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SURVEY OF MOTOR CARRIER INDUSTRY OPINION PERTAINING TO GRADUATED LICENSES

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Trucking Research Institute
2200 Mill Road
Alexandria, VA 22314-4677

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16. Abstract

Younger passenger car **and** truck drivers are overrepresented in vehicle crashes. The problem lies in both lack of maturity and lack of driving experience. Graduated driver licensing (GDL) is a system designed to ease beginning drivers into the traffic environment under controlled exposure to progressively more difficult driving experiences. It was instituted in New Zealand in 1987 and has now been adopted for light-duty vehicle drivers by 21 U.S. states, all Australian states, and two Canadian provinces. Studies indicate a 5 - 10% reduction in crashes among the affected age group. It is not clear which GDL restrictions have been most effective and which might be appropriate for a commercial vehicle GDL.

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TABLE OF CONTENTS

I. BACKGROUND

Although the number of large trucks involved in fatal crashes fell from a high of 5,684 in 1979 to 4,453 in 1995 (while vehicle miles traveled increased over 60%), the Federal Highway Administration and the motor carrier industry continue to strive to decrease the number and severity of commercial vehicle crashes.

There is general consensus in the motor vehicle community that, although crashes may involve any or all of three components -- driver, vehicle and roadway -- the driver component is key in the vast majority of cases.

Younger, less experienced, drivers are overinvolved in traffic crashes -- truck drivers as well as passenger car drivers. (6)* This is the reason the Federal Motor Carrier Safety Regulations, in section 391.11, limit driving in interstate commerce to those at least 21 years old. In fact, large truck drivers up to the age of 27 are over-involved in fatal crashes. (8) Traffic crashes are the number one cause of death for all youngsters, causing approximately 40 percent of all deaths of 15-20 year-olds, over 6,500 teenagers a year. (36)

In 1985, the Federal Highway Administration (FHWA) issued a "Model Curriculum for Training Tractor-Trailer Drivers" and the next year the motor carrier industry started the Professional Truck Driver Institute of America (PTDIA) to certify truck driver training school programs found to be acceptable under a modified version of the Model Curriculum. (16)

The Commercial Driver's License program, under which the FHWA sets state-administered minimum national standards for licensing commercial vehicle drivers, was established by the Commercial Motor Vehicle Safety Act of 1986. (16) In response to the requirements of the Intermodal Surface Transportation Efficiency Act of 1991, the Federal Highway Administration is presently considering whether training should be required for all entry-level commercial motor vehicle drivers. (17)

The concept of a graduated driver's license "to ease beginning drivers into the traffic environment under controlled exposure to progressively more difficult driving experiences" (32) is becoming popular for light-duty vehicle operators in the U.S., Canada and other countries. It may be appropriate to consider a graduated license for commercial vehicle operators as the next logical step toward improving commercial vehicle safety.

This literature search reviews and summarizes materials which may be of value in determining the potential usefulness of graduated licensing in improving highway safety in the United States.

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* Numbers in parentheses designate references found in Appendix B.

II. NOVICE DRIVER EDUCATION/TRAINING

A. Light Duty Vehicle Driver Education/Training

Formal novice (automobile) driver education has a long history in the United States. Smith (36) reports that the first known novice driver education program was developed in 1916. The first driver safety education textbook was published in 1919, and the first recorded in-school driver education class was held in the early 1930s. Later in that decade, colleges began training driver education teachers.

The zenith of high school driver education was the late 1960s and early 1970s. Its popularity waned after publication of the results of the Dekalb County driver education demonstration project in 1983. This project compared the crash-reduction effectiveness of 80- and 30- hour novice driver instructional programs to no formal training. 16,338 high school students were assigned to one of the three groups. The results showed no significant differences in number of crashes or convictions between those who received formal training and those who did not. In 1986, after those in the test had accumulated at least four years of driving experience, the records were reevaluated. This second evaluation found that only the short course provided any significant reduction in crashes, and not nearly as great a reduction as had been expected. (36)

The Dekalb study was a major blow to the intuitive position that formal training is essential for safe driving. Today, Mayhew and Simpson find in the literature little support for the claim that driver training is effective in improving safety. (30)

Mayhew and Simpson note that some jurisdictions presently offer a "time discount"* for education/training, to those obtaining a graduated license. The assumption is that the training will lead to the same level of safety improvement one would gain from a specified period of highway driving experience. Based on the research, however, Mayhew and Simpson recommend that jurisdictions **do not** include driver education/training in their graduated licensing program, if there is no precedent requiring it to be included. This recognizes that, although studies do not support the value of education/training, in some areas, it is already an integral part of the licensing system.

