Internationale samenwerking Verenigde Staten en Nederland op het gebied van verkeersveiligheidsonderzoek

Drs. P.I.J. Wouters

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Opdrachtgever:	De inhoud van dit rapport berust op gegevens verkregen in het kader van een project, dat is uitgevoerd in opdracht van de Adviesdienst Verkeer en Vervoer van Rijkswaterstaat.
Trefwoord(en):	International, USA, Netherlands, safety.
Projectinhoud:	In het kader van een overeenkomst tot samenwerking tussen het 'Department of Transportation' in de Verenigde Staten en het ministerie van Verkeer en Waterstaat zijn er besprekingen gevoerd tussen medewerkers van 'Volpe National Transportation Center', de 'Federal Highway Administration' en de 'National Highway Transportation Safety Administration' enerzijds, en medewerkers van de Adviesdienst Verkeer en Vervoer (AVV) anderzijds. Op uitnodiging van AVV nam ook een vertegenwoordiger van de SWOV hieraan deel. Ter voorbereiding zijn door de SWOV onder meer de volgende gespreksthema's uitgewerkt: 'de verkeersonveiligheid in Nederland en de aanpak ervan', 'verkeerseducatie van ouderen', 'alcohol- en drugsgebruik' en 'getrapt rijbewijs'. Tevens werden enkele adviezen over meer specifieke onderwerpen gegeven. Dit rapport doet verslag van de besprekingen. Tevens bevat het de daaraan voorafgaande thema-uitwerkingen en adviezen.
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Inhoud

1. Achtergrond en samenhang

De Adviesdienst Verkeer en Vervoer (AVV) heeft als onderdeel van het Onderzoek JaarPlan 1998 het project 'Internationale Samenwerking' (HVVL 98.506). Het doel van dit project is:
"Het vinden van oplossingen voor problemen die zich zowel in binnen- als buitenland voordoen, door middel van het uitwisselen van kennis en ervaring en andere vormen van samenwerking."

Het Nederlandse ministerie van Verkeer en Waterstaat heeft al sinds 1991 een zogeheten Memorandum of Understanding (MoU) met het Amerikaanse Department of Transportation (DoT). In het kader hiervan heeft AVV sinds januari 1998 met 'Volpe National Transportation Systems Center' (Volpe), een onderdeel van het DoT, een 'formal agreement to exchange information and technical assistance' ondertekend. Een onderdeel hiervan is 'Human centered transportation systems and safety'.

AVV wil dit onderwerp uit de overeenkomst nader uitwerken en met Volpe samenwerken op gebieden binnen de verkeersveiligheid waar zowel in de Verenigde Staten als in ons land problemen bestaan en waarvoor ook een gelijksoortige aanpak mogelijk en zinvol lijkt.

Met dit doel is de SWOV uitgenodigd mee te werken aan de voorbereiding van deze samenwerking. Dit rapport doet verslag van de werkzaamheden en uitkomsten van deze voorbereidingsfase. AVV heeft hiervoor vier thema's geselecteerd. Medewerkers van de SWOV hebben die thema's vanuit een Nederlands perspectief in de vorm van bondige statements uitgewerkt in mogelijke onderwerpen voor samenwerking. Die thema's zijn:
- *De verkeers(on)veiligheidssituatie in Nederland, de belangrijkste onderliggende problemen en hun aanpak*, ir. F.C.M. Wegman;
- *Verkeerseducatie van ouderen*, drs. P.I.J. Wouters;
- *Alcohol- en drugsgebruik*, M.P.M. Mathijssen; en
- *Getrapt rijbewijs*, drs. D.A.M. Twisk.

Voorts heeft de SWOV voorlopige beoordelingen cq adviezen opgesteld over een viertal onderwerpen die momenteel spelen in de Verenigde Staten, te weten:
- *ALERT, Advanced Law Enforcement & Response Technology*, ir. H.L. Oei;
- *IHSDM, Interactive Highway Safety Design Model*, ir. A. Dijkstra;
- *SMS, Safety Management Systems*, ing. J.A.G. Mulder;
- *Road Safety Audits*, ir. A. Dijkstra.

De thema-uitwerkingen en adviezen zijn besproken met medewerkers van Volpe, de Federal Highway Administration en de National Highway Transportation Safety Administration. Dit gebeurde tijdens een bezoek van vertegenwoordigers van AVV (drs. J.H. Kraay en drs. M.L. Duynstee) en SWOV (ir. F.C.M. Wegman) aan deze instellingen. De voorbereidingen namens de SWOV zijn gecoördineerd door drs. P.I.J. Wouters.
De Amerikaanse partners brachten ook hun ideeën voren in de vorm van een veelvoud aan korte lezingen over hun onderzoeksplannen en -inspanningen.

De tweede activiteit namens de SWOV is het deelnemen aan deze bespreking en het in overleg met AVV vastleggen en beoordelen van de betekenis van de inhoud van de Amerikaans presentaties voor de Nederlandse situatie. De verslaglegging hiervan is van de hand van ir. F.C.M. Wegman.

Het uiteindelijke oogmerk van deze rapportage is uiteraard het weergeven van mogelijke onderwerpen van samenwerking. Daarom volgen hierna het besprekingsverslag, annex beoordeling, alsmede de op grond ervan getrokken conclusies. In *Bijlage 1* tot en met *Bijlage 8* worden tevens de acht genoemde SWOV-bijdragen toegevoegd.
Ten slotte is in *Bijlage 9* een bericht toegevoegd namens Volpe (d.d. 13 juli 1998). Hierin vatten zij de volgens hen van belang zijnde onderzoeksgebieden samen.

2. Verslag bezoek

2.1. Inleiding

Van 29 juni tot en met 2 juli 1998 hebben drs. J.H. Kraay en drs. M.L. Duynstee van AVV en ir. F.C.M. Wegman van de SWOV een bezoek gebracht aan Boston en Washington in het kader van het OJP98-project (69.546) 'Internationale samenwerking: MoU-Volpe'. De heer Kraay is de projectbegeleider. Mevrouw Duynstee verblijft drie maanden in Washington om zich op de hoogte te stellen van de ontwikkelingen op het gebied van ITS in Amerika en om voorstellen te doen aan AVV voor veelbelovend onderzoek over dit onderwerp in ons land.

In Boston is een bezoek gebracht aan het John A. Volpe National Transportation Systems Centre. Dit centrum werkt in opdracht en is een onderdeel van het Department of Transportation (http://www.volpe.dot.gov). In Washington is de Federal Highway Administration (Turner-Fairbank Laboratory; http://www.tfhrc.gov) en de National Highway Transport Safety Administration (NHTSA; http://nthsa.dot.gov) bezocht.

Het verslag van dit bezoek en de beoordeling van de gespreksonderwerpen op hun wenselijkheid voor samenwerking is van de hand van de heer Wegman.

2.2. Samenwerking met Volpe

Een paar algemene indrukken vooraf. Allereerst viel op dat Volpe een echt onderzoeksinstituut is, waar een duidelijke onderzoeksattitude heerst. Verder valt op dat Volpe de problematiek van (weg)verkeersonveiligheid in het perspectief van andere transportmodi plaatst, vanuit hun taakstelling.
Dit betekent bijvoorbeeld dat zij ongevallenstatistieken met gegevens van verschillende modi ter beschikking hebben. (We ontvingen een kopie van hoofdstuk 3 van het Jaarbericht uit de Verenigde Staten: 44.000 doden in ongevallen met transportmiddelen, waarvan 95% in het wegverkeer met een economische schade van 150 miljard dollar).

Onze contactpersonen bij Volpe, E. Donald Sussman Ph.D. (afdelingshoofd) en Ms. Mary Donahue Stearns Ph.D., bleken zich niet echt met weg-verkeersveiligheid bezig te houden, maar meer met 'human factors' in transport (ook lucht, water, pleziervaart en commercieel transport over water, en trein).

I.
Van alle presentaties vielen mij een aantal op. Allereerst van David Skinner over *Improving Transportation for a Maturing Society*, (U.S. Department of Transportation, DOT-P10-97-01). Hij gaf verder een interessant paper mee met als titel *Temporal changes in crash incidence* (Volpe, June 1998). Skinner is geïnteresseerd in macro-modellen die de ontwikkelingen in de verkeersveiligheid beschrijven en mogelijk verklaren.
Zijn presentatie over ouderen had een zeer positieve uitstraling: Skinner is van mening dat ouderen zolang mogelijk zelfstandig aan het verkeer moeten blijven deelnemen, anders ontstaat het gevaaar van sociaal isolement. Verder

is hij van mening dat ouderen het heel goed doen in het verkeer: ze compenseren veel en goed en hun enige probleem is de fysieke kwetsbaarheid. Op de vraag hoe te beoordelen of een oudere nog wel zelfstandig aan het verkeer zou moeten deelnemen kwam de reactie: "zolang ze hun eigen naam kunnen herinneren, kan dat".

Beoordeling
Het onderwerp 'ouderen' lijkt niet echt een onderwerp om onderzoeksmatig met de Amerikanen verder te gaan. Ook al zijn ze behoorlijk actief op dit terrein, zoals ook blijkt uit de stroom van publikaties over dit onderwerp, er lijken geen gezamenlijke thema's te bestaan. Voorstel is de literatuur over dit onderwerp te blijven volgen, zoals de recente publikatie hoe het verkeerskundig ontwerp aan te passen aan de eisen van ouderen (Older Driver Highway Design Handbook - FHWA-RD-97-135, January 1998). We wachten de beleidsmatige opportuniteit van dit onderwerp verder af. Graag actie vanuit Verkeer & Waterstaat op dit onderwerp.

II.
Een tweede interessante presentatie kwam van een consultant (Jane Lappin) over de acceptatie van ITS-voorzieningen. Ze gaf een rapport mee *Consumer Acceptance of Automotive Crash Avoidance Devices; A report of qualitative research* (Charles River Associates Incorporated, CRA Project No. 852-05, April 1998), waar men met zogenaamde 'focus groups' werkt om de acceptatie van de consument van ITS-voorzieningen en diensten te meten. Het onderzoeksprogramma is afgesloten, hoewel de onderzoekers het plan hadden om hier een periodiek meetinstrument van te maken. Dit onderwerp is mogelijk iets voor SARTRE of PROV?

III.
Over *alcohol en drugs* kwam een presentatie (Art Flores van Volpe & Jim Ryan van NHTSA Regional Office) gericht op het komen tot .08 BAC en een zogenaamd 'zero tolerance'-beleid voor iedereen onder de 21 jaar (< .02 BAC). Hierbij dient de volgende opmerking gemaakt te worden: als volgens de officiële statistieken in Amerika sprake is van 41% van alle dodelijke slachtoffers die gevallen zijn in 'alcohol related accidents', dan is hier sprake van door de politie gerapporteerde aanwezigheid van alcohol (dus niet boven de wettelijke limiet).
We kwamen verder te spreken over het verkrijgen van een beter inzicht in de problematiek van drugsgebruik en verkeersveiligheid. De interesse van Amerikaanse kant was niet zeer groot met als redenering: drugs zijn illegaal, en dienen derhalve bestreden te worden. Als er al een verkeersveiligheidsprobleem bestaat, dan dient dit met de algehele aanpak van de drugsproblemen in de Verenigde Staten te worden opgelost.
Over het optimaliseren van verkeerstoezicht bestond ook niet al te veel interesse. De problematiek van recidivisten op dit terrein leidde wel tot een interessante discussie. Allereerst de vraag of er sprake is van een relevant (en wellicht groeiend) veiligheidsprobleem en zo ja hoe dat probleem aan te pakken.
In latere gesprekken werd dit probleem verbreed tot 'problem drivers / recidivisten / hard core': dit zijn weggebruikers die niet alleen onder invloed rijden, maar ook geen gordel dragen en zich niet houden aan de snelheidslimieten. Deze groep weggebruikers zijn oververtegenwoordigd bij ongevallen.

