The automated speed enforcement programme in France

by Laurent Carnis[1]

Introduction

France's introduction of an automated speed enforcement programme (CSA – Contrôle Sanction Automatisé) represents a major step in terms of combating traffic hazards. On the one hand implementation reflects political commitment and decision-making at the highest state level, with the system being jointly administered by the various ministries concerned; and on the other CSA has been accompanied by a substantial reduction in the number of road accident victims, comparable to that achieved in the early 1970s. The new situation also signals a break with previous approaches to deterring excessive speed, involving increased efforts at detection, certainty of application of sanctions, more severe sanctions, judicial rapidity and equity of treatment.

CSA is an innovative system in that its virtually fully automated functioning is ensured by digitisation of the processes involved and computerisation all along the line: detection, payment of fines, online consultation of one's driving license file, etc. The use of the latest technology nonetheless has its ambiguous side to the extent that it is seen as symptomatic of a system incorporating both "big brother" (gridding and surveillance of the road network) and "soft sister" (level of service on a safer network, and the pursuit of equity of treatment) (Pollitt 2003, p. 78-79).

This paper proposes a brief introduction to CSA and an overview of the first results to become available, and outlines some of the issues the system is currently raising. The first part of the article describes the context and the authorities' aims. It deals also with the working of the system and the followed strategy. The second part presents the first results obtained on driving speeds, infringements and accidents.

[1] Researcher, INRETS-GARIG, 23, Rue Alfred Nobel 77420, Champs-sur-Marne, France. Laurent.carnis@inrets.fr. The usual caveat applies.

The third and last part focuses on future issues relating to CSA functioning and the need both to rethink the system of governance it is a part of and to strive for greater social acceptance by road users.

1 The French system: an outline of the context

1.1 The historical basis: breaking with the past

In July 2002 France's then president Jacques Chirac made road safety a priority for his term of office. This political commitment at top executive level was to prove the trigger for the implementation of new road safety measures, notably in respect of automated speed detection. The legal and technical provisions for accelerated setting up of CSA were rapidly taken care of via rigorous preliminary work at interministerial level.

The introduction of CSA was a response to several factors. Among them was the determination to break with past practice, and in particular with a *highly ineffective policy of deterrence*. The prior deterrence policy was characterised by a low likelihood of detection (1 infringement per 3 hours of surveillance in 1998) (Carnis 2001, p. 492), plus the exercise of tolerance (a detection threshold of 30 kmh over the speed limit[2]) (Ibid., p. 496) and leniency (prosecutions abandoned by members of the police force[3]) (Zauberman 1999 ; Pérez-Diaz 1998). In addition, the estimated recovery rate for fines was low, with 2 offenders out of 3 avoiding payment (Carnis 2001, p. 512).[4] In brief, then, the detection system was clearly ineffective and thoroughly inequitable: the driver who got penalised was either unlucky or did not have the right connections. Thus the introduction of CSA reflects the determination to have a system of detection that is modern, effective and fairer.

CSA is also a tool for the modernisation of state intervention, [5] with near-total automation of the detection and sanction process. Its establishment required thoroughgoing interministerial cooperation. In addition to the aim of increased

[2] For example, 80 kmh in a 50 kmh urban zone: a margin of tolerance of 40%!
[3] This is a question of tolerance, not a legal practice: the police officer concerned makes an arbitrary decision to halt the legal process.
[4] This rate has been put forward by T. Godefroy, who was working on the cost of crime at the time. An article in *Le Monde* suggests that the situation has not changed in respect of other infringements. « Seules un tiers des condamnations pécuniaires et des amendes sont payées », Issue 12 July 2007.
[5] Sécurité Routière, « Le contrôle sanction automatisé », 13 juin 2003, Dossier de presse.

deterrence capacity, the system is aimed at rapid legal processing – indeed, rapidity of sanctioning is vital if deterrence is to remain credible. In this respect the system has been a striking success: written notification takes place, on average, within a week of the infringement's being committed and payment must be effected within 45 days. In the past the process could take up to several months and certain infringements were often annulled by a statute of limitations, so lengthy was the procedure. Reliability and imperviousness to human manipulation were other demands made by the authorities, the goal being to gain public confidence through quality of service and to highlight the egalitarian character of the legal procedure. Furthermore, the automation of detection was intended to bring about a reduction in the accident rate. For a long time France's accident rate had been earning the country a bad reputation in road safety terms (ONSIR 1998, p. 102 and ff.). Adoption of the new system was intended to make good this shortfall and represented a certain standardisation, bringing France an effective system comparable to those already being used in other countries (Carte Blanche Conseil 2003).

