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02 ANSWER TO EC PUBLIC CONSULTATION.DOC

## ANSWER TO EC PUBLIC CONSULTATION

### Table of contents

1.	DOCUMENT REVISION HISTORY.....	1
2.	INTRODUCTION .....	1
3.	RELEVANT DOCUMENTS .....	2
4.	GENERAL VIEW OF STONERIDGE .....	2
5.	QUESTIONNAIRE ANSWERS.....	3
5.1.	Functioning of the recording equipment.....	3
5.2.	Integration of ITS applications.....	3
5.3.	Remote download of recorded data .....	4
5.4.	Speed of downloading.....	4
5.5.	Improvement of controls.....	4
5.6.	Security level of the system .....	5
5.7.	Scope of the regulation .....	5
5.8.	Compatibility and interoperability .....	6
5.9.	Introduction of equipment based on new specifications .....	6
5.10.	Provisions for Field Tests.....	7
5.11.	Equipment in relation with the tachograph where no type approval is foreseen.....	7
5.12.	Adaptation to technical progress.....	7
5.13.	Installation and inspection .....	8
5.14.	Automatic and manual recording of information .....	8
5.15.	Uniqueness of the driver card .....	9
5.16.	Warnings .....	9
5.17.	Other Comments And Suggestions.....	9
5.18.	Usability and Control Reliability.....	9

## 1. DOCUMENT REVISION HISTORY

**Rev: 01    Date of issue: 2010-02-25    Issued by: Andreas Hörnedal**

First issue sent for internal review.

**Rev: 01    Date of issue: 2010-02-27    Issued by: Andreas Hörnedal**

Clarifications on 5.3, 5.10.  
Chapter numbering.

## 2. INTRODUCTION

This document represents the integrated view of Stoneridge. Our aim is to give suggestions for viable options for the long term evolution of the tachograph system.

Stoneridge supplies a wide array of products and services for the European tachograph market:

- digital and analogue tachographs,
- data download and analysis equipment,
- the M1/N1 adaptor,
- workshop download and calibration equipment,
- driver and workshop training.

Our answers are based on input from:

- a number of recent workshops which Stoneridge either have participated in or have arranged internally for reference groups of end user and industry stakeholders;
- our previous strategic market research.

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>2(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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### 3. RELEVANT DOCUMENTS

The appendices and documents listed below are of essential value for the understanding of this document.

#### Document

Ref.	Document no.	Title
[1]	1123/49-990136	Consultation Document Digital Tachographs
[2]	<a href="http://ec.europa.eu/enterprise/policies/better-regulation/files/hlg_opinion_transport_050309_en.pdf">http://ec.europa.eu/enterprise/policies/better-regulation/files/hlg_opinion_transport_050309_en.pdf</a>	

### 4. GENERAL VIEW OF STONERIDGE

From Stoneridge's point of view, a handful of issues stand out as the most important. Therefore, we take the opportunity to highlight these, before going into the actual answers to the questionnaire [1].

In general, Stoneridge supports strict and detailed legislation in the areas where necessary, combined with market drive and open industry standardisation where possible. Necessary legislation areas in this context are requirements on data recording rules, interfaces and functions to enable law enforcement, type approval and security. Market drive and open industry standardisation have proven to be efficient mechanisms to provide a usable system to drivers, fleets, workshops and vehicle manufacturers, e.g. interfaces and functionality for calibration, remote download, sensor and vehicle interfaces.

It is of major importance to prioritise and focus on the right areas which shall be legislated, since technical definitions have to be very precise and detailed to be meaningful and effective. Errors in the definitions have a big negative impact and are hard to amend afterwards. Also, if the legislation prohibits (with or without intent) alternative and innovative ways to satisfy the underlying needs, it can even be counter-productive and hamper innovation and evolution. The same holds true in a lesser extent for standardisation. Areas like user interfaces for drivers, fleets and workshops should therefore have as much freedom to be able to evolve. Market pull will eventually force tachographs to converge to similar solutions if and when it benefits the buyers of the components and services.