Beoordeling
Het onderwerp van de 'problem drivers' sluit aardig aan bij het voorstel dat in de 'Nieuwe Kijk' is gedaan om de speerpunten alcohol, gordels en snelheden vanuit een nieuw perspectief te bezien. We komen op dit moment niet veel verder met de huidige aanpak (kort aangeduid met meer controles door de politie) en er is behoefte aan een nieuwe kijk. De aanpak van de 'hard core' is wellicht een nieuwe mogelijkheid, waarbij uiteraard wel eerst dient te worden vastgesteld of dit een zinvolle aanpak is. Kortom een aardig terrein voor samenwerking met de Amerikanen. Dit werd onderschreven door Sussman.

IV.
Wassim Najim gaf een interessante presentatie over het Volpe-onderzoek: *ITS Crash Avoidance Research.* Wat aansprak in hun aanpak was de systematische wijze waarop de probleemdefinitie werd gepresenteerd, evenals de analyse van 'target accidents', het ontwikkelen van concepten om ongevallen via ITS te voorkomen, het definiëren van 'performance specificaties' en vervolgens het opstellen van scenario's op basis waarvan kosten en baten van verschillende systemen (achteraanrijdingen, rijstrook-wisselen en van de weg raken) zijn geschat. Uit de becijferingen begrijp ik dat men verwacht dat met deze systemen ongeveer een zesde deel van alle ongevallen is te voorkomen. Er worden nu proeven in de praktijk gehouden met een Intelligente Cruise Control (Chrysler, Universiteit van Michigan). Opmerkelijk: men 'market' dit soort toepassingen niet als veiligheids-toepassingen, maar verbeteringen van het rijcomfort en vermindering van de spanning tijdens het rijden.

Beoordeling
Dit onderwerp lijkt geen onderwerp om met de Amerikanen samen te gaan werken. Bij het tot stand brengen van een Nederlands onderzoeksprogramma zou echter van deze studies zeker kennis genomen moeten worden. Dit geldt trouwens evenzeer voor de TRL-scenario-studie op dit gebied.

V.
Donald Sussman kwam met een opsomming van zijn belangrijkste nieuwe onderzoeken voor de naaste toekomst: 'vermoeidheid' (hij wil dat gaan onderzoeken bij de Coast Guard) en 'het gebruik van rijsimulatoren in de rijopleiding' (hij wil onderzoek gaan doen bij de Amerikaanse marine). Zijn gedachte is dat een rijsimulator in de opleiding ook voor andere transport-modi werkt en dat het dus de moeite waard is om te bezien of dit ook in het wegverkeer iets zou kunnen zijn. Deze gedachte kan zelfs worden uitgebreid naar de vraag wat er in het wegverkeer geleerd zou kunnen worden van opleidingen bij andere transportmodi (trein, vliegtuig, schip).

Beoordeling
Het is moeilijk te overzien of dit nu een interessant onderzoeksonderwerp is en wat de praktische mogelijkheden zijn van het gebruik van simulatoren onder de Nederlandse omstandigheden. Hierbij dient zich ook de vraag aan van wat precies beoogd wordt met het onderwerp: gaat het om het beter begrijpen van rijgedrag, gegeven de (risicoverhogende) omstandigheden, of gaat het om het onderzoeken of een rijsimulator ingeschakeld zou kunnen worden in de initiële rijopleiding en tegen welke kosten bepaalde winsten bereikt kunnen worden. Wellicht dat een verkennende studie op dit onderwerp kan plaatsvinden, maar dan eerder in het kader van de 'graduated licensing'-studie.

VI.
Tot slot van het programma in Boston de volgende suggestie die we samen met Volpe hebben gedaan: het houden van een gezamenlijke workshop in het voorjaar van 1999 in Nederland over expositie en risico in transport. Het gaat dan in het bijzonder om het verkennen van de mogelijkheden (theoretisch en praktisch) om 'expositie' werkelijk te meten (in plaats van steeds te moeten benaderen via grootheden die toch al verzameld zijn en die vervolgens als expositie worden aangenomen).

Beoordeling
Inhoudelijk is dit een zeer interessante suggestie, die daarom zeker ondersteund zou kunnen worden van onze kant. Dit onderwerp is wellicht ook goed onder te brengen in het onderzoeksprogramma van de SWOV in de toekomst. Het lijkt nuttig de lopende ETSC-studie over dit onderwerp bij de verdere voorbereidingen te betrekken.

2.3. Samenwerking met de FHWA (Turner-Fairbank) en NHTSA

Tijdens het bezoek aan Washington zijn de volgende onderwerpen aan de orde geweest:
- Interactive Highway Safety Design Model (IHSDM);
- Advanced Law Enforcement & Response Technology (ALERT);
- Safety Management Systems;
- Road Safety Audits;
- Graduated Licensing Systems.

Hieronder volgt een korte beschrijving van elk onderwerp en een beoordeling (voorstel) voor verdere samenwerking.

I.
De FHWA (Turner-Fairbank Highway Research Centre) en daarbinnen meer in het bijzonder het Geometric Design Laboratory, sinds kort onder leiding van Raymond Krammes, probeert al sinds begin van de jaren negentig een hulpmiddel voor wegontwerpers te ontwikkelen dat de kennis uit onderzoek over een veilig wegontwerp bij de wegontwerpers brengt. Het is een software-produkt dat geïntegreerd moet worden in een (bestaande en veel gebruikte) CAD-omgeving. Dit *Interactive Highway Safety Design Model* (IHSDM) zou ontwerpers de mogelijkheid moeten bieden om de (relatieve) veiligheid van alternatieve wegontwerpen te vergelijken vanaf de plannings-fase van wegen tot aan het verkeerstechnisch detailontwerp. Nu beperkt IHSDM zich tot tweestrooks wegen buiten de bebouwde kom; dit type weg is gekozen als het onveiligste wegtype.

IHSDM heeft 5 modules:
- 'Accident Analysis Module', met drie componenten: roadway model, een model om de benefit-cost ratio's van alternatieve wegberminrichtingen te schatten en een expertsysteem voor het ontwerp van ongelijkvloerse kruisingen.
- 'Design Consistency Module'.
- 'Driver / Vehicle Module', combinatie van een 'driver performance'-model met een 'vehicle dynamics'-model.
- 'Policy Review Module', een module die checkt hoe een voorgesteld wegontwerp tegemoet komt aan de ontwerp-richtlijnen van AASHTO's Green Book;

- 'Traffic Analysis Module', toetsing op veiligheid en doelmatigheid van de verkeersafwikkeling.

Er is een CD-ROM van IHSDM meegegeven. Een kopie van de sheets van de presentatie van Krammes is eveneens beschikbaar.

Het hele IHSDM is een combinatie van software-ontwikkeling, 'state-of-the-art'-achtig werk en nader onderzoek om kennisleemten in te vullen.
De schatting van de Amerikanen was dat er in de tien jaar looptijd van dit project ongeveer vijftien miljoen dollar aan besteed is. Inmiddels heeft men een (eerste) contract getekend met een softwareverkoper van een CAD-programma (Geopak).

Beoordeling
De doelstellingen van dit project spreken aan, evenals de verwachte resultaten en de ambitie waarmee het project is opgezet en vormgegeven: het gaat erom wetenschappelijke kennis ter beschikking te stellen aan weg-ontwerpers en -planners tijdens het ontwerpproces. Dit lijkt een moderne manier om de wetenschappelijke kennis ook daadwerkelijk te benutten op het moment dat de kennis nodig is. Voordat wordt besloten zoiets ook in Nederland te gaan ontwikkelen, bijvoorbeeld in het kader van 'duurzaam-veilig', zou wat preciezer moeten worden nagegaan hoe dit onder de Nederlandse omstandigheden in te passen: aansluiten bij RONA-aanpak, aansluiten bij wegontwerpprogramma's, nagaan wie belang hebben bij het vormgeven van een dergelijke ontwikkeling. Ook is het interessant na te gaan of (in ieder geval een deel van) deze ontwikkeling in Europees verband zou kunnen plaatsvinden (5e Kaderprogramma?). In dit kader moet dan ook een oordeel worden gevormd of deze aanpak in Amerika wel aan zijn verwachtingen voldoet. Binnenkort komt een beta-release op de markt; het gebruik hiervan wordt geëvalueerd. Verder kent de inhoudelijke voorbereiding uiteraard ook zijn kwetsbare kanten: hoe sterk is het 'accident prediction'-model en het 'driver performance'-model?

Deze vragen zijn echter geen reden om op dit punt niet verder te willen. Sterker nog: deze aanpak is een zeer interessante invulling van het SWOV-onderzoeksprogramma op het gebied van verkeerskundig ontwerp; uiteraard niet alleen, maar juist in samenspraak en in samenwerking met andere partijen (Beleidsdirecties V&W, AVV, Bouwdienst, CROW, TU Delft, wegbeheerders, enzovoort). Voorgesteld wordt een haalbaarheidsonderzoek, zowel inhoudelijk als organisatorisch.

II.
Over *ALERT*, oftewel *Advanced Law Enforcement & Response Technology* is uitgebreide documentatie beschikbaar: een brochure, een overdruk uit een politietijdschrift (The Police Chief, september 1997), een CD-ROM en een video. Het betreft hier een 'mobile data gathering platform' waarmee openbare diensten (politie, brandweer, ambulances, 'disaster management', 'geheime diensten') met elkaar kunnen communiceren op basis van de 'plug and play gedachte'. Het systeem bestaat uit een computer, randapparatuur, gestandaardiseerde verbindingen tussen de onderdelen en verbeterde communicatiemogelijkheden tussen de diensten ter plaatse van het incident (een ongeval, een ramp, of zoiets). Het concept is derhalve tamelijk simpel, de uitwerking heeft nogal wat voeten in de aarde gehad. Het gaat hier om een voorziening die ertoe leidt dat openbare diensten met elkaar gaan samenwerken: integratie van technologie leidt tot organisatorische integratie. In de titel van het project staat 'law enforcement', maar deze naam ervaart

men nu eerder als een belemmering dan als een voordeel. Het gaat nu over 'Public Safety Technolgy for the 21st Century'. Er zijn een paar test-voertuigen uitgerust met deze technologie. Er volgen nog meer testen en daarna moet het commercieel op de markt.

Beoordeling
De aanpak lijkt in eerste instantie voor betrokken hulpdiensten interessant; derhalve lijkt het een goed idee als ook in Nederland deze gedachte wordt gehanteerd (iets dat misschien al gebeurt?). Voor verkeersveiligheid zijn er aantrekkelijke mogelijkheden aan vast te koppelen: het invullen van het ongevallenformulier (en het gebruik van GPS voor de lokatiecodering) en het efficiënter maken van politietoezicht (bijvoorbeeld snelheidsmetingen / controles zonder tussenkomst in de computer verwerken). Ook voor incident-management bieden systemen als ALERT perspectieven. Voor AVV is wellicht nauwere betrokkenheid te overwegen. De SWOV zal bij deze ontwikkeling slechts op een afstand geïnteresseerd moeten zijn. Verantwoordelijkheden en initiatieven liggen immers niet zozeer bij dit instituut, maar bij anderen (de politie-organisatie?).
Overigens was het 'onafhankelijke' ministerie van Transportation (NHTSA) de initiatiefnemer en ontwikkelaar van dit project!