Development of CSA involved several phases. Early in 2003 specific sites were chosen for testing the automated system. This *experimental phase* involved establishing the anticipated results of such a system, even if the technology then used was rudimentary. In November 2003 80 first-generation radars were put into operation. This launch phase brought to light technical problems to do with networking – which the authorities were quick to deal with – and a significant drop in the road toll. In 2004–06 the system escalated, with a total of 1500 radar devices planned for the end of the period. This *extension phase* was followed by those of *diversification* and *consolidation*, with the government deciding to set up 500 additional detection devices. Moreover, the system began to focus on detection of other violations: checks at red lights, checks of distances between vehicles and the placing of devices in cities, rather than simply on the main peripheral roads.

1.2. Functioning: a totally automated, centralised system

The automated speed detection and sanction system is based on a *quasi-automation* of the process, from detection through to sanction. When the driver of a vehicle breaks the speed limit, the detection device records both the vehicle's license number and speed. This information is transmitted via a broadband Internet

connection to the National Processing Centre (CNT) in Rennes, where the checking of various files, including that of car registration, enables identification of the owner, who is a priori considered the guilty party. The owner has the right to contest this finding and indicate who in fact committed the infraction. The deposit principle nonetheless means that the fine must be paid, with the possibility of its being refunded when the legal process is over. The owner may also take the matter to court. In practice, however, the quality of the photos makes this approach pointless, which explains why so few actions actually reach the courts (ONSIR 2006, p. 23). Since July 2007 drivers may consult the Ministry of the Interior's Internet site to see how many points have been deducted from their license.

The automated detection system is founded on a kind of *duality*. While the fixed speed cameras are totally automatic and function fulltime, the mobile version functions discontinuously, its operation requiring intervention by the forces of law and order: the Gendarmerie Nationale in country and periurban areas and the Police Nationale in cities. The mobile camera calls for additional human input: presence on the terrain – for adjustment of the device, selection of information sought, etc. – and Internet transfer of data. Both types of device reinforce traditional speed detection methods.

CSA's centralised management system is run by the DPICA (Interministerial Automated Speed Detection Project), which handles strategy and decision-making – location, studies, legal and administrative aspects – and the CNT operations centre. Even so, the detection system's marked centralisation does not discourage individual strategies for modification once the system is put to work (Hamelin et Al. 2006). These include adapting operations centre decisions to local considerations and to the organisational constraints of system implementation.

1.3. Strategic organisation: gridding the territory

Currently 1482 radars are in operation in France, of which 941 are fixed and 531 mobile. The new generation of mobile cameras can be used independently of a police vehicle and the information obtained transmitted by WiFi.[6] The rule applied by the authorities is 2 fixed radars for 1 mobile, the strategy being to produce a

[6] www.securite.routiere.gouv.fr, donwloaded on 16th of July, 2007.

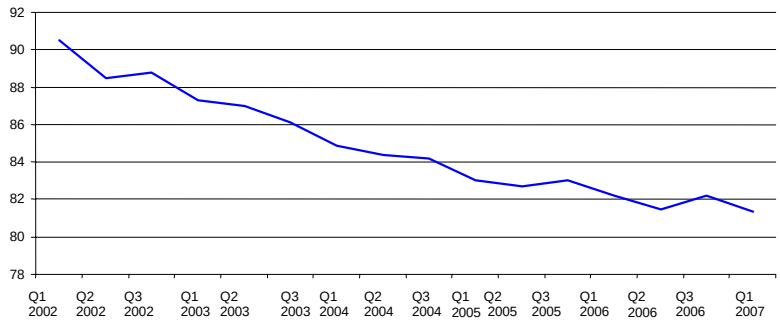
preventive and educative effect with the fixed cameras, whose presence is signalled and whose locations are indicated on the Websites of the ministries involved in speed detection. Being unmarked, the mobile units are part of a more punitive plan to identify offenders. The great majority of radars are placed on main roads (over 50%), secondary roads and freeways (about 20% each) (ONSIR 2006, p. 13). Each unit records an average of 1000–1500 infringements per month. One of the aims of the system is to produce a relatively sophisticated surveillance gridding of France's road network. In 2005 270 million checks were effected – an average of 6 checks per month per driver (Ibid. p.15-16).