New Zealand, which presently has a "time discount" for training, is proposing to drop it in rulemaking which may lead to major changes in the world's-first comprehensive graduated drivers license system (GDLS). (27)

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* For example, allowing a novice driver to cut a 12-month waiting period between obtaining a restricted and a full license, to 6 months upon completion of a prescribed training course.

At the very least, training (from some source) is necessary for an individual to learn to properly control a motor vehicle. Gregersen (20) confirms that tradition and common sense assume that increased skill leads to increased safety. But, he finds that skill, as traditionally-defined, is only a small part of the complex structure of factors involved in crashes. He reminds us that some studies show drivers given professional training have higher crash rates, and some show lower rates. (21) Despite the studies to date, most feel that proper training has some place in the highway safety equation. This has led to a review of training methods in the hope of identifying those which will show documented highway safety improvement.

Mayhew and Simpson (30) feel there is some promise that a reconceptualization of driver education/training might make it more effective in decreasing the crash risk of young drivers. They feel that skills which have proven to help avoid collisions should be emphasized. Young drivers may be motivated to use the safe driving skills they acquire in education/training through a phased graduated licensing program, which requires novices to avoid collisions and violations in order to obtain their full license. A multiphase education/training regime is suggested, assuming that early in the licensing process the young driver is concentrating on basic control of the vehicle. Later he/she may be better able to absorb safety-related information.

Gregersen (20) concluded that certain types of "skill" training may lead novice drivers to become overconfident of their ability to handle dangerous situations, leading to more, rather than less crashes. He suggests that "insight training" be added to skill training, so the driver is made aware of the limits to the skills which are learned.

The House of Representatives Appropriations Committee requested the DOT's National Highway Traffic Safety Administration (NHTSA) to develop a plan for a strengthened driver education program. Smith's report (36) in response to that request explains why novice driver education is not as productive as it might be expected, and why an improved program could be an effective part of a graduated licensing system. The report provides a research, development and evaluation plan for more effective novice driver education.

Smith found that new methods, placing greater emphasis on crash-reducing, experience-related factors, should be developed, since the current system of novice driver education does not seem to provide a substantial improvement in the driving behavior of young drivers. He stresses that driver education will be most effective if it is distributed over time as an integral part of a graduated licensing system.

Smith believes that the problem with driver education is when and how it is administered. Students need a grounding in basic vehicle controls skills before they can learn safe driving skills and strategies. And, in addition to education, a driver needs motivation to drive safely. Getting (and keeping) a driver's license can provide that motivation.

The Smith report asserts that a graduated licensing system can provide both sequential learning and motivation. Specifically, the program's first stage would include driver education in basic vehicle handling skills, six months driving with a learner's permit, then passing the basic road test and receiving an intermediate/provisional license. Additional driver education would be provided only after six months of highway driving experience. The additional training would concentrate on safe driving skills and procedures. This logical progression assures that the novice driver knows enough about how to maneuver the vehicle to be able to concentrate on the safe driving skills education when it is given.

A graduated driver license program could provide the motivation to drive safely by moving the novice along to increased driving privileges only so long as responsible and violation-free driving behavior is demonstrated. Graduated licensing allows for progressive learning and behind-the-wheel driving experience under controlled conditions. (36)

B. Commercial Vehicle Driver Education/Training

In a study required by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Dueker (15) determined that adequate entry-level driver training was not being provided by any of the three motor carrier sectors; heavy truck, motorcoach and school bus.

Although he found that training was not adequate, he, like other researchers, found no evidence of a relationship between frequency of crashes and adequacy of driver training. Dueker suggested the answer to this obvious dichotomy was that adequate training is a necessary, but not sufficient, condition for the reduction of commercial vehicle crashes. Something has to be added for training to have the needed effect. He suggests a combination of a strategy which regulates the content of training (training based) **or** one which regulates the outcome of training (performance based) should be combined with an industry-based strategy. The training-based strategy involves requiring the training of entry-level CMV drivers. The performance-based strategy requires passing more comprehensive knowledge and skills tests to obtain a CDL. Industry-based training would achieve a reduction in crashes by carefully structuring a set of cooperative FHWA-industry initiatives to encourage better training of commercial drivers.