III.
Safety Management Systems (SMS) is een recente ontwikkeling in de Verenigde Staten waarmee men probeert op een integrale, maar evenzeer formele wijze de verkeersveiligheid te bevorderen via 'communication, coordination and cooperation'. We spraken over deze aanpak met mevrouw Phyllis Young (Office of Highway Safety van de FHWA). Het merk-waardige van dit gesprek was dat zij SMS eigenlijk helemaal niet steunde: ze sprak over 'safety management' in een omgeving waarin betrokken autoriteiten samenwerken op basis van 'commitment' en niet omdat er voldaan zou moeten worden aan een federale wet (compliance). Kortom ze zag niet veel in het bindende en formele karakter van SMS. Dit bijvoorbeeld in tegenstelling tot anderen, die menen dat zonder formele binding en 'compliance' in de Verenigde Staten niets tot stand komt.
Beziet men de documentatie over dit onderwerp, dan spreekt daaruit dat een systematische aanpak behoort te voldoen aan bepaalde kenmerken en dat zo'n systematische aanpak onder meer tot beter en breder verkeers-veiligheidsbeleid leidt. Er zijn inmiddels ook richtlijnen over dit onderwerp beschikbaar. Een aantal staten hanteren deze aanpak; op het eerste gezicht is daar inhoudelijk niets mee mis, zij het dat het wat schools aandoet (maar geldt dat niet voor elke check-list?).

Beoordeling
De aanpak lijkt niet geschikt voor de Nederlandse situatie. Ook wij proberen 'meer en beter verkeersveiligheidsbeleid' tot stand te laten komen zonder daarover actoren formeel te binden. Dat past immers ook niet zozeer in onze bestuurlijke cultuur. Anderzijds ontstaat dan het probleem van een te vrijblijvende aanpak van alleen goedwillenden. Ik meen dat we dit probleem in Nederland zelf zouden moeten oplossen en dat SMS geen nieuwe gezichtspunten oplevert.
Overigens is de vraag of we op het gebied van het management van verkeersveiligheid zo gemakkelijk van het buitenland kunnen leren; hooguit wellicht wat laten inspireren. Het voorstel van de SWOV is om dit onderwerp geen onderdeel te laten zijn van verdere samenwerking tussen

Nederland en de Verenigde Staten. Laten wij ons op de hoogte stellen van de ontwikkelingen op dit gebied via de literatuur en het daarbij laten.

IV.
Het onderwerp van de *Road Safety Audits* staat ook in de Verenigde Staten in de belangstelling. De Amerikanen hebben met een groep deskundigen een studiereis gemaakt (naar Australië en Nieuw Zeeland) en op basis daarvan een voorstel uitgewerkt (zie ook: FHWA Study Tour for Road Safety Audits; Part 1 and 2). Inmiddels heeft de FHWA besloten ervaring te gaan opdoen met safety audits; in veertien staten zullen pilots worden uitgevoerd. Men verwacht in 1999 over deze pilots te kunnen rapporteren. Paul Harker is de contactpersoon over dit onderwerp bij de FHWA. Inhoudelijk werd niet veel nieuws verteld. Wel vertelde hij wat van het 'Safety Audit Congres' onlangs in Australie, met bijvoorbeeld de mededeling dat het congres daar gekozen had om de laatste fase van de audit-procedure (na de opening bezien hoe het wegontwerp functioneert) geen onderdeel meer te laten zijn van het audit proces. Kortom, het is zaak om op de hoogte te blijven via de proceedings van dit congres.

Beoordeling
Nu er inhoudelijk weinig nieuws onder de zon is en de Verenigde Staten een vergelijkbare aanpak heeft gekozen als wij (een eigen audit-procedure ontwikkeling op basis van ervaringen in het buitenland, deze procedure in eigen land uitproberen en op basis daarvan tot vervolgstappen besluiten) is er weinig reden nu met de Amerikanen hierover verdere specifieke contacten te onderhouden.
Volgens de SWOV blijft de poging om wereldwijd een methodologie te ontwikkelen en toe te passen om de effectiviteit en doelmatigheid van de audit vast te stellen, wel interessant. Wellicht is het verstandiger hierover eerst binnen Europa en later met de deskundigen uit Australië en Nieuw-Zeeland tot overeenstemming te komen. Kortom, mijn voorstel is om aan dit onderwerp geen vervolg te geven in de samenwerking tussen de Verenigde Staten en Nederland.

V.
Over het onderwerp *Graduated Driver Licensing Systems* hebben we gesproken met Michael Smith van NHTSA. Hij gaf ons een overzicht van de stand van zaken in de Verenigde Staten, zowel inhoudelijk als op het gebeid van organisatie / structuur. De federale regering (NHTSA) is erg voor 'graduated licensing systems' en ze ondersteunen staten bij de invoering; overigens moeten de staten zelf tot realisatie besluiten en heeft de federale overheid hier geen formele rol bij. Smith gaf een 'Fact sheet' mee over dit onderwerp (NHTSA, September 1997), waarin het aanbevolen 'drie fasen systeem' staat beschreven (p. 2). Verder heeft men een 'Handbook on Graduated License System' in voorbereiding.
Ook bood Smith een verhaal aan van Allan F. Williams ('Graduated Licensing and Other Approaches to Controlling Young Driver Risk Taking', Insurance Institute for Highway Safety, October 1997).

Over de effectiviteit van deze aanpak zijn inmiddels verschillende cijfers in omloop, enerzijds afhankelijk van de kwaliteit van de bottom-line, anderzijds van de kwaliteit van de 'graduated licensing systems': een reductie in ongevallen tussen de 5 en 15%. Maar inmiddels zijn ook voorlopige resultaten bekend vanuit Ontario (Canada): een reductie van 30%

in ongevallen (een combinatie van minder verkeersdeelname en reductie in ongevallenrisico).

Vanuit de SWOV was ook een bijdrage beschikbaar over dit onderwerp. Het gaat om het rapport 'The potential of graduated licensing systems and recent developments in the Netherlands'. Ook in deze bijdrage wordt een sterk pleidooi gehouden voor zoiets als 'graduated driving licenses', opgebouwd uit verschillende elementen (delay license, point system, restrict driving, training, accompanied driving).

Beoordeling
Ook in Nederland worden wij nog steeds geconfronteerd met relatief hoge risico's voor jonge en onervaren automobilisten. Er bestaat een zekere (latente?) wens via verbeteringen aan de rijopleiding (in brede zin bedoeld) het risico van jonge en beginnende automobilisten terug te brengen. Anderzijds moeten we constateren dat er in ons land niet veel ruimte voor verbeteringen lijkt te bestaan. Het onderwerp blijft echter van belang en de ontwikkelingen buiten Nederland zouden als voorbeeld kunnen dienen. Om deze reden lijkt het interessant om met de Verenigde Staten samen te werken en te bezien of er mogelijkheden voor samenwerking zijn. De voorkeur voor deze samenwerking gaat uit naar bijvoorbeeld NHTSA of het Insurance Institute for Highway Safety (IIHS). Samenwerking zou zich wel dienen te baseren op een goede beleidsmatige analyse van de situatie in ons land. Voorgesteld wordt en dergelijke analyse eerst te maken (door het ministerie van V&W?) en tegelijkertijd inhoudelijke samenwerking met de Verenigde Staten af te tasten (bijvoorbeeld door de SWOV): er ligt nu bijvoorbeeld een uitnodiging van IIHS om samen een artikel over dit onderwerp te schrijven.

2.4. Samenvattend

Op basis van de verkregen informatie en een beoordeling vanuit Nederlands perspectief, wordt voorgesteld voor de volgende onderwerpen samenwerking op het gebied van verkeersveiligheidsonderzoek met de Verenigde Staten verder te verkennen:

Volpe:
- 'problem drivers' in relatie tot een nieuwe kijk op de Nederlandse speerpunten 'alcohol', 'gordels' en 'snelheid';
- expositie en risico in transport;
- (wellicht) trainingsmethoden (waaronder simulatoren) vanuit andere transportmodi.

FHWA:
- Interactive Highway Design Model IHSDM.

NHTSA/IIHS:
- Graduated Driver Licensing Systems.

3. Follow-up

Gezien het bezoekverslag, is een aantal activiteiten als follow-up voorzien:

I.
Het is de bedoeling dat in april 1999 vertegenwoordigers van Volpe naar Nederland komen.
De principe-afspraak is gemaakt dat er bij die gelegenheid een gezamenlijke workshop wordt gehouden over het thema '*Expositie maatstaven voor het bepalen risico bij verkeersdeelname*'.
Het ligt in de verwachting dat een te verschijnen ETSC-rapport hiervoor de geschikte achtergrond-informatie kan verschaffen.

II.
AVV zal moeten kiezen welke onderwerpen zich lenen voor het exploreren van mogelijkheden van verdere samenwerking. Daarbij is uiteraard de beoordeling van Amerikaanse zijde van groot gewicht. Zowel Volpe (zie *Bijlage 9*) als de SWOV (zie hoofdstuk 2) hebben hun bevindingen vastgelegd.
In principe kan een agenda voor verdere samenwerking onder meer de volgende onderwerpen bevatten:

- Trainingsmethoden; voor jongeren met name 'graduated licensing'-systemen en voor ouderen in het bijzonder het inzetten van simulatoren.
- Beïnvloeding van recidivisten / 'problem drivers', in relatie tot een 'nieuwe kijk' op de Nederlandse speerpunten: 'alcohol, gordels en snelheid'.
- Ouderen in het verkeer.
- ITS in relatie tot verkeersveiligheid.
- Drugs in het verkeer.

Bijlage 1 t/m 9

1. *Road safety in the Netherlands*
2. *Selection and training of older road users*
3. *The use of alcohol and drugs by motorists*
4. *Young/novice driver behaviour, the limitations of driver training and the potential of graduated licensing*
5. *Advanced Law Enforcement & Response Technology ALERT*
6. *How to look at the Interactive Highway Safety Design Model (IHSDM)?*
7. *Safety Management Systems: good practices for development and implementation*
8. *Road Safety Audits: how to prove their benefits?*
9. *Volpe: summary of 'Research topics of mutual interest'*

Bijlage 1 Road safety in the Netherlands

1.1. Background Data

The Netherlands is a small country (41,028 km2), dense populated with 15.650 million inhabitants. The country has about 113,000 kilometer of paved roads, half inside and half outside urban areas, 2,200 kilometer of motorways, and added to that 19,000 kilometer of cycle tracks. About 6,750 million motorvehicles are registered (5,750 million passenger cars, 700,000 heavy goods vehicles/buses/vans, 335,000 motorcycles) and almost 13 million bicycles and 500,000 mopeds.

So far this century, more than 100,000 people have been killed in road accidents in the Netherlands. During 1997 there were 1,163 road deaths and about. 20,000 victims were admitted to hospital. A further 100,000 were treated in the Accident and Emergency (A&E) departments of Dutch hospitals. It is estimated that annually, there are at least one and a half million accidents with slight injury or Material Damage Only (MDO). As in most countries, road accidents are recorded by the police. It is well known that some of the accidents that actually happened are not recorded by the police. For this reason, there have been many attempts in the Netherlands during the last few years, to establish how many accidents and casulaties there really are. These numbers presented here were not obtained from the police but from specific research projects.

The costs of road accidents have been recently estimated (Muizelaar a.o., 1995). For the 1993 estimates, the costs were divided into medical costs, the so-called gross costs of loss of production, the material costs, and the costs of handling accident consequences. The estimates totalled up to 9.3 billion guilders (4 billion ecu). To these the costs of prevention (of accidents, casualties, and material damage) can be added; these are 3 billion guilders. The costs of road accidents in the Netherlands are more than 2% of the Gross National Product (GNP). These estimates do not take the cost of social (emotional) damage into account. By comparing other countries in Europe, the costs of social damage are estimated to be 2.8 billion guilders.

Fortunately, the suffering caused by road accidents has proved not to be unassailable. The annual number of road deaths is now less than 1,100, whereas in 1972 it was 3,264. During this period the total distance travelled rose by 120% to 220 billion kilometres, whereas the number of casulaties fell by 30% and the number of killed people by 65%.

The development of road safety since 1950 can be described as a product of the death rate (deaths per unit of exposure) and the total distance travelled (see *Figure 1*).
The decrease in the death rate (deaths per billion vehicle kilometres) was not as strong during these years. For example, during the period 1973-1985 there was a very rapid decrease of 9% each year, with an extreme of as much as 13% each year during the period 1973-1975.