2 Some lessons to be drawn from CSA

2.1. The impact on speed

CSA's impact on traffic speeds has been significant for the various road networks and for all types of vehicle. Over the period 2002–2007 the average speed of private cars has fallen by 11.4 kmh on freeways, 11.9 kmh on main roads and over 15 kmh on secondary roads. The overall indicator for speed per kilometre driven for the various road networks dropped by more than 10% for the same period (Graph 1).

Graph1: Average Speed for Passenger Cars (2002-2007)



However, close analysis of speed changes foregrounds a significant reduction beginning in 2002, when the first detection devices had not yet been installed. Half the decrease in driving speeds was obtained before the system actually went into operation, with heavier sanctions, the introduction of laser binoculars and

overreaction by drivers doubtless proving conducive to this reduction. This initial impact was reinforced by the personal commitment of the President to road safety: among other things this meant a narrowing of the habitual amnesty for driving offences (14 July 2002) and the raising of road safety to the level of a national priority. Thus pre-implementation impact was considerable. Subsequent installation of the automated devices brought a consolidation of these initial gains and added to them by bringing a further drop in driving speeds.

Even if the average speed represents an interesting item of information, it is of only limited value as regards the improvements obtained in that it provides no information on speed distribution. An analysis of the levels of excess speed gives a clearer idea of the impact of CSA on traffic speeds. The level of excess has been measured for private cars at 13.4% (as against 32.5% in 1999 and 25.7% in 2003), for motorcycles at 29.9% (as against 46.9% and 42% respectively) and for trucks at 10.7% (as against 21% and 21.2% respectively) (Appendix 1). In addition, it should be noted that major speed limit excesses – 30–40 kmh – have all but disappeared (Appendix 2). To sum up, a real reduction in speed has taken place, together with a marked drop in the highest speeds; this is confirmed by the decrease in the standard deviation of speed distribution (-2 kmh between 2002 and 2005).

2.2. Effects on infringements detected

CSA has also been a real success in terms of the number of infringements detected, with implementation of the system having brought a five-fold increase. Before CSA went into operation the number of speeding offences was running at around 1.3 million annually – a figure that rose to 7.5 million in 2006. Appendix 3 offers a breakdown of the infringements per detection method.

Firstly, a diachronic analysis highlights the system's growing effectiveness, with plateaux indicating the achievement of aims in terms of ongoing installation of detection devices, even if there has been a slight delay in respect of the initial schedule. In addition, summer-season peaks point up a failure to provide information for holidaymakers regarding detection sites, in contrast with regular users. Since early 2006 a new plateau appears to have been reached, with the number of infringements detected rising only very slowly. This threshold effect can be put down on the one hand to driver learning and behaviour adaptation in respect of existing

checkpoints, and on the other to a lower level of efficiency for newly installed devices, with a regular decrease in the number of infringements detected by radar. This change is particularly marked in the case of fixed devices (ONSIR 2006, p. 13).

Secondly, the total production of infringements comes essentially from fixed devices (45%) and mobile ones (30%). Thus CSA accounts for 75% of all speeding offences detected. Fixed devices represent 60% of CSA-detected violations, while checks requiring human intervention make up 55% of the global total of infractions detected. To sum up, there are three intervention channels in the field of speed limit enforcement.

Thirdly, Appendix 3 highlights the complementarity existing between detection systems. CSA has not taken the place of "manual" checks by the police and the gendarmerie, even though these bodies are being used for deployment of mobile detection devices. Overall, the number of infringements detected by human agency is stable and this method remains an essential component of the system of deterrence.

Lastly the infringements detected basically involve minor violations of speed limits, with over 90% of them falling short of a threshold of 20 kmh.[7] This result can be put down to the deterrent effect of the detection system (decrease in traffic speed variation, virtual disappearance of major speed excesses) and the system's technical capacity for identification and processing (margin of tolerance of 8 %).

2.3. Effects on road toll figures

There have been few studies evaluating CSA impact on road safety. Nonetheless the assessment published by the National Interministerial Road Safety Observatory (ONISR) suggests that CSA is responsible for 75% of the improvement obtained in 2002–05 (ONSIR 2006, p. 46). The authorities have put forward a figure of 9000 lives saved and 110,000 cases of injury avoided as a result of automated speed detection. In 2002 the number of road deaths was some 7200, injuries some 138,000 and accidents involving injury 116,000. By 2006 the official figures were down to around 4700 deaths, 102,000 injured and 80,000 accidents involving injury. These substantial decreases represent a remarkable achievement of which a large part can doubtless be attributed to the introduction of CSA.