With the above in mind, the vision of a "universal on-board unit" (UOBU) can be appealing in theory, but it may also have a number of practical drawbacks. Such a single "monolithic" solution to a number of diverse problems could end up not fulfilling any of the different needs particularly well, and at a higher cost because of the higher complexity of a highly integrated approach. Instead of acting as a catalyst for competition and innovation in the field, it may have the opposed effect of restricting this to one or very few manufacturers which are able to produce such a product at sufficient volumes to be profitable. One possible scenario would be that the current diverse and dynamic marketplaces for fleet management systems (FMS) transforms into one or few players who control hardware and other key parts of the FMS ecosystem, and decide who may provide software and services and who may not, in essence "One Black Box to Rule Them All".

Security and data privacy will always be a major concern, in order for the tachograph system to remain credible and acceptable to the majority of the community.

Due to the digital nature of the digital tachograph, it would be possible, at least in theory, to devise fraud schemes which would be as good as impossible to discover for law enforcement, in the event that the data encryption used in the tachographs would be cracked. It would (theoretically) be possible for all fleets in Europe to tamper freely with data without law enforcement taking notice, in a more straightforward way than was possible with the analogue tachograph system. Therefore, security must constantly evolve and there needs to be more continuous planning on how to take on the security challenge, with planned upgrades but also with contingency planning.

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>3(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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## 5. QUESTIONNAIRE ANSWERS

This paragraph goes through and answers the 18 questions in the questionnaire from DG TREN.

### 5.1. Functioning of the recording equipment

**Question 1** - *Is it important that equipment of different manufacturers functions in exactly the same way? Or should legislation focus on essential requirements and give manufacturers more freedom to develop solutions and improve the equipment?*

**SRE:** Legislation should focus on functions and interfaces necessary for uniform and unbiased data recording together with fair and effective enforcement based on this data.

In the short time where digital tachographs have been used in the industry and in the field, it the transport industry has already proven that it can take care of the standardisation which is necessary for industry, fleets and drivers. Pertinent examples are:

- electrical connectors on the back
- remote download
- mechanical attachment and form factor
- calculations and warnings of drive times in addition to continuous drive time (in progress).

Whether the user interface should work in exactly the same way or not has been subject to debate. Our position is that this shall not be legislated. The main reasons are that the parts of the user interface which were actually legislated in detail have generally failed to become easy to use, and that there is a big number of similar electronic devices in everyday life which have big differences in user interface design, while users are still able to assimilate the differences and use the differing devices with relative ease. Or to put it shorter: it is normally easier to learn to use several different devices which are easy and intuitive to use, than to learn to use one device which is hard and unintuitive to use.

However, market pressure is not guaranteed to take care of the needs of law enforcement, e.g.:

- card data interface
- front connector download interface
- uniform and unbiased data recording
- security

### 5.2. Integration of ITS applications

**Question 2** - *Should the legislation on the tachograph already foresee the integration of the digital tachograph into an open in-vehicle platform? If so, what other regulatory applications should be integrated in this platform (e.g. e-toll, recorder for accident investigation, e-call, speed control) and why? Would it be interesting for fleet management or other applications related to safety or security of transport, or to law enforcement, to have a real-time "tracking and tracing" function?*

**SRE:** In general, we welcome efforts to achieve open standards for ITS applications in commercial vehicles. However, this should be driven by standardisation rather than legislation, so that the necessary ITS infrastructure can evolve in an evolutionary and organic manner, rather than being imposed on the transport industry by legislators.

It is easy to overestimate the value of integration between different technical sub-systems, and at the same time underestimate the cost and complexity of such integration. It is important to emphasise interfaces between different applications and basic enabling services, especially if the overall purpose is unclear. Integration should only be done where there is a clear benefit, where cost to do so is low and where the robustness of the overall system can be maintained.

Examples of basic services which would serve to enable higher level applications are:

- wireless access to the Internet,
- secure data storage,
- positioning.