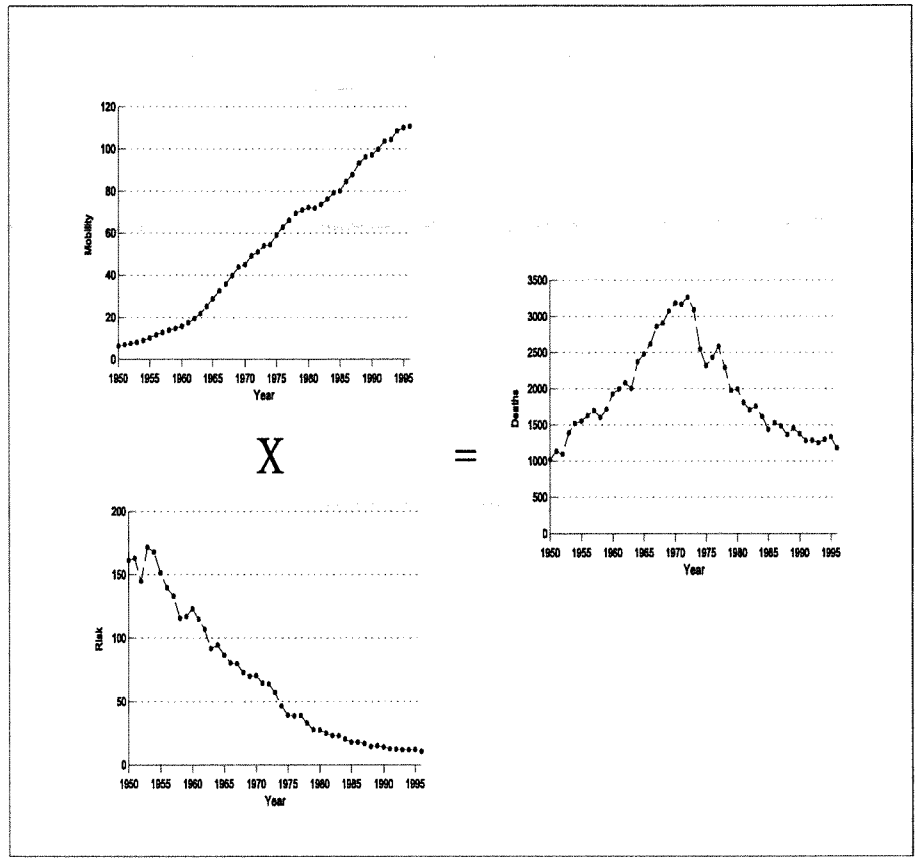

Figure 1. *The development of road safety since 1950, as a product of the death rate (deaths per unit of exposure) and the total distance travelled.*

Since 1985 the decrease was 4.5% per year. During the last few years this has been no more than a little above 1%.

In order to compare the road safety in the Netherlands with other countries, the number of victims (deaths) can be related to the population (mortality) and to the amount of traffic. In 1997 the mortality in the Netherlands was 7.4. This means that the Netherlands are in the 'first division' of the safest countries in Europe. The average of the countries of the European Union is 12.0. Compared with other countries of Europe, the Netherlands had the greatest reduction in mortality since 1970: 69%. Since 1990, the mortality in the Netherlands decreased by only 12%, whereas in other countries this was more than 30%. The Netherlands is thus being demoted from the first division.

Relating the absolute numbers to the numbers of vehicle kilometres, is a good indicator of the quality of road traffic. The Scandinavian countries, but also for example Switzerland and the United States score better than the Netherlands.

1.2. History: road safety situation, policies, plans, and programmes

Road safety policy in the Netherlands can be roughly described as a number of generations of measures. This is shown as a diagram in *Figure 2*.

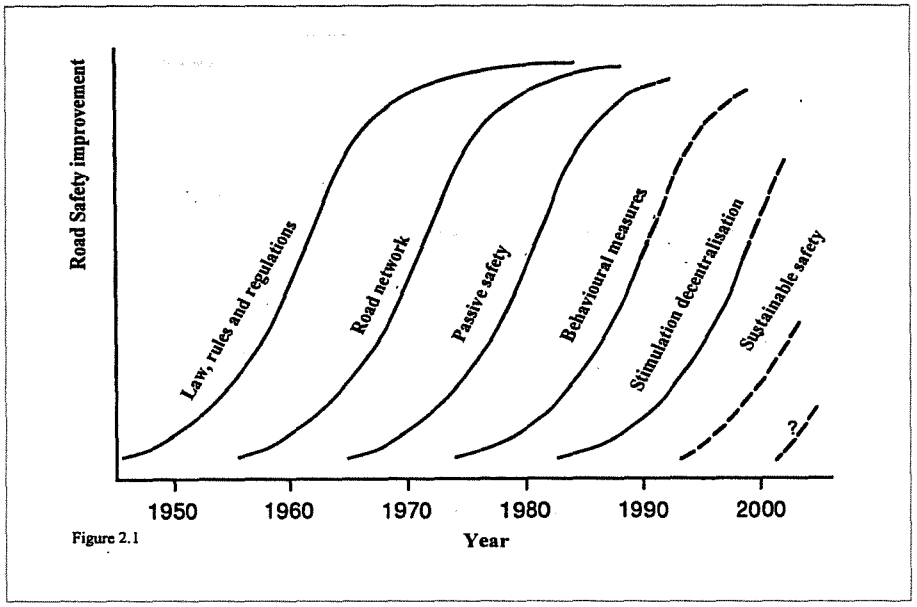

Figure 2. *Number of generations of road safety measures in the Netherlands.*

Up to 1965 the policy could be described as 'be a gentleman in traffic'. During this period the mass-motoring had begun (1965: 100 passenger cars per 1,000 population). The first generation of safety measures concerned the Highway Code: the Road Traffic Law of 1951 and the Traffic Regulations and Road Signs of 1966. The responsibility for looking after safety lay with private initiative and the police. The authorities announced that road accidents were for 80 to 90% the result of irresponsibility, recklessness, and carelessness; in other words, the road users were to blame. What was needed was education and strict punishment of those who had been guilty of 'traffic misbehaviour'. This was seen as the solution: legal force, born of the idea of repression. In 1962, SWOV was founded by the Ministry of Transport and by private initiatives (Royal Dutch Touring Organisation ANWB and insurance companies). Parliament asked for a Safety Plan and SWOV produced this in 1965.

The second generation of measures concerned road building, and especially building motorways and rural through-roads. The slogan was then 'building on our future'. This development anticipated a colossal growth in the amount of motorised traffic (from 100 passenger cars per 1,000 population in 1965 to 250 in 1975). At the end of 1970 Parliament handled a 'memorandum of oral pleading' from one of the political parties. It took until 1973 before a coordinating minister for road safety was appointed, together with a ministerial office for road safety, and a consultancy body. It was in this period that a number of effective steps were taken: laws concerning: wearing crash motorcycle helmets (1972); drunk driving (1974); and wearing car seat belts (1975). These individual measures were prepared by a highly motivated minister. During the first Oil Crisis (1974) measures were taken to reduce the speed limit on motorways (actually to save fuel) but it had a positive road safety effect. In 1975 a Road Safety Policy Plan was produced. This consisted of a long list of measures without there being an explicate vision of the future. Policy was still targeted at adapting the infrastructure to an ever increasing demand for more room.

However, at the beginning of the seventies, an opposite aim appeared: not just sacrificing public spaces to the growing traffic, but also increasing the quality of life and road safety in urban areas. The first 'woonerf' was developed in the borough of Delft, first illegally, but later (1976) it was legalised. The government decided in 1975 to conduct a large scale experiment to investigate the possibilities of rearranging and redividing urban areas. The experimental projects started in 1976 in Rijswijk (a suburb of The Hague) and Eindhoven (a city of approx. 200,000 inhabitants).

During the period 1975-1985 (1985: 318 passenger cars per 1,000 population) the effects became visible of the measures regarding alcohol, seat belts, crash helmets, and speed limits. These years showed a very large drop in the death rate. Especially in urban areas attention was paid to subjective safety. Not everything can be expressed in the number of casualties; also relevant are what citizens experience. More attention was also paid to vulnerable road-user groups such as children, the elderly, pedestrians, and cyclists.

The main responsibility for carrying out policy remains with the national government. Financial stimulation rules are laid down so that, via subsidies, borough councils are encouraged to introduce 'woonerfs'. The same applies to build (separate) cycle tracks and other cycle promoting facilities.

During this same period important steps were taken to further improve the 'safety of vehicles'; especially the passive safety was greatly increased by the introduction of crush zones, rigid occupant compartments, and soft-and-rounded surfaces.

During this period it was realised that not all problems would be solved simply by improving and adjusting the infrastructure and improving vehicles. It also became clear that the necessary budgets were not available. Thus the slogan 'not only infrastructure, or is it?'. This (fourth) generation of measures concerned influencing behaviour through combinations of laws, information, education, surveillance, and infrastructural facilities. This especially applied to renewed and intensified police surveillance of drivers' alcohol usage, the broadly imbedded alcohol information, and the manufacturing of low-alcohol drinks.

The fifth generation of measures (1985-1995), in 1995 (365 passenger car per 1,000 population), with the slogan 'decentralisation without full accountability', was more organisational than substantial. The commitment started in the second half of the eighties with a quantitative goal of 25% less victims in 2000 compared to 1985. This was later extended to 2010 with 50% less killed and 40% less wounded. This goal lead to the 'Action -25%'. It was aimed to stimulate boroughs to pursue more, and a better, policy. Another important organisational step was to set up a Regional Committee for Road Safety in all twelve of the provinces. This organisation was originally part of the national government and they therefore financed it. In the meantime decentralisation agreements have been signed and the provinces now finance them.

In 1990 it was realised that a new vision had to be developed in order to achieve a further improvement in road safety. The existing system, historically-grown, and constantly adjusting to the growth in traffic, is inherently unsafe. Furthermore, there was increasingly more attention paid

to the social costs. This lead in 1992, with the slogan 'towards a sustainable development', to the launching of the idea of sustainable safety.

1.3. Today: characteristics of road safety policy in the mid nineties

1.3.1. *Introduction*

The present policy can be characterised in short by the following:

- There is a great deal of social and political attention paid to the improvement and extension of the physical transport infrastructure seen from the problems of congestion and accessibility. Road safety is trying to take advantage of this development by ensuring that the road safety effects are automatically taken into account whenever important decisions have to be taken. Another important point that political discussion takes into consideration, is control of the costs of health care. Also the question as to whether and how the prevention of the results of road accidents can play its role in this discussion.
- The concept of sustainable safety has in the meantime become a pillar of road safety policy in the Netherlands (Wegman & Elsenaar, 1997). On the one hand, this concept gives substance to decisions about physical planning and the infrastructure. On the other hand, the further development of this concept has given a fresh impulse to road safety policy. An initial programme has been set up and approved by the central government, provinces, boroughs, and water boards. Demonstration projects are being carried out to gain practical experience and to establish guidelines for the facilities and design of roads. In all these, the concept plays an important role.
- For a number of traditional road safety subjects: drink-driving, driving at appropriate speeds, and the use of seat belts; a new profile is being looked for. This in combination with a renewed and greater commitment of police and the courts, in order to increase surveillance.
- The decentralisation of policy has lead to a number of road safety responsibilities being explicitly the task of local governments. These bodies, however, do not yet know exactly how to handle them.
- Government budgets available for improving road safety do not seem to be sufficient. This has lead to discussions about alternative financial sources for preventing (the consequences of) road accidents. These sources lay outside the regular government bodies.
- A final area of importance at this moment in time is the application of developments in telematics (ITS) to improving road safety.