[7] Comité Interministériel de Sécurité Routière, Dossier de Presse du 24 janvier 2005.

3 Current issues

3.1. The system's future: a range of issues

The first issue is the scale of the system. CSA initially enjoyed the backing of a major sponsor in the form of France's president. What level of commitment will the present government provide? Will the expansion of the system continue, and if so, at what rate? Looming as the new priorities are the questions of drink-driving and a relatively high road toll among motorcyclists, which may justify a shift of emphasis in terms of public-sector intervention, with automatic speed detection being relegated to the background.[8] In this respect the question of the optimal scale for the system calls for urgent consideration. Installation of more devices may turn out not to be the most appropriate solution – given the plateau effect and decreasing productivity – or the one best suited to the issues currently raised by speeding violations. In certain traffic situations, and especially in rural areas, the traditional checking method may prove the most effective. Thus a real alternative exists, between *consolidation* of the present system and gradual *extension*.

Perpetuation of the present system is another issue, in that it raises the question of ongoing replacement of the current devices by more recent, more sophisticated and more productive models. This seems inevitable in the case of devices that have been vandalised or destroyed and those that have ceased to function. Replacement may also result from a decision to modernise in the interests of making the equipment stock newer and more efficient, one example being the use of rearview cameras for checking motorcycle speeds. The aim here is to improve identification performance – currently some 30% of photographs are defective in this respect – and to maintain detection capacity by avoiding the breakdowns resulting from equipment ageing. Perpetuation of the system also implies finding ways of taking best advantage of mobile devices – increasing their time of use, training teams, etc. – and devising a system of remuneration for the time the police forces allocate to CSA. Lastly perpetuation requires the continuing of negotiations with neighbouring countries with a view to effective prosecution of foreign drivers, who

[8] Négroni Angélique (2007), « Routes : l'alcool devient la première cause d'accident », *Le Figaro*, issue 15 July.

represent 30% of the infringements detected and who for the most part evade penalties.

The system's character could be modified too, by diversifying the field of violations. Testing of red light and vehicle interdistance cameras should lead in 2007 to the installation of 50 automatic devices with no speed detection function.[9] *Diversification* is another possible way to go, with automatic checking for infringements concerning parking, truck loads and other road safety regulations.

Lastly, it cannot be excluded that a strategic shift will take place regarding siting of radars and a move towards fixed devices whose location is no longer signalled.[10] Other possibilities are the use of dummy devices, random checking (fixed devices currently function fulltime), devices in urban settings, and a change of emphasis in favour of mobile devices. A prerequisite for this strategic shift is strategic *thinking* about which way the system should go: towards deterrence that is local or global, specific or general. There is already a substantial literature devoted to these questions and it can be used by those making the decisions (Cameron et Al. 2003).

3.2. Constructing a new kind of governance

The current architecture of the detection system has a marked centralist stamp, even if its local application can embody specific approaches and special aims (Carnis 2005). If functioning is to remain uniform and equitable treatment of road users maintained, it would seem necessary to prepare a proper operational guide along the lines of the English and Scottish handbooks or the documents drawn up for the state of Victoria (DFT 2006 ; Victoria Police 2006). These publications specify, among other things, the rules for installation and use of the devices and enable professionalisation and standardisation of related practices.

The equitable treatment rationale also calls for investigation of the geographical distribution of the devices, with a view to placement that is appropriate to the issues in traffic and road toll terms and to avoidance of over- or under-

[9] See « 3 questions à Jean-Jacques Debacq, Préfet directeur du projet interministériel Contrôle automatisé », www.securite-routiere.gouv.fr/data/revue152/onenparle.

[10] Debate on this question has been triggered by the unsatisfactory road safety statistics for the beginning of 2007, see Négroni Angélique (2007), « La suppression des panneaux signalant les radars à l'étude », *Le Figaro*, Issue of 24 May.

equipping of certain areas. This rationale should take precedence over political and technical considerations where the gridding of the national territory is concerned.