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>4(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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Currently, the most senseless duplication of independent equipment in the vehicle would be that it is not uncommon for systems in a vehicle to use multiple wireless (e.g. mobile phone) terminals, each with its own subscription, or similarly to have multiple GNSS receivers, with no way to share basic services between applications.

An example of a valid overall purpose would be that an end user can use the vehicle in a coherent way and that workload is kept to a minimum, especially while driving.

What is important in any case is that equipment which falls into the ITS domain and which is required by law should be given legal provisions so it is at least possible to integrate into fewer devices, whenever this is technically and economically feasible. It would be premature to make assumptions at this time about the architecture of a future open in-vehicle platform.

### 5.3. Remote download of recorded data

**Question 3** - *Should remote download of the digital tachograph be encouraged? Is a regulatory approach deemed appropriate in order to facilitate widespread introduction?*

**SRE:** Today there exists already an open and widely accepted standard for remote download, together with a healthy number of contesting alternatives in the marketplace. It would be of no use to regulate this any further if it means imposing this function on all fleets. This alternative would actually add an administrative burden especially on SMEs and distort competition unfavourably to SMEs, since they in general get quite small efficiency gains in relation to expenses, compared to larger fleets.

However, there are ways to encourage widespread introduction. The single biggest hurdle to widespread adaption of remote download which exists today is probably the cost of wireless (e.g. GPRS) data transfer, in particular roaming fees. Remote download will become attractive also for smaller fleets when and if data tariffs are brought down to more sensible levels in all of Europe. The greatest facilitator to widespread introduction would thus be readily available and low cost wireless access in vehicles, which can be shared among applications.

### 5.4. Speed of downloading

**Question 4** - *What is your practical experience? Are there any obstacles for speedy download of data?*

**SRE:** There is no need for legal requirements on download speeds. Market pressure has been enough to amend the initial problems in this area. If fleets and drivers would require even faster download, there is nothing stopping the industry to standardise an additional interface for this. If for any reason download times for enforcement users would need to be even shorter, the next logical step would be to bring them down to seconds. This would require a revised specification for the front connector download, either in legislation or a standard

It may be in place to point out that in [2], item (19), The time needed to download a card has been somewhat exaggerated: in fact it takes more in the order of one minute to download a full set of driver card data, for most combinations of driver cards and card download equipment currently in the market. However, it is still true that for certain combinations of older digital tachographs and download tools, a vehicle unit download may take 20-30 minutes, as stated.

### 5.5. Improvement of controls

**Question 5** - *How could the equipment be changed in order to make controls more efficient? Should the mobile control of moving vehicles be envisaged in order to reduce administrative burden for industry and enforcement bodies?*

**SRE:** The primary source of data for enforcement should be (digital) downloads of activity data. The primary means of evaluating this data should be in equipment owned by enforcement, so that the evaluation of data and the decision to prosecute is un-biased as possible between different brands or variants of recording equipment.

The equipment could implement some warnings which could be presented to the enforcement officer at the road side check. However, this would need to be regulated in law in order to provide uniform and unbiased warnings.

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>5(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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Also the different implementation of regulation EC 561/2006 in different member states would present a problem. Normal download speeds and the efficiency in the controls have already improved significantly.

If mobile control of moving vehicles is required, the option to do it through the remote download method should be considered, perhaps on a voluntary basis together with some kind of encouraging incentive for the fleets, like a higher tolerance threshold against minor infringements which were reported in this voluntary manner. There are currently no legal provisions for this and there are several issues to be worked out before this could be realised.

## 5.6. Security level of the system

**Question 6** - *Is the current security level proportional? Can and should there be other sources of motion? Could the authenticated time/speed/positioning data provided by the future European "GPS" system, Galileo, be used as a second and independent source of motion to ensure security of data?*

**SRE:** It is tempting for a fleet owner to tamper with the system in order to make more money out of its vehicles. Therefore, security must be kept at a relatively high level. The digital nature of the system could make it attractive for qualified attackers to try to find and exploit general security holes in the system. For example, if certain cryptographic keys in the system are cracked, then it would be possible at least in theory to change activity data in any way in downloads and on cards without leaving any traces. It is also important to maintain and evolve this security level in the future in order to keep the tachograph system secure.