1.3.2. *The organisation of policy*

Members of Parliament in the Netherlands traditionally have had a certain interest in road safety as an issue. This means that the subject is discussed at least once each parliamentary year in a commission. Considerable influence can be exercised. Parliament is now looking for another role now that the Minister of Transport (the central figure in the Netherlands' road safety policy) has, after getting Parliament's approval of decentralising the carrying out of policy to the provinces and boroughs. This decentralisation impulse is not limited to road safety but is part of a new political culture of deciding policy centrally, but carrying it out somewhere else. The organisation of provinces and boroughs is an important factor in this. Within the central government there are few practical possibilities to steer or

influence other ministries in the direction of road safety goals. This is especially true in the cases of education, police, and environment. Even within the ministry where road safety is a separate unit (the Directorates of Personal Transport and Safety & Vehicle) there are no guarantees that 'hard' methods will be used to explicitly let road safety arguments play their proper role.

A consultation exists between the minister and private organisations to discuss various road safety matters. It is not clear how this works. All types of organisations are represented; some with the goal of increasing road safety, some with other goals in which safety plays a certain part.

1.3.3. *Road safety plans and programmes*

In the Netherlands, the road safety programmes are traditionally written by the Ministry of Transport. Consulting with 'third parties' is done in a number of ways. The plans are always debated in Parliament. In addition, they are discussed when the ministry's budget is being dealt with. As preparation for such parliamentary debates, the members of parliament obtain information from road safety organisations and others. The character of these plans has changed from being aimed at execution, to being aimed at strategy. Since 1986 the Netherlands has a quantitative goal for 2000. Since then, the discussion on how to continue has started.

When decentralising the execution of policy to the twelve provinces, it was agreed that every province would make a plan on how to fulfil their new role. Such a plan exists in all provinces. A first evaluation of these plans showed that there is room for improvement in making such a plan; but a start had been made.

When adapting the infrastructure, road authorities let themselves to a large extent be lead by guidelines (motorways and trunk roads) and (urban) recommendations. The Information and Technology Centre for Transport and Information CROW plays in this process a central and coordinating role. The development of the 'sustainable safe' concept has lead to the situation that, when the guidelines were revised, an important contribution from sustainable safety was expected. Some are even of the opinion that such attention is exaggerated. An important step in this process was the publication of a Handbook for categorising roads on a sustainably safe basis (1997).

Within the framework of the initial programme Sustainable Safety, it has been decided to experiment with a Safety Audit for two years.

1.3.4. *Road safety budgets*

In order to estimate the costs of preventing road accidents: research, information, driving courses, vehicles, and infrastructure; many assumptions have to be made, just as when it concerns so-called settlement costs of road accidents (police, fire brigade, and courts). The most recent estimate (1993) indicates a total of 3 billion guilders. Maybe the increase in the costs of 30% in 10 years is of even more importance.

1.4. Future: further developments

It is of course no easy matter to say anything certain about future developments. Especially if the future is not autonomous, but is influenced by human decisions and actions. Much can be said about a desirable future for road safety. This desirable future includes policy making and execution of measures, as well as the substance of these measures.

An AGENDA 2000 +

- A strategic approach based on a vision, with solid goals in which participants retain sufficient room for flexible execution.

- Integration of three goals:

1. accessibility/economic development;
2. environment and road safety (the substance as well as organisational Town and Country Planning procedures);
3. mobility and infrastructure policy.

- A clear role for government and its various parts and levels.

- Increase of public support for and recognition of the approach to road safety problems, as well as an increase of acceptance of the necessary measures.

- Foundation of a rational way of grouping measures.

- Improving, among road safety professionals, the ability to learn.

The following subjects should be central in the Netherlands:

- The sustainable safe vision to be executed on a large scale, and in a uniform, consistent, and systematic way.
- Target ITS applications in such a way that the most unsafe types of roads (urban through-roads and rural roads) and the most vulnerable groups of road users (children, the elderly, pedestrians, and cyclists) should benefit from the positive effects.
- Improve (internationally) vehicle quality ergonomically as well as crash-worthiness.
- Directed and sharpened attention for self-evident dangerous behaviour: driving under influence, driving at unsuitable speed, and driving without protection devices (seat belts, child restraint seats, crash helmets) and massive information (campaigns) and police surveillance.

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Bijlage 2 Selection and training of older road users

2.1. The subject in its context

Older people are forming an ever increasing part of the numbers of road users. Car driving is one of the most use-friendly of the various modes of transport. It is also regarded as being socially safer. There are, however, a number of negative aspects of car driving that especially effect older people. Firstly, physical vulnerability increases with age. Accidents are generally much severer for older people than for those younger. In addition, the sensory, perceptive-motorial, and cognitive abilities decline together with the degeneration processes and illnesses of old age.

It is the general aim of Dutch government policy to ensure that the elderly (or 'senior citizens' as they are known as in America) continue to play a long and full part in society. Part of this is being a good and safe road user.

Generally speaking, there are three main ways of promoting the road safety of the elderly:

- The first is: preventing avoidable aging. The inevitable reduction in functions can be delayed considerably by continuing to exercise them, also in traffic. A consequence of this is to remain a road user as active as possible .
- There is condition for remaining a road user; this is the second; viz. the traffic infrastructure must be adapted to safe use, also for the elderly road users. To achieve this the Dutch government is working at creating a 'sustainable safe' traffic and transport system. A starting point for sustainably safe is 'it is people that count'. Situations can become a problem for older people sooner than for the young, e.g. simultaneously performing the multiple tasks of being in traffic, when in a hurry and under other unfavourable conditions. This can be partly met in the design of a traffic infrastructure.
- A third way is that the elderly are also able to be safe in the traffic and transport system. To enable them to do this, information education, and (self) selection is necessary.

In this coherence of promoting safe traffic among the elderly now, the third way includes the theme of diagnosis of capabilities, selection criteria, encouraging self-selection, tuned training and education of and for elderly road users.
The emphasis here will concentrate anyway on the elderly car driver. However, elderly pedestrians and (for the Dutch situation especially) cyclists are just as important.

2.2. Screening, diagnosis, and selection in relation to information and training

It is assumed that there is a relatively large amount of knowledge about those characteristics of getting old which are relevant for being an adequate road user. Research in America has made an important contribution.

Much of this knowledge and research have up till now concentrated on the 'measuring' those aspects of human behaviour which accompany getting old. These include: observation acuity, contrast sensitivity, useful field of

view, reaction times, speed and distance perception, critical gap acceptance etc. Such knowledge is essential for the adaptation of designs and constructions of many traffic utilities to being suitable for the elderly. Or being a basis for judging their ability to be road users.

However necessary it may be to increase this sort of knowledge, it would seem to be time to examine the following: to what extent can existing knowledge be put into operation in order to (be able to) judge the abilities (of the functions as road user) of individual road users who are experiencing the declines of old age.
A choice can be made between types of testing that fit the driving behaviour actually shown (such as in driving skill trips) or measuring the more elementary types of functioning. In both cases it is necessary to take into account the fact that traffic behaviour can be distinguished at strategic, tactical, and operational levels.

Establishing criteria and norms, screening procedures, and diagnosing the shortcomings of the functioning of car drivers in traffic, etc., or in other words to pass judgement, can be seen as a first step. The purpose of this step is not to remove people from traffic. On the contrary, its purpose is to find a reliable foundation to enable them to remain in traffic and function adequately.
The next step is to provide suitable information and training for the elderly and others who need it, in order to compensate for the shortcomings found.

The before mentioned does not say that a diagnosis can not indicate that further traffic participation is irresponsible. Nor that training etc. can not compensate for the shortcomings found. On the contrary, done in such a way, the diagnosis leads to the correct conclusion. The present selection and test procedure in Holland leaves something to be desired.

Well-founded and relevant information can also form a prerequisite for self-selection of the people it concerns.

As far as information and training programmes are concerned, it can be maintained that much development is needed, especially concerning traffic participation. The necessary knowledge and experience already exists for the general practising, teaching, and training of the elderly. In passing, we would like to mention that the driving skill trips in Holland (known as BROEM) are of course a sympathetic initiative that also appeal to many elderly road users. However, their foundation is rather shaky.
It would seem both possible and sensible to make such programmes specifically relevant for road usage.

Information and training of the elderly has an important educational purpose; to enable them to exercise the various traffic tasks in a way that suits their own abilities. For example, information and training can aim at advising and supplying compensatory strategies as to how they can best deal with certain traffic situations.

2.3. Research themes

In the light of what has now been established, there are two subjects or themes for which cooperation can be strived for:

- Developing a diagnostic instrument regarding the traffic participation of the elderly. On the one side one can think of applying a large scale instrument; and on the other side, an aid for self-diagnosis.

- Developing educational aids such as information and training programmes that compensate the various shortcomings that can effect the elderly in traffic.

Besides, another topic of interest should be adapting the design of the traffic infrastructure and traffic regulations to being suitable for elderly drivers.

Bijlage 3 The use of alcohol and drugs by motorists

From 1970 on, SWOV has conducted periodic roadside surveys into the alcohol use of motorists. These surveys were conducted in Autumn weekend nights, between 10 pm and 4 am (Mathijssen, 1998a).
In the 1997 roadside survey, motorists in nine selected areas were tested not only for alcohol but also for a number of licit and illicit drugs: (meth)amphetamines, cannabis, cocaine, opiates, methadone, benzodiazepines, barbiturates, and tricyclic antidepressives (Mathijssen, 1998b).

In the 1997 roadside survey, 10.0% of motorists tested for alcohol (N = 22,614) had a BAC > 0.02%; 4.3% had a BAC > 0.05% (the legal limit); 2.1% had a BAC > 0.08%; and 0,6% had a BAC > 0.13%.
In the nine selected areas, 8.5% of motorists tested for drugs (N = 293) proved to be positive, 7% being positive for illicit drugs, and 2% being positive for both drugs and alcohol (BAC > 0.02%). Especially among male drivers in the age of 18 to 25 the incidence of illicit drugs was found to be high: 17.5% tested positive. The vast majority of these tested positive for cannabis, while an occasional subject also tested positive for cocaine or amphetamine.

In the near future, special attention should be paid to the relative accident risk after (illicit) drug use, by means of epidemiologic research. This research should compare the incidence of drugs in a sample of drivers not involved in accidents with the incidence of drugs in a sample of drivers involved in accidents. Both samples should be extracted from the same population.

A major problem concerning the use of alcohol by motorists is the increased drink driving by male motorists in the age of 18 to 25, since their relative risk is twice as high as for older male motorists. In the 1991-1993 SWOV roadside surveys, 3.2% of young male drivers had a BAC > 0.05%; in the 1994-1996 surveys 3.5%; and in the 1997 survey 3.9%. While forming only 5% of the population of the Netherlands, their share in alcohol-related fatalities and serious injuries is around 22%. An important measure to be taken might be a zero tolerance law for novice drivers, in combination with a 2-year period of probationary licensing.

On June 1st, 1996, new administrative measures against the hard-core drinking driver have become effective in the Netherlands. In short, the content of the measures is as follows:

- First offenders with a BAC between 130 and 210 mg/100 ml, and recidivists with a BAC between 80 and 210 mg/100 ml, are obliged to follow a three-day educational course at their own expense (c. $ 425). If they have caused a serious accident, they are not allowed to follow the course. This being the case, they have to undergo a medical examination in order to establish their suitability for driving a car.
- First offenders with a BAC > 210 mg/100 ml and multiple recidivists also have to undergo a medical examination.
- The driving license of first offenders with a BAC > 250 mg/100 ml is suspended, awaiting their medical examination. The same applies to multiple recidivists.

- The sanction for not attending the three-day educational course, is that the offender's driving license is suspended until the result of a medical examination is available.
- If the result of the medical examination is negative, the offender's driving license is declared invalid.

In 1997, 8,475 drivers had to follow the three-day educational course, while 3,559 had to undergo the medical examination. The effect of these measures should be evaluated in the years to come.