III. GRADUATED LICENSING FOR THE NOVICE LIGHT-DUTY VEHICLE DRIVER

A. History/Concept/Logic of Graduated Licensing

The first known documented discussion of the graduated licensing concept is in the 1938 Uniform Vehicle Code definition of "provisional licensing" for novice drivers under age 21. In 1960 the Australian state of New South Wales instituted a program involving some

parts of what is now considered a graduated licensing system.* A recent newspaper article (11) credited Dr. Patricia Waller, now Director of the University of Michigan's Transportation Research Institute, with developing the concept of graduated licensing as a method of reducing the crash rate of younger novice drivers. In 1970 Dr. Waller published a paper which included a recommendation for restricted licensing of new drivers.

The National Highway Traffic Safety Administration became interested in the graduated licensing concept in the 1970s and first endorsed it in 1977. (23) The agency sees graduated licensing as a way of easing beginning drivers into the traffic environment under controlled conditions, progressively exposing them to more difficult driving experiences. Beginners can improve driving skills and acquire on-the-road experience under less risky conditions. Novices progress, or graduate, through three licensing stages -- learner's permit, intermediate or provisional license, and full or unrestricted license. (32)

McKnight (38) states that graduated licensing is expected to reduce the frequency and severity of new driver crashes by *reducing exposure* to the risks that lead to crashes, by *improving skills so drivers can better cope with risks, and by enhancing motivation* to avoid risk.

B. Components of a Graduated Driver's License (GDL)

Mayhew and Simpson (38) differentiate among the various types of driver licensing systems: conventional; probationary; provisional; and graduated. Conventional licensing systems treat new drivers the same as other drivers -- passing the vision, knowledge and on-road test provides unrestricted driving privileges. A probationary licensing system treats the driver more strictly in that it takes fewer citations to cause license suspension during the probationary period. Provisional licenses also subject young drivers to tighter license suspension rules, hopefully encouraging them to operate within the law. Graduated licensing systems provide a systematic, step-wise approach to full licensing status.

Mayhew and Simpson add that a graduated licensing system can take many forms, depending on how the restrictions applied at each step are selected, to whom and for how long they apply, any additional sanctions for violators, and so on. They caution that a graduated license's features should follow the basic principle of minimizing risk while providing opportunities to obtain driving experience.

Mayhew and Simpson feel (31) the opportunity to drive in more risky situations should be phased in as experience and competence are gained. However, the value of specific restrictions often included in a graduated licensing system, such as night-time

* Personal communication with Michael Smith of NHTSA, September 5, 1997.

driving, blood-alcohol concentration, restriction on passengers, and reduced speeds remain unclear because they have not been adequately tested.

NHTSA (33) outlines the three states of a graduated licensing system as:

- **Learner's permit** where supervision is required at all times in addition to other restrictions,
- **Intermediate License**, which may be called a provisional or junior license, where fewer restrictions are imposed and unsupervised driving is permitted during certain hours, and
- **Full or unrestricted license** where all restrictions have been removed.

NHTSA and AAMVA (32) note that young people are overrepresented in motor vehicle crashes because of inexperience, high risk-taking behavior and high risk exposure (driving at high-risk times or under high-risk situations). A graduated driver licensing system addresses the causes of youth crashes by:

- Increasing the amount of supervised behind-the-wheel driving practice,
- Increasing exposure to more difficult driving experiences through each stage of licensure by gradually removing restrictions, so that new and more complex traffic conditions are encountered, and
- Requiring crash and violation-free driving performance for a minimum period of time before advancing to the next level of licensing.

NHTSA states that graduated licensing reduces exposure to high risk situations, motivates the candidate by its requirements, and educates him/her through associated driver training and improvement programs. The agency affirms that a graduated licensing system can significantly reduce the crash rate of young inexperienced drivers. It recommends the following components be considered in a graduated licensing system for young drivers of light-duty vehicles (33):

- Successful completion of a learner's permit phase of licensure for a specified period of behind-the-wheel training including a basic driver education course,
- Requirements that a parent/guardian, or adult licensed driver age 21 or older, supervise basic driving practice and practice sessions during high-risk (nighttime) hours,
- Nighttime driving restriction (e.g., no driving from 10:00 pm to 6:00 am unless under supervision) as a part of an intermediate licensing phase, and possibly as a post-licensing driver improvement action,

- A second level driver education program (e.g., safe driving decision-making skills) after the beginning driver has acquired basic skills,
- Youth-oriented and more rapid driver improvement actions for any violations (e.g., warning letter, driver improvement course, suspension),
- Mandatory safety belt usage by all occupants and limitations on the number of passengers in a motor vehicle being operated by the beginning driver,
- Zero blood alcohol concentration for drivers under age 21,
- Demonstrated safe driving performance, (i.e., having no crashes or convictions for a specified period of time prior to advancing to the next licensing phase), and
- Issuance of a provisional license to all drivers under the age of 21 (or age 18) which is distinctive from the regular driver's license (e.g., Marked 'PROVISIONAL,' and/or a different color or different colored photo background).