The weak link in the security chain today is the motion sensor and its connection to the tachograph. Secondary independent sources of motion are useful if they are as economical and robust in the typical automotive environment as the current motion sensor is. The secure Galileo services, e.g. the Public Regulated Service (PRS), would be useful. However, all vehicles cannot be expected to be receiving satellite signals at all times.

Even if the use of Galileo would not be obligatory in all tachographs, legal provisions which would facilitate widespread use of this would include:

- provisions to use at least one secure Galileo service (CS, PRS or SoL) free of charge for the tachograph/vehicle;
- a detailed common definition of what constitutes proper use of Galileo as a secondary source of motion information;
- requirements on additional data, e.g. reception quality over time, to be recorded in order to make give enforcement additional tools to find tamper attempts.
- provisions to uphold proper data privacy for the fleet and driver.

In the case that an external Galileo receiver (e.g. as a part of the envisioned open in-vehicle platform) feeds the tachograph with motion data, there needs to be a unified data protocol for this. This is ideally done through voluntary standardisation rather than legislation.

A general weak point in the current legislated secondary motion data is that it only mandates an "on/off" Boolean warning about errors from the primary motion sensor, and that it is unsure whether law enforcement will actually be able to use this as an effective means of finding and providing evidence of motion sensor tampering. It would probably be helpful to record additional data about the status and quality of secondary motion data, much in the same way that the speed chart is used by enforcers to spot suspect behaviour when driving with analogue tachographs.

## 5.7. Scope of the regulation

**Question 7** - *In case a vehicle is only occasionally used in the scope of Regulation (EC) No 561/2006, for example when exceeding from time to time the radius set in some exceptions, should it be possible to use different means of recording activities?*

**SRE:** All vehicles that can fall under scope of the 561 legislation should be equipped with a digital tachograph. No other way of recording drivers data shall be used. With each exemption from the general rules and for each special solution for some group of vehicles, there is another risk of distortion of competition between companies and vehicles that must follow different rules. Each special case also decreases the transparency of the social legislation. To maintain and increase transparency should also be considered as a way to decrease administrative burdens, even if it is harder to measure this. It will always be natural for some groups to get



Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>6(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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additional exemptions from the general rules, and it will always be easier to grant additional exemptions than to withdraw existing ones.

## 5.8. Compatibility and interoperability

[... Three options can be envisaged:

**Option 1:** No new generation of recording equipment should be introduced; make full interoperability with the current system of digital tachographs a strict requirement for all future developments.

**Option 2:** Foresee a new generation of recording equipment, but make sure that at least driver cards (or other parts of the equipment) can be used with the current generation of digital tachographs and the new generation of recording equipment (backwards compatibility).

**Option 3:** Foresee a new generation of recording equipment without any requirement on the compatibility.]

**Question 8 -** Which option do you prefer? In case you prefer option 2: What are the most important issues for compatibility between a new generation of tachographs and the current digital tachograph, and what other parts of the equipment, apart from driver cards, should be compatible in your view?

**SRE:** Due to the problems with increasing security requirements already mentioned, option 1 is not realistic. This would also put unnecessary constraints on the future evolution and development of the tachograph system.

Option 2 is generally the most realistic and feasible way forward, as it provides more options for evolution, while protecting the heavy investments already done by enforcement, card issuing authorities, fleets, drivers and vehicle manufacturers. There will probably be a need for legal provisions for evolutionary security upgrades, e.g. schemes to phase in stronger cryptographic mechanisms on tachographs and cards, and to a lesser extent download equipment.

Option 3 is impractical, as it unnecessarily throws away most of the considerable effort and investment which has gone in to the current working system and presents a considerable risk of failure or excessive delays.