The considerable revenue generated by CSA is currently much coveted by France's *départements*, and the general councils that administer them demand payment of a fee by the state in return for the management of the system which has been their responsibility since 2006. This partial transfer of road network management involves the handover of relatively important sums, and the detection device fees[11] look like a kind of kickback out of proportion to the financial issues. Apart from matters that have already taken a legal turn, the *redistribution of the profits* accruing from the system merits debate and maybe a shift in emphasis. The financing of road safety programs and of rehabilitation measures for accident victims are ideas that deserve consideration and should certainly not be ignored. The Australian experience in this field is worth looking into with a view to an understanding of the issues and the related demands.

What this means is that thought has to be given to a new kind of governance for the system. The examples mentioned indicate certain avenues, to which could be added the role of experts and researchers in the production of knowledge relevant to adaptation of the detection system; the part to be played by associations of road users and accident victims; and the issue of transparency and access to information bearing on the system's functioning.

3.3. Social acceptability of the system

Little research has been carried out into the aspect of society's consent to the introduction of this kind of system. The term "social acceptability" is generally used here, and generally misinterpreted (Carnis et Hamelin 2007 ; Cameron et Al. 2003). Nonetheless this is clearly an essential factor in the implementation of the system, in terms of determining both its functioning and its efficiency (Ragot 2006).

Even if the implementation of CSA has led to a lowering of traffic speeds and a rate of infringements of less than 1% at the detection points, there remains a real resistance on the part of drivers. The actual rate of violation of the speed limit is in fact far from negligible, running at 22% on freeways, 33% on main roads and over

[11] Négroni Angélique (2007), « Cacophonie judiciaire sur la redevance des radars », *Le Figaro*, Issue of 10 July.

80% on certain urban thoroughfares (statistics for passenger cars in 2005) (ONSIR 2006, p. 144). Drivers adopt an avoidance strategy, slowing down at the identified detection points and then accelerating again (Oie 1998).

Protests can also take more radical forms. Vandalism is no minor concern, with a current average rate of 22%. It focuses primarily on recently installed equipment and continues during the first few months of operation. All in all deliberately inflicted damage, together with brief periods of breakdown, means that at most some 80% of devices are functioning fulltime. In addition to the cost of repairs there is the loss of revenue occasioned by reduced traffic surveillance. Vandalism also has a social significance, pointing not only to active resistance by a small group of users, but also to outright rejection of the system. The authorities react with technical improvements, at the same time as they choose safer locations for the devices. Rapid and systematic repair of radars is intended as a means of maintaining CSA's credibility, in line with the lessons of the broken windows theory (Kelling and Wilson 1982).

The issues relating to social acceptability are equally palpable in respective of the pecuniary and administrative sanctions. The offender incurs both a financial sanction in the form of a fine that varies in proportion to the excess speed detected, and a non-financial one in the form of deduction of points from his driving license. CSA is regularly denounced as a cash cow for the government and the reason for the increase in unlicensed driving (Routier 2007). The severity of the sanctions is also the subject of protest. In a partial response to these criticisms, in December 2004 the French government boosted sanctions for major speed infractions and reduced the fine for minor violations in the open countryside.[12] More recently, the authorities have made it easier to regain lost license points: 1 point per year for a minor infringement instead of three years without any other offence being committed. Nonetheless the number of lost points doubled in 2003–06, while the number of cancelled licenses rose to 69,000 – four times the figure for 2003![13] As a way of partially beating the sanction, exchanges of points among family members have begun to take place, and

[12] Sécurité Routière (2004), Radars : la révolution du contrôle sanction automatisé, *Revue de la Sécurité Routière,* Numéro spécial, décembre.
[13] Ministère de l'Intérieur (2007), *le permis à points*, dossier de presse, 27 juin.

there is even a parallel market functioning on the Internet, with drivers offering to sell points. So far there has been no study of the extent of this phenomenon. [14]

At the same time these reactions represent another form of protest against the system and highlight the limits of social acceptability for road users. These practices foreground the need for close consideration of the terms and conditions of sanctioning in the context of an efficient detection system; such consideration could draw on the substantial literature devoted to the economic analysis of crime, which would appear to suggest that a trade-off should be reached between the likelihood of detection and the severity of the sanction (Becker 1968). Given that the driving license is not only an authorisation to drive, but also a means of being able to work and meet one's needs, sanctions should be appropriate. Thus road toll considerations must be combined with social and economic issues.