McKnight (38) also notes that most graduated licensing programs involve the learner's permit, intermediate and full license levels. He suggests that elements of a graduated license which reduce the novice's exposure, improve his/her driving proficiency and enhance motivation, might be:

Reducing Exposure	**Improving Proficiency**	**Enhancing Motivation**
delayed licensure	multi-level instruction	contingent restrictions
night restriction	multi-level testing	license sanctions
passenger limitations	parent guidance	improvement courses
speed limits	improvement courses	
restraint use	delayed retest	
delayed retest		
license sanctions		
visible identifier		

McKnight states that an effective graduated licensing system must take full account of the relationship of these elements to driving safety, and that existing graduated licensing systems have not done so. Some seem primarily to discourage licensing, which could be done simply by raising the licensing age. Without guidance as to what works, programs have been instituted based on political expediency.

The American Automobile Association (11) recommends that all graduated licensing programs make provisions for:

1. Establishing relevant and timely restrictions on driving, particularly on nighttime driving during early stages of licensure,

2. Imposing meaningful sanctions against serious or cumulative traffic violations, especially those involving driving while impaired by alcohol or other drugs,
3. Granting additional driving privileges only after development of skills, values and attitudes which lead to safe driving habits, violation-free driving records and increased driving proficiency, and
4. Convenient access to supplemental training programs, preferably utilizing state-of-the-art instructional technology.

New Zealand, sets forth the following graduated licensing requirements and restrictions for novice car drivers aged 15 to 25 (27):

To obtain Learner License	**Learner Restrictions**	**To obtain Restricted License**	**Restricted License Restrictions**	**To obtain Full License**
• Pass theory test • Fill in application form • Pay fee	• Must be accompanied by supervisor when driving • Blood alcohol level must be less than 30 milligrams of alcohol per 100 millilitres of blood • Must carry Learner license at all times	• Wait 6 months (or 3 months if a Certificate of driving competence is produced) • Pass practical driving test • Pay fee	• Blood alcohol level must be less than 30 milligrams alcohol per 100 millilitres of blood • Must carry Restricted license at all times • No driving between 10pm and 5am unless supervisor is in the car • No passengers unless supervisor is in the car	• Wait 18 months (or 9 months if an approved certificate is produced) • Pay fee

C. Popularity of Graduated Driver Licensing

The first comprehensive graduated driver's license was introduced in New Zealand in 1987. On April 1, 1997, Michigan became the 21st U.S. state to adopt at least some features of graduated licensing. All Australian states, and the Canadian provinces of Ontario and Nova Scotia have also adopted forms of graduated licensing. (27) (11)

Tom Curley of *USA Today* reports that Michigan's program allows teens to get a learner's permit before they are 15. Then they may practice driving with a licensed driver

over 21. They must hold the learner's permit for at least six months. During this phase they must take an introductory driver education course and parents must certify that they have supervised 50 hours of driving, including 10 hours at night. At age 16, novices move to the intermediate level, if they keep a clean driving record. This allows them to drive without supervision, except between midnight and 5 a.m. To obtain the intermediate license they must take a road test and an advanced driver education course. At 17 novices who have spent at least six months at the intermediate level, and are crash and violation free for 12 consecutive months, can earn a regular license without restrictions. (11)

While the graduated driver's license seems to be catching on quickly among U.S. states, Gregersen and Bjurulf (21) report that Norway evaluated a two-phase graduated licensing system and did not find the expected crash reduction. They changed to a two-year practice period (between 16 and 18) of driving with an instructor, a system also used in Sweden, France, Belgium and other countries.

In the United States, the graduated licensing concept has been endorsed by the American Automobile Association (1)(2), the American Association of Motor Vehicle Administrators (23)(32), the National Highway Traffic Safety Administration (32)(33), the National Safety Council (23), the National Transportation Safety Board (34), and the Insurance Institute for Highway Safety (38). However, none of these organizations appear to have addressed the issue of whether the GDL would be appropriate for commercial vehicle drivers.

To date, support for a commercial vehicle GDL has come from the Canadian Provinces of Ontario and British Columbia and from New Zealand, although no jurisdiction worldwide has introduced such a GDL as yet. See section IV, below for a more detailed discussion.