In each of the three fields mentioned above, the Netherlands is interested in co-operation with the USA.

Bijlage 4 Young/novice driver behaviour, the limitations of driver training and the potential of graduated licensing

4.1. Introduction

'Graduated driving license system' is a concept that has been used to coin systems of licensing that have in common the objective to introduce new drivers in a stepwise manner into the traffic system. How this is achieved differs widely between the applications. But in essence the following components can be part of it:

- Restrictions in order to control task load such that young drivers do not get in traffic situations they are not able to handle. Examples of such restrictions are night time driving curfews, zero alcohol limit, a ban on passengers etc. These restrictions are (gradually) lifted when driving skills have reached adequate levels.
- Training of skills and feedback on driving performance (for example going to a driving school for extra lessons).
- A strict penalty regime on violations (point demerit system) sometimes in combination with the obligation to carry plates indicating that the car is driven by a new driver.

Up to now the safety effects of graduated driving licenses have not been evaluated in a systematic way. Sometimes there is evidence of effectiveness of elements but than the combined effects are not known.
Moreover in some cases evaluations have only looked at the effects without considering whether the measures were implemented in an adequate way. For example a lowered alcohol limit will - most likely- not be effective if the police does not enforce the limit.

In the face of limited evaluation data and the necessity to estimate the potential of the graduated driving license systems, we need to turn to the fundamental questions and those questions are:

- What are the characteristic of the problem that needs to be 'solved' by graduated licensing systems?
- What components need to be part of such graduated systems, so that the problems are dealt with?

First of all we describe how novice driver performance differs from expert driving. To understand what is involved in the process of becoming an expert driver, we first describe the driving task and how driving skill is mastered, with particular reference the important role of consistent feedback. In other fields and also in driving, 'formal training' is frequently used to teach a skill, in order to understand the potential of graduated licensing systems, we need to consider the advantages and limitations of formal training. These limitations of a formal training system, in combination with the problems of young drivers, show the necessity of a licensing system that provides more support than only instruction. However, before discussing this further, we need to address the questions whether the problem of the young driver is a problem of all young drivers or that it is problem that is concentrated in a relatively small group of problem drivers. If it is a problem of all drivers than the graduated driving license system should address the

generic problems. If it is only a small group than the system should concentrate on this particular group, provided that this subgroup can easily be identified and that individuals can be targeted for specific 'treatments'. Important subgroups are: the young inexperienced drivers versus the mature inexperienced driver, male versus female drivers, and specific life style groups.
On the basis of the young driver problems, the limitations of formal training and the subgroup analysis, the potential of graduated driving licenses and the necessary components are identified and discussed.

4.2. Young driver characteristics

Driving performance of young/novice drivers falls short in many aspects, such as adequate speed choice (Van de Velde Harsenhorst & Lourens, 1988, 1989; Forsyth, 1992b; Schlag et al., 1986), visual search (Mourant & Rockwell, 1971; Cohen, 1985) and safety margins (Quimby & Watts, 1981). These inadequacies may certainly contribute to the high accident risk of young/novice drivers. However, the next question is: why do they drive in this manner? There are many factors that are contributing to inadequate performance on the one hand and accident risk on the other hand. These factors are associated with:

- immaturity (Hale & Glendon, 1987);
- limited hazard perception skills (Soliday & Allen, 1972; Brown, 1982);
- high risk acceptance (Moe & Jensen, 1993);
- overestimation of driving skills (Moe, 1987) in combination with underestimation of the complexity of the traffic situation (Matthews & Moran, 1986; Brown & Copeman, 1975);
- lack of robust driving routines;
- high exposure: youngsters drive a lot, especially young men often under more dangerous conditions such as the weekend nights (Weissbrodt, 1989; Forsyth 1992b; Van Kampen, 1989);
- overload due to limited capacity to attend to all stimuli (Milech et al. 1992);
- life style: explore new situations, seek company of friends, show off and enjoy competition, conform to peer group standards.

4.3. The driving task and how driving skill is developed

4.3.1. *Learning to drive*

Driving is a complex task that requires fast responses to fast changing situations, in which attention should be paid to many aspects simultaneously. Driving is not complex in terms of vehicle control, such as steering, braking, shifting gears etc. The complexity of the task is more of a cognitive nature. It implies the ability to detect and evaluate dangers and to foresee that an apparently 'normal' traffic condition, may change in seconds into a 'dangerous' one. This is a cognitive ability that needs to be developed. Moreover its application should also be more or less automatic, otherwise, the task of driving may exceed the resources of human attention and awareness. As a result drivers may become exhausted after only a short while (Shiffrin & Schneider, 1977).
Furthermore, behaviour that is not automatic (= needs attention and controlled processing) is more prone to errors, in conditions of high

information load and time constraints. This proneness to errors is intensified by stress factors. Stress factors negatively affect driver performance, especially the performance of inexperienced drivers. Examples of stress factors with known effects include haste, tiredness, but also alcohol in low doses.
With experience, that is practice on the task, driving (not only vehicle handling but also higher order skills such as hazard perception and application of traffic rules) becomes automatic, so that attention can be devoted to other matters. "The major difference between novice drivers and experienced drivers is that the novices have an inadequate repertoire of routine actions (automated actions) at their disposal therefore have to perform many driving activities at the lower level of functioning of conscious behaviour" (Heinrich, 1990).
The other side of the concept of automation is that it can lead to inadequate and inappropriate behavioural routines becoming 'ingrained'. Erroneous routines will easily creep in, if feedback on the quality of the performance is low. Not only routines have to be trained. It is even more important to teach, to which classes of traffic situations these routines apply. Or to state it more broadly, training experiences in specific traffic situations need to be generalised to other similar traffic situations (Rothengatter, 1985). The prevention of errors in these generalisations might be of more importance to traffic safety than to prevent errors in the action routines themselves.

4.3.2. *The role of feedback in the learning process*

The above illustrates the important role of feedback with the correct acquisition of new skills. Learning through experience is the adaptation of behaviour because of feedback.
In the daily traffic environment, feedback will not consistently 'occur' in every situation. Furthermore as a car driver, one is in a physical and social sense isolated from others. Physical isolation can lead to a driver not noticing signals from outside. Social isolation can lead to feelings of 'detachment' from the rest of the system, and this may reinforce the illusion that one is invincible (Hale & Glendon, 1987). Moreover, the novice driver lacks the cognitive ability to identify and evaluate the signals that might suggest inadequate performance on his part.
This indicates that 'learning' on one's own is seriously confined due to the absence of essential feedback. It is unlikely that learners will receive appropriate feedback and this may lead to reinforcement of undesirable driving behaviour.

In contrast, in driver training, the instructor can provide immediate feedback and can show the pupil the correct behaviour. This teaches the correct behaviour at the initial stage of skill acquisition, before the bad habits are formed and ingrained. In this respect it is to be expected that driver training is superior to 'practice on one's own'. Furthermore, the instructor may play an important role in structuring the task of the learner, so that his task load is not so great that it makes him unable to assimilate and process the feedback. He may organise his instruction, so that skill acquisition is built up hierarchically and in modular fashion. First the basic skills must be learnt, after which more complex skills can be trained. The learning process should therefore not simply aim to having the novice imitate the expert's example. He should learn in a stepwise progress, with a set strategy per phase adapted to the level of skill acquired.

Additionally, the instructor may be an influential model (Bandura, 1977) for the transmission of 'safety related behaviour and attitudes'. The small number of studies that relate to the learning of safe behaviour shows that the instructors of security devices represent the most important factor in explaining the difference between groups of students with respect to the use of security devices (Hale & Glendon, 1987). There is no known study regarding such effects about the behaviour of drivers. It is recommended that we study the effects of 'model behaviour' on the behaviour of young drivers. An obvious object of study in this context could be the 'driving behaviour' of driving instructors.

4.4. The inherent limitations of driver training

A driver training course is subject to inherent limitations. For example, there is limitation in course duration. The skill must be acquired in a restricted number of lessons. Certainly after a limited period of lessons taken, one may assume that 'learning' as a process does not stop. The novice learns new behaviour and so modifies behaviour (De Velde, Harsenhorst & Lourens, 1988). Particularly higher order skills, such as taking decisions, develop slowly and require much more practice. Apart from limitations in time, a limitation in circumstances is also applicable. Not all critical traffic situations present themselves during the lesson time and consequently after the driving exam the novice driver has to master and cope with these situations on his own.

So, after the driving exam, teaching may stop, but learning continues. Some studies have addressed the question of how the novice driver responds to this period himself with respect to attitude development, skill developments, and developments in mobility.
The results show that:

- driving style is changing considerably over time: driving speed goes up and errors in driving routines develop (De Velde Harsenhorst & Lourens, 1988, 1989; Forsyth, 1992b, Rolls et al, 1991);
- Driving performance falls below test standards after qualification (Vissers, 1990; Forsyth, 1992b, Rolls et al, 1991).

So these findings suggest that only improving driver training will not be sufficient. Besides the improved driver training, in the post-exam period safe driving circumstances should be created to enable young/novice drivers to gain experience safely and to stimulate a safety-oriented attitude. A problem of all drivers or only a subgroup?

4.5. Important subgroups

4.5.1. *Young and/or new to the road*

Mayhew & Simpson (1990) reviewed studies on the relative importance of factors associated with age and driving experience in collision involvement. They conclude: "given the apparent importance of the issue, relative few studies have actually attempted to disentangle the effects and have clearly established the separate roles of youthfulness and experience in collision involvement. Those few studies that have been conducted defined driving experience in different ways and most often produced contradictory results. Several studies have found that age is the more important factor in collision

involvement; others have shown that the accumulation of driving experience plays the dominant role, and still others contend both factors - age and driving experience - in collision rates. While no clear picture emerges, the review of the literature suggests that both age related factors and lack of driving experience account for some of the higher crash rates of young drivers - the relative contribution of these factors remains unknown. This is partly attributable to the fact that other mediating factors in the relationship, such as exposure and self-selection are seldom accounted for in the analysis" (p. 92).
Mayhew & Simpson consider the relative contribution of age and experience important as "changing demographics and licensing patterns (in Canada) indicate that older people constitute a relative larger share of the new driver population."

Implication for the licensing system
With respect to the age/experience groups the discussion is whether a graduated driving license system should apply to all inexperienced drivers (irrespective of age) or that it should apply to the young inexperienced drivers only. Looking at the learning process and the slowly developing skills it is rational to apply such systems to all inexperienced drivers. Although most of the studies on accident risk in this field are methodologically weak, these studies indicate that especially the young inexperienced driver is at risk, and that the accident risk of more mature novice drivers is only slightly raised. This supports the need for a system that targets youngsters in particular and does not curtail the 'rights' of mature novice drivers. Looking at the pros and cons, this issue may appear rather fundamental in the licensing debate. From a more practical point of view, the issue is a non-issue, as more than 80% (rough guess) of the novice driver population is between 18-24 years old.

4.5.2. *Gender differences*

The above mentioned factors are applicable to all young and novice drivers. However not all young drivers have the same accident risk and some identifiable groups of young drivers are more at risk than others.
One such a subgroup is the male young driver. His accident risk is about twice as high as that of the young female driver (Twisk, 1994).
The difference becomes even more distinct in specific driving circumstances, such as driving during the weekend-night.

Implication for the licensing system
It is unlikely that in any formal licensing system it is accepted that candidate drivers will be treated differently dependent on whether they are male or female. So, although there are differences in accident risk the same system shall apply to both sexes.