Conclusion

CSA in France represents an interesting experiment in terms of the technology used, the system's functioning and the results obtained. The historical circumstances of its implementation, political contingencies and institutional constraints are vital sources of information for public-sector decision makers in respect of the possibility of putting this kind of detection system into operation.

Current debate – as to the system's evolution, the modalities of governance and the social, political and economic issues they give rise to – highlights the importance of institutional factors requiring close attention from decision-makers. These factors point to a vital aspect of prerequisites for the system's success. Traditional approaches are guilty of real neglect of this regard, in that they focus on the effects in terms of the road toll or speed – a situation that can be partially explained by the greater ease of measuring and quantifying effects and results and the difficulty of grasping more qualitative considerations.

In closing, these results ought to be looked at in the framework of a structured international comparison. This would make it possible to home in on the preconditions for success and identify best practices; but also to define the

[14] Le monde (2007), Des points du permis de conduire en vente sur internet, Issue of 11 July.

institutional alternatives that ensure sound management of this kind of system with a view to shaping an effective public policy for maintaining the safety of road users.

Bibliography

Becker Gary (1968), "Crime and Punishment : An Economic Approach", *Journal of Political Economy*, march april, n°78, pp. 169-217.

Cameron M., A. Delaney, K. Diamantopoulou & B. Lough (2003), Scientific Basis for the Strategic Directions of the Safety Camera Program in Victoria, Report n°202, *Monash University Accident Research Center*.

Carnis Laurent (2005), « Le contrôle automatisé de la vitesse en France et en Grande-Bretagne : Deux régimes de régulation des vitesses distincts ? » dans *Les régimes français et britanniques de régulation du risque routier : la vitesse d'abord, Groupe opérationnel du PREDIT :* GO3, décembre, pp. 189-218.

Carnis Laurent (2001), *Entre intervention publique et initiative privée : une analyse économique en sécurité routière, Une application aux législations sur la vitesse*, Thèse de doctorat, Faculté des sciences économiques et de gestion, Université de Reims Champagne-Ardenne, 2 volumes.

Carnis Laurent et Fabrice Hamelin (2007), Revue de littérature internationale sur le contrôle automatisé de la vitesse, Rapport final INRETS, Convention de recherche CV05-021 commanditée par la DSCR à l'INRETS, juillet.

Carte Blanche Conseil (2003), *Etude des pratiques du contrôle-sanction automatisé dans différents pays*, Rapport final, Direction de la sécurité et de la circulation routières, Ministère de l'équipement des transports du logement, du tourisme et de la mer.

Department for Transport (DFT) (2006), *Handbook of Rules and Guidance for the National Safety Camera Programme for England and Wales for 2006/2007*, *DFT Publications*.

Hamelin Fabrice, Elodie Pinsard et Bérangère Véron (2006), *Regards locaux sur le contrôle automatisé*, Rapport final INRETS, Convention de recherche CV05-021, décembre.

Pollitt Christopher (2006 [2003]), The Essential Public Manager, Public Policy and Management, *Open University Press*.

ONISR (2006), Impact *du contrôle sanction automatisé sur la sécurité routière (2003-2005)*, Sécurité routière.

ONISR (2006), *La sécurité routière en France , Bilan de l'année 2005*, La documentation française.

ONISR (1998), *Bilan annuel, statistiques et commentaires Année 1998*, La documentation française.

Oei H-L. (1998), The Effect of Enforcement on Speed Behaviour: A Literature Study, Public Master – *SWOV Institute for Road Safety Research*, june, 55 pages.

Pérez-Diaz Claudine (1998), Jeux avec des règles pénales, L'Harmattan, collection logiques sociales, Déviance/CESDIP.

Ragot Isabelle (2006), « Acceptabilité du CSA : Connaissance, crédibilité de l'information et efficacité perçue », in *Séminaire Vitesse, apports récents de la recherche en matière de vitesse*, Actes n°105, Les collections de l'INRETS, pp.159-168.