D. Effectiveness of Graduated Driver Licensing

Although New Zealand is the world leader in graduated driver licensing systems (GDLS), in March 1997, the New Zealand Land Transport Safety Authority (LTSA) issued a proposal to improve its driver licensing system, including adding a graduated license for commercial vehicle drivers. (27)

LTSA asserts that the GDLS has worked, citing a study by Frith and Perkins (1992) which found the introduction of the GDLS was accompanied by a drop in young driver casualties with no evidence of any increased unlicensed driving. They report a continuing 8% reduction in the proportion of 15-19 year olds involved in crashes.

Langley, Wagenaar and Begg (28) used injury crash data from New Zealand's Health Information Services' national public hospital inpatient morbidity data files for 1979-1982,

disaggregated into 15-19, 20-24 and 25 and older age groups. Time series analysis showed a 23% reduction in car crash injuries for 15-19 year olds, following the introduction of the GDLS. Taking into account other factors (general reduction in injuries, worsening economic conditions), the authors felt a conservative estimate of effectiveness for 15-19 year olds would be 7%. This assumes that other factors had an equal impact on all age groups. Since they feel this is unlikely, they estimate the effect of the GDLS to be a reduction in young driver crashes of between 7% and 23%. However, they warn that injury reductions could be due to a decrease in the population of young drivers. They believe the findings suggest that a major effect of the GDLS on crashes may be through a reduction in overall exposure, i.e., delayed licensing or decreased travel by young drivers.

Hedlund and Miller of NHTSA (38) summarized research on the effectiveness of graduated licensing in the U.S. In Maryland, the first state to implement features of a graduated licensing system (in 1979), a 5% reduction in crashes and a 10% reduction in convictions for 16 and 17-year olds was found in a 1983 study. A 1990 study basically confirmed these results. California's program became operational in October 1983. A 1988 California Division of Motor Vehicles study found the licensing system was responsible for a 5.3 percent reduction in the rate of crashes involving 15-17 year old drivers. A 1991 study on Oregon's program, which began in October 1989, showed a 16 percent reduction in crashes for male drivers age 16-17, but no significant difference for females. It should be remembered that NHTSA and AAMVA, in 1996, (32) noted that no state had yet implemented a **comprehensive** graduated driver licensing system.

Foss (38) summed up the available data on the effectiveness of the graduated licensing system, saying that its demonstrated effects are "modest," but empirical evidence indicates it is having clear, measurable benefits. However he also warns that graduated licensing will limit the mobility of novice drivers, although not to a great or long-lasting extent.

E. Why New Zealand is Considering Revising the GDLS

If the literature indicates that graduated licensing is successful in decreasing crashes among novice/young drivers, why is New Zealand, which initiated the world's first full graduated licensing system just ten years ago, considering substantial changes?

The Land Transport Safety Authority's rulemaking proposal (27) reports that a major review of driver licensing began in 1994, with the object of identifying best practice in other countries, evaluating possible improvements to the driver licensing system, and investigating how licensing procedures could contribute to the reduction in death and injuries. Although New Zealand's traffic fatalities have been decreasing since 1987, LTSA reports that it still has one of the worst road safety records among OECD (Organisation for Economic Co-Operation and Development) countries.

Some of the major proposed changes are to: raise the minimum licensing age from 15 to 17 for light duty vehicles and motorcycles*; change the "one license for life" (i.e., up to 71 years old before renewal is necessary) to one renewable every ten years; introduce a GDLS for heavy rigid and combination-type vehicles in place of the present single class of license to drive heavy trade vehicles with an extra class to drive heavy trailers; widen the license endorsement system beyond dangerous goods (the only present endorsement); and introduce a medical assessment for heavy vehicle drivers every ten years (none is required now).

The proposal would make relatively minor modifications in the GDLS and extend it to all novice drivers. It states that graduated licensing sends the message that driving is learned over a period of time and provides a safer learning environment with novices gaining experience under less risky conditions. LTSA asserts that the GDLS has worked as a package, but it is not clear which elements of the package are most effective in improving highway safety.

IV. GRADUATED LICENSING FOR COMMERCIAL VEHICLE DRIVERS

A. Effectiveness of the Commercial Driver's License

To help ensure that large truck and bus drivers have both the knowledge and skills to safely operate their vehicles on public highways, the Commercial Motor Vehicle Safety Act of 1986 established the Commercial Driver's License program, requiring a valid CDL by April 1, 1992. (16) More specifically, the Federal Highway Administration sets out the purpose of the CDL "to help reduce or prevent truck and bus accidents, fatalities, and injuries by requiring drivers to have a single commercial motor vehicle driver's license and by disqualifying drivers who operate commercial motor vehicles in an unsafe manner." (49 CFR 383.1).