4.5.3. *Lifestyle differences*

Also more detailed studies of background variables show that at a group level, particular values, preferences, attitudes and behaviours (lifestyle) are associated with good or poor traffic safety records.
These studies have shown that deviant driving styles may be concentrated in small sub groups (Jonah, 1986b), such as DWI (Elliott, 1987), and that motives for DWI differ so widely that marketing techniques should be used to become more acquainted with the target groups in the interest of effective

education (Lastovicka et al, 1987). Furthermore, within these subgroups combinations of risky traffic behaviour occur, e.g. no use of safety belts, DWI, high speed. Jonah & Dawson (1987) call this the 'risk syndrome'. A large scale four-year longitudinal study showed that young people who became involved in motor vehicle collisions were more likely than non-crash involved youth to engage in a variety of high risk, and health compromising behaviours such as drug use, heavy drinking and other negative health behaviours (Beirness et al, 1993). Also a relationship with petty crime was found (Maron, et al., 1986, cited in Jessor, 1987).

A German study showed that the presence of extra driving motives was connected with particular lifestyles that differed in leisure preferences, choice of clothes and music choice (Schulze, 1990). A Swedish study managed to relate lifestyle to accident risk. Lifestyle groups accident risk (accidents per licence holder) varied from 150% over-risk and 75% under-risk (Gregerson & Berg, 1993). This pattern may be the result of different levels of exposures between the lifestyle groups but also reflect differences in driving style.
In keeping with previous work, Ingham et al. (1994) reported that there is a large within age group variation, showing that about 2/3 of the young driver group did not differ from the older more experienced age groups, with respect to self reported violations, attitudes and at fault accidents. Roughly about one-third are particularly risky. A comparison of the most safe young drivers with the least safe drivers showed that:

- there were no clear differences with respect to social class or level of education received;
- unsafe drivers had higher ratings of their own ability;
- they did not believe that they were unsafe, and they underplayed their own potential contribution to accident involvement;
- they are more affected by social influences such as the presence of passengers;
- differences between the group are related to motivation rather than to (lack of) skills.

It may be concluded first, that different lifestyles are associated with different accident risks, and that prevention could aim at the underlying personality and environmental factors that predispose particular groups to risk-seeking behaviour. It also implies that preventive measures do not need to be related to traffic and participation in traffic, but may focus on an entirely different field.
Secondly, prevention may already start at the pre-driver training stage, for instance in secondary school. Ingham et al. (1994) developed a teaching module aimed at affecting social norms about safe driving and directed at the final year of secondary school. An evaluation study showed that especially those youngsters at risk (that is with negative safety attitudes) changed towards more positive attitudes.

Implication for the licensing system
Research indicates that youngsters differ in accident risk and that these youngsters differ in lifestyle/personality from youngsters with a lower accident risk. However these findings do not provide us with the tools to successfully identify those drivers before the accidents actually happen. In addition problem driver accidents only constitute a relatively small part of all young driver accidents.

If it is assumed or contended that the young problem driver sub-group warrants specific attention due to their frequency of crashing two further problems remain:

- There is no agreed definition of a young problem driver and even very good, current identification procedures using crash, violation and demographic information are very inefficient. While managing to successfully identify some problem drivers, they only do so with a large false alarm rate (that is, substantial numbers of non-problem drivers are falsely included as problem drivers).
- Currently there is very limited ability to actually treat identified 'problem' drivers through driver improvement programs and the like which are designed to reduce their risk of crash involvement. Even if effective programs could be developed, they would be unlikely to be cost-beneficial due to a combination of small treatment effects and the application of such programs to drivers who do not warrant inclusion in the treatment program (the false alarm drivers).

On this basis, action designed to focus specific attention on young problem drivers should be accorded low priority relative to the development and implementation of young driver safety initiatives.

4.6. Safety potential of graduated licences

The application of a graduated driving licence is about the only possibility to assure safe driving conditions after licensing. Such a graduated driving licence is characterised by measures directed at novice drivers, that do not apply to holders of a full driving licence.
The objectives of graduated driving licences are:

a. To accomplish a protected (safe) learning environment after licensing.
b. To safeguard and to automate correct driving routines (e.g. correct visual search, accurate vehicle skills).
c. To foster a safety oriented attitude, which implies that novice drivers do not engage in wilfully committed traffic violations such as DWI, red light violations and speeding.
d. To teach and train higher order cognitive skills such as hazard perception and anticipation.

Taking the inherent limitations of driver training into account, it seems likely that graduated licence systems combining all four objectives will be the most effective in reducing accident involvement.

To achieve these objectives there are several components used in graduated driving licences, single or in combination. These are:

- the application of restrictions, to reduce exposure;
- the application of special enforcement regimes (penalty point system);
- additional training (second phase in education);
- continuous guidance (drive after licensing a period with a more experienced driver);
- to delay licensing.

A combination of components with the identified problem fields in young/novice drivers enables us to understand how these components may contribute to more safe novice drivers (see *Table 4.1*). The cell fillings are not based on empirical findings but are estimates of the potential of a component to positively affect the phenomenon. The table provides a

guideline to discuss the different programs that empirically have been tested. The complete programs can often not directly be compared as the elements of programs differ as well as the criteria used in evaluations.

Phenomenon	Cause	Graduated driving license				
		Delay license	Point system	Restrict driving	Training	Driving guided
Immaturity	biological + development	+++	+	+	0	+
Limited hazard perception skill	insufficient practice	+	+	+	+++	++
Overestimation skills	youthful optimism	+	0	+	+	++
Overload	limited automation in combination with high task demands	0	0	+++	0	++
Error prone driving routines	lack of feedback	0	0	0	++	++
High risk acceptance	a. not recognised	+	0	0	++	++
	b. high utility	0	+++	+	0	++
	c. thrill	0	--	--	0	+
High exposure	life style adolescence	+++	0	+++	++	++

Table 4.1. *Estimated effect of five components of graduated driving licences on the contributing factors to the novice/young driver risk.*

4.7. Research issues

Questions:

- How effective are graduated driving licenses ?
- How can graduated driving licensing systems succesfully and adequately be implemented, especially in countries in which a stepwise introduction also implies an infringement of standing rights?
- What is the role of formal training? How can it be made more effective? Some experts question the role of formal training and argue that it should not be a part of a graduated driving license system, as its effectiveness has never been demonstrated.
- What are effective ways of training higher cognitive skills (like hazard perception), how to test development of these skills. Do you only learn by experience?

Bijlage 5 Advanced Law Enforcement & Response Technology ALERT

Objective
A tentative judgement of the ALERT Advanced Law Enforcement & Response Technology system is given below.

Short description of ALERT
An integrated in-car computer based communication system, for management of emergency lights, siren, radar, radio, video and GPS. The system consists of an in-car computer, an in-car as well as hand-held touch screen display, a digital camera and a data communication system with police department. This colour display forms a common interface for all vehicle's control functions. A photo made by the digital camera is recorded on a removable PCMCIA card and is also transmitted to the printer in the car and from the car to the police department. Information from bar codes or magnetic stripes of e.g. a driving license can be read by a sensor attached to the hand held on screen display. For pursuits one touch on the screen will activate lights, siren and camera. A desired specific sequence of the operation of these functions can be managed by the system.
The geographical position of the police car can automatically be pin pointed using GPS. This ALERT system is in experimental phase.

Accident recording and citations
When an accident occurs a police officer can enter details of the accident on the required accident form, using the hand-held touch screen display.
For citations another form is used. Forms filled in by hand on the display are automatically converted into print letter.

Benefits
In the USA it is stated that the average time to clear accidents is 50 minutes. The expectation is expressed that 20 to 50% of this time can be saved by using ALERT. There is direct access to data sources, such as car ownership and criminal records. No long waits to collect information. This system can also be used for enforcement purposes and for other fleet owners such as fire brigades, emergency services and commercial vehicles. The possibility of errors will be reduced markedly. Dispatching help when needed to the location of the car asking for help can be done easily using GPS. Communication with trains for safely passing rail crossing is possible.

Functional requirements (Baker & Smith, 1997)
- Project ALERT should be expanded to include all first responders.
- Attention should be given to the supporting software and hardware infrastructure (CAD / records).
- System architecture should be designed to meet the needs of all departments (local, county, state, multi-agency and combined first responders).
- Methods of communication must include wireless, analog and digital. They must also be backward/forward-compatible.
- Software systems must have open architecture, and meet all federal- and state-mandated requirements.

- Hardware must be modular, as well as backward/forward-compatible to fit into a department's needs.
- Systems must be user-friendly through the application of graphical user interface (GUI), which allows users to select functions represented by pictures or graphical images.
- All transmissions and data must be encrypted during transmission to avoid interception and misuse.
- All systems must have manual back-up and over-ride capability.
- Training must be directed to the ability of the average officer.
- Hardware used must be off-the-shelf and easily repairable.
- Further it is also recommended that a national campaign be undertaken to educate the law enforcement community about Project ALERT and the need to plan for the future.

Tentative judgement

From management point of view efficiency is enhanced, as the position of every vehicle at any moment is known at the base station. Dispatching of the nearest free vehicle to an emergency situation can be done easily. From individual point the feeling of security is enlarged, as the base station can send help when needed as the position of the vehicle is known. Further the system offers a great potential for increasing the efficiency in processing and managing accidents. The time needed for recording and processing the accident situation and clearing the freeway for other traffic that has been blocked or delayed, will be reduced. As a result of this, the duration of the congestion will also be reduced. The probability of rear end collisions and of 'grid-lock', where traffic at on- and off-ramps is blocked by the congestion will also be lowered. For tracking purposes of e.g. lost persons or vehicles, the ALERT communication system offers the possibility of speedily spreading characteristics/photos to police vehicles on the road. The handling of the system should be done either while the car is parked or by a front passenger. From safety point of view the hardware should be constructed and placed in such a way that this will not cause injuries when crashes occur.

One of the specifications as summed above, requires backward and forward compatibility. It must be stated that backward compatibility is easier to fulfill than forward compatibility, especially when the time period in future extends over several years.

The Dutch motorway police (and also regional police force) has her vehicle fleet equipped with lap top computers, from which information of e.g. ownership of vehicles, periodical inspection status, driving licence and vehicle insurance can be obtained. The strategy of the Dutch motorway police is to go from specific functionality today, to integrated multi-functional infrastructure in future.

It is advised to study the telematics/communication requirements now and in the future of the Dutch police (motorway and regional police) and whether a system as ALERT fulfills these requirements and is compatible with the strategy of the Dutch police. Standardisation of systems for the motorway and regional police is deemed necessary.

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Bijlage 6 How to look at the Interactive Highway Safety Design Model (IHSDM)?

The Federal Highway Administration (FHWA) is developing an Interactive Highway Safety Design Model (IHSDM). FHWA's Geometric Design Laboratory at the Turner-Fairbank Highway Research Center (TFHRC) plays an important role in developing this IHSDM.
Descriptions of IHSDM have been given by (amongst others) Reagan (1994), Lum & Reagan (1995), Paniati & True (1996) and Krammes (1997). The basic concept of this model is to support the road design process by adding different types of modules to a (commercial) package for computer-aided design (CAD). Each module is meant to check the design for a specific aspect. Two modules are related tot road safety: the Accident Analysis/Prediction Module and the Consistency Module.

Accident Analysis/Prediction Module
This module consists of three parts:
- Roadway accident prediction.
- Roadside accident prediction.
- Diagnostic review.

Accident prediction models will play an important role in the parts dealing with the roadway and the roadside accident prediction. Models from previous research projects will be used in a first phase. These models are reviewed in a six-volume report (FHWA, 1992). More details of these models are given in an overview by Dijkstra (1998).
Opiela et al. (1995) give a list of problems related to the use of these kind of prediction models:
- inadequate sample size;
- improper application of statistical analysis techniques;
- application of inappropriate statistical analysis techniques;
- poor quality of the crash data;
- poor location information related to reported crashes;
- failure to properly account for confounding factors;
- unreported crashes;
- changes to accident reporting thresholds, forms and practices;
- failure to account for changes to the physical environment;
- failure to consider other factors or variables;
- failure to properly account for maturation and age effects;
- failure to properly account for regression-to-the-mean effects.

