles in Ireland can be calculated at €11.6m. On the other hand, dedicated LED DRL bulbs (www.hella.com) last up to six times longer than conventional dipped head light bulbs.

Appendix IV

DRL usage increases the cost of running the national fleet of vehicles through increased fuel usage, increased air pollution and light bulb consumption. This amounts to circa €41m as can be seen in Appendices I, II and III above. The total costs of road collisions in 2007 are detailed below\textsuperscript{viii}. Using these costs, a reduction of 14 fatal collisions alone per year would offset the costs of DRL usage.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of collisions</th>
<th>Cost per collision</th>
<th>Total cost (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal</td>
<td>309</td>
<td>€2,891,435</td>
<td>€893,453,472</td>
</tr>
<tr>
<td>Serious</td>
<td>618</td>
<td>€385,286</td>
<td>€238,724,498</td>
</tr>
<tr>
<td>Minor</td>
<td>4,540</td>
<td>€38,045</td>
<td>€172,725,207</td>
</tr>
<tr>
<td>Material Damage</td>
<td>23,770</td>
<td>€3,044</td>
<td>€72,346,752</td>
</tr>
<tr>
<td>Total</td>
<td>29,237</td>
<td>N/A</td>
<td>€1,377,249,928</td>
</tr>
</tbody>
</table>

\textsuperscript{viii}Road Collision Facts Ireland 2007

http://www.dft.gov.uk/pgr/roads/vehicles/vssafety/drls/daytimerunninglampsfinalreport