To conclude, option 2 is our preferred option. The most important compatibility issues between different generations of digital tachographs will be in the area of data output (downloads, printouts) for enforcement purposes. Enforcement must be able to download and comprehend data from different generations of tachographs, without massive investments in downloading and analysis equipment for each new generations of tachographs. Also it desirable that fleets and workshops can use the same equipment for data download on different generations of tachographs. Of course necessary upgrades in security will probably result in that future driver cards might not be backwards compatible with all generations of tachographs. If this needs to be done, a phase out plan for the old tachographs will be necessary.

## 5.9. Introduction of equipment based on new specifications

**Question 9 -** Should the legislation specify how new equipment has to be introduced in the field? Should a retrofit be possible, mandatory or take place in case of replacement of defective equipment? What are the essential steps for the introduction of new equipment? Should type approval for tachographs fall under the general type approval scheme for vehicles?

**SRE:** A long term phase-out of older generations of tachographs, i.e. retrofitting new generation recording equipment into old vehicles, would have the advantage of helping with the problem of obsolete security and backwards compatibility of old tachographs, as well as providing better coherence in enforcement between generations of vehicles. This may even become necessary in the event that security of the current or older system has been compromised beyond repair.

On the other hand, a too ambitious retrofit plan would pose an unnecessary burden on vehicle manufacturers, who would need to guarantee integration with all historically produced vehicles out in the field, as well as for fleets which would take the cost for the retrofit itself, as well as lower utilisation of their vehicles. It is therefore important to take different alternatives into account and find a balance between the different aspects of this.

Introduction of new equipment is a long and time consuming process. There should be a pre-type approval stage where the equipment can be tested in real life without type approval granted, and without excessive paperwork for the test fleets.

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>7(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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Type approval of the digital tachograph is generally working well today. It should not be part of the overall vehicle type approval. This would severely limit competition and leave the tachograph manufacturers approval process in the hands of the vehicle manufacturers. If the recording equipment is type approved by itself, it allows for a greater degree of interoperability, flexibility and lesser administrative burdens for tachograph manufacturers and type approval authorities than if done as part of vehicle type approval.

## 5.10. Provisions for Field Tests

**Question 10** - Should it be possible to carry out field tests before type approval is requested, while maintaining the same security standards? How should field test be limited (geographically, number of equipments, duration of the field test, etc.)?

**SRE:** Field test shall be possible to be performed before the type approval is granted. There is a very easy way to ensure the that the number of filed tests are limited and that is to put the requirement that the digital tachograph manufacturer must redraw the test units from the field no later than 2 years from the date when the unit was dispatched for test. This will limitation the number of tachographs in the field due to economical rather than legislative reasons.

## 5.11. Equipment in relation with the tachograph where no type approval is foreseen

[... The current legislation does not provide for detailed requirements in the following fields: seals, downloading equipment, control equipment, calibration tools.

The following options could be envisaged:

**Option 1:** Do not change the current situation

**Option 2:** Optional standardisation of this equipment through technical bodies

**Option 3:** Community legislation ]

**Question 11** - Which option do you prefer and if you prefer option 2 or 3, for which parts: seals, downloading equipment, control equipment, calibration tools, etc.?

**SRE:** Option 1 is the preferred option. There shall not be a mandatory type approval.

However if effective and fair enforcement would benefit from certain minimum performance requirements on the above mentioned equipment, there is always the possibility to standardise those and certify relevant equipment to relevant standards, option 2. A more stringent level would be EU-wide harmonisation of such performance requirements, regulated through a "new approach" directive which then is implemented as standards in CEN or CENELEC. This would essentially be a variant of option 3. This may be especially relevant for seals and similar security relevant equipment, in order to better harmonise requirements on such equipment throughout Europe.