To overcome some of these problems, new models will be created by extracting information from the FHWA Highway Safety Information System (HSIS). This database contains traffic, geometric design, roadway inventory, and traffic volume data from eight states.
Dijkstra (1998) notices that the models (of the first phase) are based on data which originate from comparisons between existing roads. No information is used from before-after studies. But the FHWA report (FHWA, 1992) presents the output from the models in such a way as if modification of a design element will (automatically) result in a specified accident reduction percentage. This approach of quasi-before-after results is proposed and elaborated many times by Zegeer (e.g. Zegeer et al, 1990).

The diagnostic review will be based on qualitative information about the safety of highways. Expert knowledge, in-depth research and safety audits are input for this part of the module.

Consistency Module
This module is an important tool to evaluate the design consistency of a highway. Design consistency is also called 'relation design'. Lamm & Smith (1994) give the following definition of relation design:

"... no more single design elements with minimum or maximum limiting values are put together more or less arbitrarily; rather, design element sequences are formed in which the design elements following one another are subject to specific relations or relation ranges."

Krammes (1997) gives a description of this module. The input for this module is based on research and concepts conducted by Krammes et al. (1995) and Lamm et al. (1995). This kind of approach has recently been applied in Europe by Cardoso et al. (1998).

Dijkstra (1998) concludes that design consistency or relation design is relevant for bendy roads. This type of road is not very common in the Netherlands. Therefor Dutch road authorities will probably not be very interested in this module. To illustrate this: The Dutch guidelines for roads outside urban areas (RONA, 1989) have literally copied the German guidelines for design consistency.

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Bijlage 7 Safety Management Systems: good practices for development and implementation

Introduction

A Safety Management System (SMS) is a systematic process that has the goal of reducing the number and severity of traffic crashes. One tries to reach that goal by ensuring that all opportunities to improve road safety are identified, considered, implemented as appropriate, and evaluated in all phases of road planning, design, construction, maintenance and operation. Besides that in the development of safety programs relating to vehicles and people and by providing information for selecting and implementing effective road safety strategies and projects. Such a SMS assists decision makers in selecting cost-effective strategies and actions to improve the safety and efficiency of the road transportation system.

There is a number of reasons why the development and implementation of a SMS is important. The most important of them is the number of casualties and the annual costs they bring together.
A comprehensive process that brings together engineering, enforcement, education, and emergency response disciplines and the medical establishment is needed to help address these issues. Furthermore resources are declining and demands are escalating. (Road) authorities must therefore ensure that maximum effectiveness is achieved in the utilisation of these resources. In this regard, the need for improved coordination of road safety programs becomes more imperative. Thus, one of the most important aspects of a SMS is to bring people with different safety responsibilities together to determine what each may have to offer to improve overall road safety.

Development

A successful SMS would ensure communication, coordination and cooperation from the various governmental and other organisations within a country that has road safety roles, responsibilities or interests for the roadway, human and vehicle safety elements of road safety. Road safety functions reside in a number of different central governmental or local agencies. Within individual agencies, specific responsibilities that impact safety may be assigned to various subunits, divisions etc. or even to individual employees. In addition there may also be prominent private safety organisations which have a significant impact on road safety.
With regard to responsibility an important initial step is the designation of a leading agency and focal point. This focal point has to be charged with coordination of the development, establishment and implementation of the SMS. One major task of the SMS focal point would be bringing the various individual agencies and organizations together, getting organised and coordinating the activities of the group. In many countries suitable coordinating groups (formal or informal) will already exist, but the SMS development/implementation has to be formalised. The next critical step therefore is the identification of the key agencies and organisations to be brought together to form the SMS coalition. The coalition will include players which have major road safety roles and responsibilities and will ensure that safety is appropriately considered in all phases of road planning, design, construction, maintenance and operations and in the development of safety programs.

Components of a SMS

A single way to develop and implement a SMS does not exist because the countries differ from each other. However there will be many elements of a SMS already working in most countries. Countries should take advantage of and build on those road safety organisations and processes that already exist and work well.

In structuring a SMS the following major areas should be considered:

1. Coordinating and integrating broad base safety programs.
2. Developing processes and procedures to ensure that the major safety problems are identified and addressed.
3. Ensuring early consideration of safety in all road transportation programs and projects.
4. Identifying safety needs of special user groups such as older drivers, pedestrians, bicyclists, heavy traffic in the planning, design, construction and operation of the road system.
5. Routinely maintaining and upgrading safety hardware.

Within each of these five major areas the following elements should be incorporated as appropriate:

1. Establishment of short- and long term road safety goals to address both existing and anticipated safety problems.
2. Establishment of accountability by identifying and defining the safety responsibilities of units and positions.
3. Recognition of institutional and organisational initiatives through identification of disciplines involved in road safety at governmental and local level.
4. Collection, maintenance and dissemination of data necessary for identifying problems and determining improvement needs.
5. Analysis of available data, multi-disciplinary and operational investigations, and comparisons of existing conditions and current standards to assess road safety needs, select countermeasures and set priorities.
6. Evaluation of the effectiveness of activities that relate to road safety performance to guide future decisions.
7. Development and implementation of public information and education activities to educate and inform the public on safety needs, programs and countermeasures.
8. Identification of skills, resources and current and future training needs to implement activities and programs affecting road safety.
9. Development of a program to carry out necessary training and development of methods for monitoring and disseminating new technology and incorporating effective results.

Work plan

In order to determine what needs to be accomplished and to proceed in developing and implementing a fully operational SMS, a work plan should be developed. Those plans will vary with respect to the local level because of different organisational structures as well as differing safety needs. The work plans may also differ among local authorities as to the level of detail required to provide a document that is useful to the individual local authority. However, work plans should be flexible to allow for changes based on unforeseen circumstances and the feedback from implementation of the plans themselves. Also the work plans should not focus on individual countermeasures for specific safety problems, but rather be directed at

organisational and program activities to address safety issues on a systematic basis.

Implementation
Once a work plan is developed and endorsed by the working group and/or agencies, the challenge becomes one of carrying out the identified tasks/activities to achieve the desired results. This requires a process for activity management, coordination and oversight, including periodic task monitoring of progress, reporting of such progress and regularly scheduled meetings of the work group and/or its subgroups to generally manage program implementation.

Self-assessment of a SMS
Agencies should have an internal quality control system and review procedure. Agencies should establish, maintain and utilise a system that assures continuous improvement and compliance with the goals of the Safety Management System. The system should include the methods, procedures, controls, records and maintenance of the system to provide continual progress toward the goals.

Bijlage 8 Road Safety Audits: how to prove their benefits?

Road Safety Audits (RSA) have become a common feature in the United Kingdom, Australia and New Zealand (Van der Kooi & Dijkstra, 1997). Denmark has experimented with RSA, and is at the starting point of introducing RSA on a national scale. The Netherlands are entering a phase of experimenting (Van Schagen, 1998); which is also valid for the United States (Trentacoste, 1997).
The concept of RSA seems rather clear and convincing. To look at the safety aspect in different stages of the planning and design process will have a positive influence.
But still the question remains: how many accidents will be prevented by performing RSA and changing the design consequently?
Transfund New Zealand is particularly interested in this question, and set up a proposal for determining the benefits of RSA (Gadd, 1997).
The proposal distinguishes three approaches:

- Prediction of accident reductions theoretically from the detection and correction of crash inducing features using common crash factors.
- Comparison between two groups (with and without RSA) of similar infrastructural improvement projects (before-after studies).
- Creating a data base of RSA and their results and the monitoring of crash rates at audited sites (before-after studies).

This proposal was presented to people in different countries who are involved in the process of introducing or evaluating RSA. This international 'call' seems to be necessary because of two reasons:

- Small number of accidents in each case study. The more cases, the better possibilities for a statistical sound evaluation.
- Lack of budget for doing this kind of research. Some international forum must have some budget for performing this type of evaluation.

The proposal is (already) supported by people from United Kingdom, United States, Australia and the Netherlands.
The Danish Road Directorate presented an evaluation which was based on the first method (Wrisberg & Nilsson, 1996).
A fourth method could be added to the proposal:

- Performing RSA on 'old' road schemes by auditors who are not familiar with the local situation. The results of the RSA can be compared with the actual accident data and further developments.

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Bijlage 9 Volpe: summary of 'Research topics of mutual interest'

> -----Original Message-----
> From: Stearns, Mary D
> Sent: Friday, July 10, 1998 3:38 PM
> To: 'Kraay, Joop H.'
> Cc: Sussman, E Donald; 'Lyons, William M'; 'Skinner, David L'
> Subject: Research Topics of Mutual Interest
>
> Per our meeting here at Volpe, I have summarized the research areas of
> mutual interest as follows:
>
> Summary of Meeting Between the Volpe Center and the Transportation
> Research Center, TRC, Ministry of Transport and the SWOV Institute for
> Road Safety Research in The Netherlands
>
> Volpe staff hosted a visit from Joop H Kraay, Program Manager Road
> Safety, Lies Duynstee, Human Factors Psychologist, of the
> Transportation Research Center TRC, Ministry of Transport and Fred
> Wegman, Research Director, the SWOV Institute for Road Safety Research
> in The Netherlands at the Volpe Center on Monday and Tuesday, June
> 29-30, 1998. The purpose of their visit was to discuss topics of
> mutual interest related to highway safety trends, the influence of
> alcohol and the use of licit and illicit drugs on highway safety and
> motor vehicle operation, education and training for highway safety and
> to identify research areas for future collaboration.
>
> The following topics were identified as the basis for future
> collaboration.
>
> 1. There is a need for research on exposure and risk. The EU has
> asked the Dutch Ministry of Transport for this data. The Dutch
> Ministry of Transport and the AVV would like to sponsor a workshop on
> the topic in the Netherlands in spring 1999 with Volpe participation.
> Two or three keynote papers would be presented and they would provide
> the basis for discussion by the experts participating.
>
> 2. There is a need to determine whether there is a hard core of
> recidivists and exactly how much they contribute to the motor vehicle
> accidents and injuries. If there is a hard core population
> disproportionately responsible for motor vehicle accidents, what are
> the most effective ways to educate them? What are the research issues?
>
>
> 3. There is a need to examine and measure the driving behaviors that
> the elderly use and to develop a way to reduce any degradation. One

> strategy is to monitor elderly drivers for an extended time period,
> i.e., one week, to determine what, and where, skills are diminishing
> and use that information to develop compensatory strategies.
> Technologies which could be used are "Holter monitor" type data
> collection devices and GPS to record location and time.
>
> 4. There is a need to obtain data on elderly operators' driving
> behavior. Research proposals should be developed to determine what
> the older driver's performance was in accidents and what the types of
> accidents are across countries and by profiles of elderly drivers.
> For example, evidence suggest that they are more likely to be struck
> than to strike. This research would lead to ways to maintain the
> mobility of older drivers.
>
> 5. The Dutch Ministry wants to use the Borkenstein methodology to
> study how drug use impairs driving performance, document what the dose
> response relationship is, and decide how many drugs to analyze.
> Currently there are no effective field sobriety test for drugs. The US
> can't do this research due to current laws but Jim Fell, NHTSA, is
> interested in this research. Volpe will provide a copy of research
> done for the United States Coast Guard used to estimate the proportion
> of alcohol use among recreational boaters.
>
> 6. There is a need to obtain blood sample data from all motor vehicle
> fatalities in the US but it must be requested state by state.
>
> 7. There is a mutual interest in determining how ITS contributes to
> safety.
>
> 8. There is an interest in documenting the lessons learned from
> establishing and operating op control centers
>
> 9. Other topics include: tracking German research on the use of and
> data from "black boxes," Swedish studies of the accident experience of
> 16 year old drivers with monitored driving versus 17 year old drivers.
> the introduction of "speed limiters," i.e., intelligent cruise
> control," cell phone research and the potential for deskilling drivers
> by introducing ITS.