Five years after the CDL went into effect, it is drawing praise. Almost everyone contacted by the National Safety Council's *Traffic Safety* magazine felt that the new rules were getting problem drivers off the road. The magazine reported that the AAMVA surveyed the states in 1994 and the majority of traffic officials and law-enforcement offices were pleased with the results of the CDL. (19) At a meeting of the Driver Training and Development Alliance in April, 1997, Brian Mclaughlin of FHWA concurred that there is agreement that the CDL has been successful but that it may now be in need of enhancement. (13)

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* One would hope studies would be undertaken to determine if increasing the minimum driving age substantially decreases the effectiveness of the GDLS.

However a 1996 study of the effectiveness of the California CDL program, by Robert Hagge and Patricia Romanowicz, found no statistically significant effect from the CDL program, on either fatal or injury crashes involving heavy vehicles operated by California-licensed drivers. (22)

B. Driver Shortage

The author believes that parts of the trucking industry are more likely to be positive toward the graduated CDL concept only if it allows them to introduce younger drivers into the industry. This would help alleviate a long-standing shortage of qualified drivers. Based on this presumption, a discussion of the driver shortage is included in this literature search.

In 1988, Johnston and Reed of The Hudson Institute (26) found that there is a truck driver shortage because of a declining supply of qualified workers, growth in the demand for drivers, and competition from other industries. About 300,000 new drivers are needed each year to replace those leaving the industry. Total demand for drivers will increase 16-23% from 1988 to 2000, leading to a need for about 450,000 new drivers annually. They predicted that most of the causes of the driver shortage will grow worse, including the low number of young men available. Higher standards will drive out candidates, and more attractive jobs will be available.

The Interstate Truckload Carriers Conference (now the Truckload Carriers Association) and American Trucking Associations' 1994 study (25) collected information from 54% of ITCC's 414 motor carrier members with annual gross revenues over $4 million. They found that carriers in all revenue categories experienced recruitment and retention problems and that 93% of respondents said they had turned down loads due to driver shortages.

The recent (draft) Gallup Organization study (37) predicts:

- The total number of truck driving positions will rise from 2.9 million in 1994 to 3.3 million in 2005.
- Over 500,000 new hires will be needed annually, to replace current drivers who decide to leave the industry.
- These two factors will lead to the hiring of approximately 6.1 million truck drivers over the period 1994 to 2005.
- The pool of young men (the traditional source for new truck drivers) in the labor force will not increase as fast as the need for new drivers, and in addition, they will be attracted to better paying industries. Therefore the trucking industry should

continue efforts to recruit more drivers from non-traditional groups -- women and minorities.

C. Status of Graduated Driver Licensing for Commercial Vehicle Drivers

Recently, three jurisdictions have shown interest in the graduated driver licensing concept for commercial vehicle operators; Ontario and British Columbia in Canada and New Zealand. The U.S. Federal Highway Administration has also discussed the possibility of instituting a graduated licensing system as part of the Commercial Driver's License program, to allow drivers to "ease into" the industry, acquiring higher levels of licensing over time. (14)

In June, 1994, Ontario introduced the first North American full-fledged graduated driver licensing system for drivers of light duty vehicles. (12) In March, 1997, Ontario's government-industry "Target '97 - Task Force on Truck Safety," (35) established by the provincial transportation minister, called for "a major overhaul of virtually every facet of the rules governing truck safety," including a recommendation that a new graduated licensing system with the following characteristics be introduced for tractor-trailer drivers:

- An applicant for a tractor-trailer (Class A) license must have a light-duty (Class G) license, and must meet the same driving record criteria as currently used for school bus drivers (less than 6 demerit points, no drinking/driving or other suspension in the past year), and

- For the first 500 hours behind the wheel after obtaining a tractor-trailer license, the applicant must maintain zero blood alcohol; be restricted in terms of quantity and type of dangerous goods that can be hauled; and may not drive or apply for liquid bulk tanker, double endorsements. The employing carrier should consider a training program for new drivers, which would include fatigue management.

In the wake of three fatal truck runaway crashes, British Columbia's Minister of Transportation and Highways established a Task Force on Commercial Vehicle Safety (7). Recommendations released in April, 1997, covered the following areas:

- Driver Licensing Standards,
- Enforcement of Safety Regulations,
- Monitoring and Evaluating Carriers,
- Shipper Standards,
- Driver's License Sanction Process,

- Carrier Incentives, and
- Commercial Vehicle Inspection Programs.