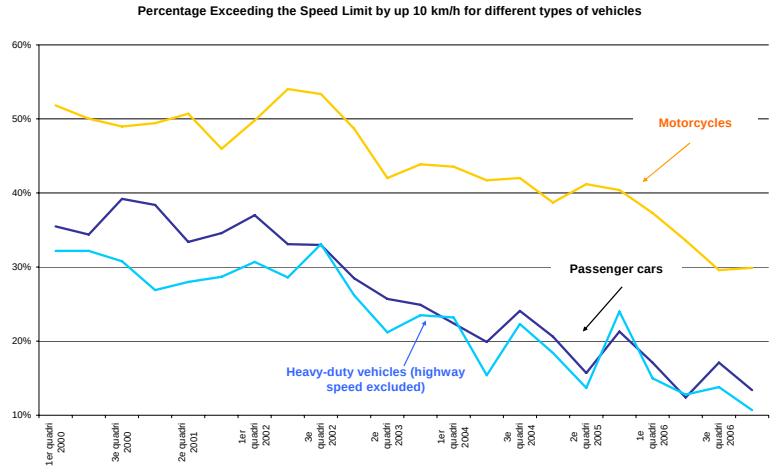
Routier Airy (2007), *La France sans permis,* Albin Michel.

Victoria Police (2006), *Mobile Caleras Policy Manual*, Victoria Police Traffic Camera Office, april.

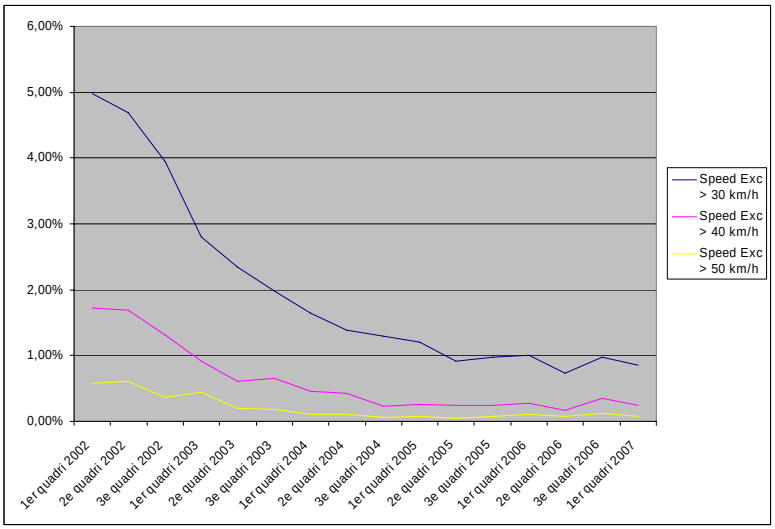
Wilson J. Q. and G. Kelling (1982), "Broken Windows", *The Atlantic Monthly*, march, pp. 29-38.

Zauberman R. (1998), « La répression des infractions routières : le gendarme comme juge », *Sociologie du travail*, (1): 43-64.

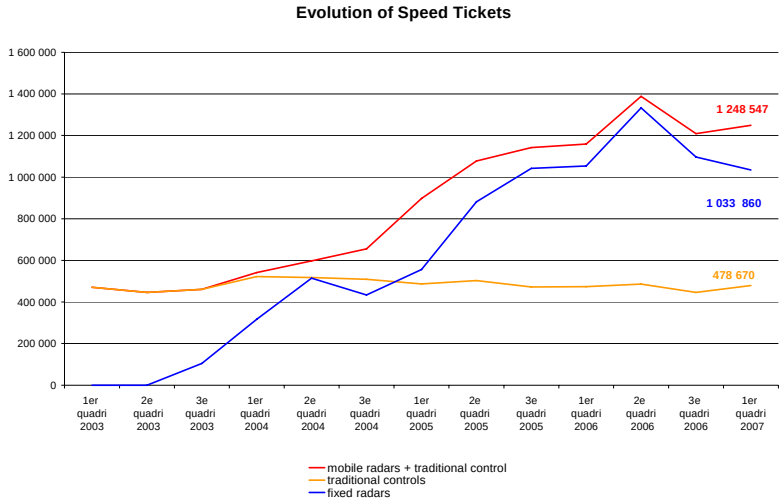
Appendix 1



Appendix 2



Appendix 3


Evolution of Speed Tickets
1 600 000
1 400 000
1 200 000
1 000 000
800 000
600 000
400 000
200 000
0
1 248 547
1 033 860
478 670
1er quadri 2003
2e quadri 2003
3e quadri 2003
1er quadri 2004
2e quadri 2004
3e quadri 2004
1er quadri 2005
2e quadri 2005
3e quadri 2005
1er quadri 2006
2e quadri 2006
3e quadri 2006
1er quadri 2007
mobile radars + traditional control
traditional controls
fixed radars