## 5.12. Adaptation to technical progress

[... The following options could be envisaged:

**Option 1:** Commission continues to update the technical specifications of the equipment through comitology

**Option 2:** The Regulation sets essential requirements for the equipment and a normative or technical body (e.g. CEN, CENELEC) is empowered to take care of the detailed technical specifications

**Option 3:** The Regulation sets the basic principles for the equipment and manufacturers decide on detailed technical specifications ]

**Question 12** - Is the current way of updating the specifications on the tachograph satisfying? Who should be responsible for the updating of the technical requirements? What is your preferred option?

**SRE:** Option 1, i.e. the comitology process, is proven and by now well known and transparent to member states. It is very suitable to take care of detailed requirements on the enforcement specific and relevant parts of the specification. It provides a certain stability to requirements, but on the other hand smaller corrections and amendments can be cumbersome to handle.

Option 2 is understood to mean a "new approach" directive, which gives the mandate to CEN or CENELEC to define a standard which complies with the high level performance requirements in the directive. This normally gives a good combination of high level decisions by legislators which is then transformed into detailed requirements cooperatively worked out by technical expertise. This is a proven concept for harmonised safety

Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>8(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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requirements and is well known and transparent to industry. Moreover, smaller corrections and amendments can be more easily introduced. However, it is important to remember two important aspects of this:

- In addition to the lead time for legislation, a CEN or CENELEC standard which is defined from the beginning normally takes three years to finish, thus incurring a substantial initial lead time before it is actually effective;
- The votes in CEN and CENELEC are cast by the respective national standardisation bodies and are weighted so that bigger countries have more votes. This is a crucial difference to the "one vote per country" in the international ISO and IEC standardisation organisations.

The industry has already defined a set of voluntary, but in practice obligatory, standards (ISO 16844) in order to ensure interoperability in a number of areas which were not detailed in legislation, e.g. interface between tachograph and motion sensor.

Option 3 may introduce interoperability issues, as well as forcing manufacturers to provide the most permissive or "forgiving" recording equipment due to market pressure.

To conclude, option 1 would probably still be needed for certain enforcement and security critical parts, but option 2 should be seriously considered for general interoperability topics, given that the initial lead time before it effectively comes into force would be acceptable.

### 5.13. Installation and inspection

**Question 13** - *Should the trustworthiness of workshops be improved? If so, how? How can conflicts of interest be avoided for workshops that are living from delivering services to individual clients but play at the same time an important role in the security of the recording equipment?*

**SRE:** Training and information is often the most efficient way of keeping corruption down. Therefore, the competence and quality standards of workshops must be constantly maintained and monitored. This will not only ensure the new control procedures of calibration and inspection is up to date, the risk of frauds will also decrease. A legislative requirement should be implemented to ensure the tachograph workshops are to have a yearly training session on the digital tachograph and the installation procedures. Compare this to the CPC requirement set on the driver community.

Another improvement suggestion to reduce the number of frauds is to change from two year inspection to a frequency of one year instead.

### 5.14. Automatic and manual recording of information

**Question 14** - *What kind of data should be entered manually by the driver? What kind of information should be recorded automatically by the recording equipment? Is it appropriate to record more precisely the location (via GPS or GNSS for example)?*

**SRE:** The current requirements on drivers and recording equipment regarding manual recording of information are simply too complicated. Ideally, the driver should not need to input any data at all, or at least only the most essential data should need to be entered either manually or automatically. Given the big number of regulations and directives which the tachograph legislation must take into account, the options are limited and a practical solution is needed.

The declaration of location where the journey begins or ends (places records) are effective tools for enforcement in the case of analogue tachographs, but almost useless as defined for digital tachographs. Moreover, the requirement to manually input places on digital tachographs is a major complication to the manual entries workflow, adding to confusion and consuming time for all drivers. To make things worse, current legislation does not allow automatic inputs, unless explicitly done with the help of satellite navigation.

To give an indication of the possible reduction of administrative burdens if mandatory places inputs were abolished, consider that the contemporary digital tachographs prompt for places input once for each card withdrawal and at least once for each card insertion. If the average driver then makes one card insertion and withdrawal in each working day, places entries can be estimated to take about 10 seconds each day. This adds up to 3-4 minutes work time each month. This would be about the same amount of time that the average driver uses up each month to download his driver card.



Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>9(10)</b>
Uppgjord/Issued by: <b>Andreas Hörmedal</b>	Godkänd/Approved: <b>MAW</b>	Datum/Date: <b>2010-02-27</b>	Dokumentnr./Document no: <b>1221/63-990136</b>	Rev: <b>02</b>

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Meaningful places information would probably require automatic input from an external position data source. This position input does not have to be very accurate or frequent to be useful. Given that today's solution relies on manual inputs, security requirements would not need to be overly high on this particular function. Therefore a public GNSS signal, GSM cellinfo, input from road tolls, etc could be good enough. Note that too high requirements on either of accuracy, frequency or security can drive cost up on the system considerably. Also, if too much additional data has to be stored, this will increase storage costs and administrative burdens. An example of meaningful accuracy could be 1 km, and frequency could be each card insertion or withdrawal or a fixed frequency of at least once each hour of driving. Another side benefit of keeping accuracy and frequency requirements to a minimum is that personal integrity of the driver is not compromised, since only a very rough record of his general whereabouts will be need to be kept.

## 5.15. Uniqueness of the driver card

**Question 15** - *Should the Regulation explicitly foresee the use of electronic data exchange on cards that are issued between card issuing authorities?*

**SRE:** This is very important and the requirement must be fulfilled in order to keep the system secure. Another more important issue to be covered is for enforcement bodies to have correct, accurate and up to date card information readily available during roadside and company checks.

## 5.16. Warnings

**Question 16** - *Should the Regulation explicitly foresee warnings for the driver in order to enhance compliance with the legislation on driving times and rest periods? Should it be up to manufacturers' choice to offer such warnings as an optional tool, including additional warnings for other aspects than the continuous driving time?*

**SRE:** Warnings is a typical customer driven feature where the tachograph manufacturers are listening to the market demands and implementing the features requested. We do appreciate the necessity to maintain a similarity between the manufacturers implementation of the warnings in order not to confuse the driver community. Voluntary standardisation, supported by all four type approved digital tachograph manufacturers is already underway. Explicit legal requirements for warnings for drive times and rest periods should be removed altogether, as they tend to introduce unnecessary dependencies to other legislation, e.g. social legislation.

## 5.17. Other Comments And Suggestions

**Question 17** - *Do you have any other comments or suggestions which you consider should be taken into account during the revision of the European legislation on recording equipment?*

**SRE:** The legislation on recording equipment should focus on recording functionality and effective enforcement of recorded data. Increasing the scope of this legislation increases complexity and decreases transparency. Also, cross references between this and other associated legislation should be kept to an absolute minimum in order to maintain relevance, transparency and coherence over the coming years.

Interoperability with other legislated devices could be encouraged and supported by the Commission, but not necessarily legislated. This should be solved by voluntary standardisation instead. Interoperability can be encouraged by making the technical parts of the regulation flexible and permissive, instead of imposing unnecessary restrictions on design and use of the tachograph.

Of major importance is to maintain and defend the personal integrity of the driver, as well as the data privacy of drivers and fleets.

## 5.18. Usability and Control Reliability

**Question 18** - *Would you like to propose other measures to make the recording equipment more user-friendly and to improve the reliability of controls?*

**SRE:** A comment relating to [2], item (18): an alternative to the filling of forms for longer rest durations, e.g. holidays or illness, would be to encourage and enable users to make this as manual entries directly into the card, in the same way as manual entries during card insertion is performed today. Filling in paper forms to declare recent activities should never be the preferred option.



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Titel/Title: <b>ANSWER TO EC PUBLIC CONSULTATION</b>				Sida/Page: <b>10(10)</b>
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02 ANSWER TO EC PUBLIC CONSULTATION.DOC

Integration in the cab environment will improve the usability of the tachograph. This does not need explicit legislation, since open and standardised interfaces will be the result of the interoperability requirements coming from vehicle manufacturers.