Among the 12 Driver Licensing Standards recommended were:

- Introduce a graduated licensing system,
- Explore the implications for reciprocity with other jurisdictions and grandparenting of existing commercial drivers license holders, and
- Elevate the graduated licensing proposal to the Canadian Council of Motor Transport Administrators for discussion.

Among the changes The Land Transport Safety Authority proposed to New Zealand's licensing system (27) was the introduction of a graduated driver licensing system for various classes of heavy rigid and combination-type vehicles. This system would replace the present license classes to drive any heavy (over 3500 kg [7700 lb]) trade vehicle and any heavy (over 3500 kg [7700 lb]) trailer. In addition, the license endorsement system would be extended ("dangerous goods" is the only present endorsement), and a medical assessment every ten years for heavy vehicle drivers would be introduced (none is required now). The justification for the commercial driver GDLS proposal was that "license holders should build their skills and gain experience driving smaller vehicles before being entitled to drive larger vehicles with different handling characteristics."

The present New Zealand Class F license allows driving of any vehicle over 3500 kg (7700 lb). The class L license allows towing of trailers over 3500 kg (7700 lb). The new system would have classes for MR (medium rigid), HR (heavy rigid), MC (medium combination) and HC (heavy combination) vehicles* to avoid the problem of passing the test in a relatively small vehicle and being permitted to drive much larger vehicles.

The Land Transport Safety Authority answered the question "Why change to a graduated license class system [for heavy vehicles]?" The Authority reasoned:

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* A "medium rigid" vehicle is a non-articulated vehicle with a GVWR (gross vehicle weight rating) of no more than 15,000 kg (33,000 lb), or any combination of vehicles with a GCWR (gross combination weight rating) of no more than 12,000 kg (26,500 lb).

A "heavy rigid" vehicle is a non-articulated vehicle with a GVWR in excess of 15,000 kg (33,000 lb).

A "medium combination" vehicle is an articulated vehicle with a GCWR of from 12,000 to 25,000 kg (26,500 - 55,000 lb).

A "heavy combination" vehicle is an articulated vehicle with a GCWR of over 25,000 kg (55,000 lb).

The heavier a vehicle, the greater is the likelihood of death or serious injury to its occupants and other road users if it is involved in a crash. Drivers of large vehicles, therefore, need to be experienced and competent to minimise the possibility of their causing a crash.

Some classes of driver license currently allow drivers to operate a variety of vehicles without necessarily having demonstrated their competency to do so. Driving heavy vehicles is a specialised skill. It is distinct in many ways from, and more demanding than, operating smaller vehicles. The dynamics and handling characteristics of all vehicles change as their weight increases. The addition of a trailer further alters the way in which a vehicle behaves on the road. Drivers need to be aware of these differences and have appropriate training and experience to ensure that they can safely drive such vehicles.

The proposed system would enable drivers to build their skills incrementally so that license holders have the opportunity to gain experience driving 'smaller' vehicles before being permitted to drive 'larger' vehicles.

The proposed new commercial vehicle graduated driver's license would require:

- Applicants for a Class MR [medium rigid] license must have held a full light vehicle license for at least 12 months,
- Applicants for a Class HR [heavy rigid] license must have held a full Class MR license for at least 12 months, or a full Class MC [medium combination] license for at least 6 months,
- Applicants for a Class MC license must have held a full Class MR license for at least 6 months, and
- Applicants for a Class HC [heavy combination] license must have held a full Class HR for at least 6 months.

Now the light vehicle license can be obtained at 15 and class F and L licenses can be earned at 18. The Authority has proposed raising the 15 year minimum age for light vehicle drivers to 17. This would effectively increase the minimum age at which heavy rigid, and all combination vehicles could be driven, since the above procedure requires the applicant to hold a light vehicle license for a full year before starting to earn a medium or heavy vehicle license.

Also of interest is that, at present, periodic (apparently annual) medical checks are required only for drivers of passenger vehicles and vehicle recovery vehicles. The proposal would instead require medical checks every five years for those drivers, driving instructors

and testing officers. Medical checks for holders of MR, MC, HR and HC licenses would be required every ten years.

A "fit and proper person check" (check of past criminal offenses, mental health or behavioral problems, etc.) is now required periodically only for drivers of small buses and taxis. The proposal would extend it to all bus and taxi drivers, driving instructors and testing officers.

In addition to the above proposed requirements, a revised system of driver license endorsements is recommended. A "P" endorsement would be required to transport passengers and a "D" endorsement to carry hazardous materials. The proposal explains that license classes relate to driving requirements and road safety risks, while endorsements relate to non-driving elements such as personal safety risks to passengers.

To obtain the "P" endorsement to transport passengers, the prerequisites would be:

- Having held a full license for at least two years,
- An advanced driving assessment, if not already undertaken,
- A medical certificate,
- A fit and proper person check, and
- An industry-based knowledge test.

To obtain a "D" endorsement to transport hazardous materials or dangerous goods the current requirements to complete an approved course would continue.

D. Effective Features of Graduated Licensing

Although the validity of the nine components of a graduated licensing system recommended by NHTSA (33) (section III. B.) might seem intuitive, the literature raises questions as to whether they are all equally effective. New Zealand's Land Transport Safety Authority (LTSA) (27) admits that, although graduated licensing has worked as a package, it does not know what contribution each element of the package has made toward improved safety.

Cooper (10) also concluded that there is little or no documented justification for the particular restrictions placed on novices in GDL schemes. The one restriction that he felt had proven its value for young passenger-car drivers, the restriction on the carrying of passengers (teenage friends), would be inappropriate for either commercial truck or bus drivers. Cooper's results did suggest that the strict imposition of license restrictions after traffic citations is effective. In apparent frustration, Cooper concludes:

the higher crash rate for novices than for non-novices argues persuasively for some type of differential licensing treatment. The only question to be answered relates to what form a novice driver licensing system should take. The concept of applying initial driving restrictions that are "gradually" relaxed with increasing experience is intuitively appealing but not necessarily appropriate. Jurisdictions that choose this path should be prepared to support with some substantive analyses the specific restrictions to be imposed.

As mentioned above, Mayhew and Simpson recommend that driver education or training requirements not be introduced into a new graduated licensing system unless there is precedent (such as past history or political need) for doing so. (30) The New Zealand Land Transport Safety Authority (27) also does not propose compulsory professional driver training because:

- studies in Quebec, Norway and the United States have shown compulsory driver training to have no or negative safety effect,
- research does not show that professional driver training produces safer drivers than private training by relatives and friends, and
- compulsory professional driver training would be costly and likely to encourage unlicensed driving by those who could not afford driving lessons.

Waller (40) carefully differentiates between the safety effects of inexperience and age alone. Young drivers have two major causes of crash risk, inexperience and the tendency to engage in high risk behavior. Young drivers are often issued "provisional" licenses which means they get in more trouble than older drivers if they make a mistake. Increasing threat does not counter inexperience, but it should have an effect on deliberate undertaking of high risk behavior. Inexperience can be countered by extended practice over a lengthy period of time with the task being easier in the earlier stages.

Waller adds that licensure at a higher age, or nighttime curfews, are not effective in providing experience, but that safety can be improved by a more gradual introduction into the driving population.

Campbell surveyed data on large trucks involved in fatal crashes, focusing on the implications of lowering the minimum age for drivers of interstate commercial trucks from 21 to 19 years. (8) In addition to the general conclusion that fatal crash involvement rates for drivers of large trucks increase with decreasing driver age, he looked at specific factors which might be considered as restrictions during steps of a graduated driver's license program, finding that younger drivers were overinvolved during the day as much as at night, in rural and urban areas and on all types of roads.

Blower (6) noted that many factors are associated with increased risk for all truck drivers, such as:

- Bobtails have higher crash rates than combination vehicles,
- U.S. and state routes have twice the crash rate of Interstates, and all other roads have seven times the rate,
- Night and rural driving has higher crash risks than day and urban driving, and
- Large fleets are more likely to have an active safety program and construction firms that operate in urban areas have a different crash exposure than less-than-truckload freight haulers.

As a practical matter, Blower finds that the environment in which young truck drivers actually operate (intrastate) does not consistently point to either high or low risks. Most drive locally, in straight trucks, for private, intrastate firms. They do little night travel, have less formal driver education than older drivers, and, of course, less experience.

Finally, it is of interest to note that the present Alaska CDL learner's permit may provide a model for one step of a commercial GDL, in that it requires that holders must: 1) be at least 17 years old, 2) be licensed for at least one year, 3) pass a commercial knowledge test, 4) have permission from a parent or guardian (if under 18) and 5) be accompanied by a qualified licensed driver to operate a vehicle. It is valid for a period of two years although holders are not required to hold it for a minimum period of time before obtaining a full CDL. For 17-year olds getting their CDL learner's permit, however, there would be effectively a two-year delay in getting a full CDL, since it cannot be obtained before 19. (3)

E. Potential Administrative and Cost Concerns of a Graduated Commercial License

Very little material addressed the issue of increased administrative and user costs of the introduction of graduated driver licensing. *Driver/Education*'s 1994 article "Ontario's New Deal in Licensing, Training" (12) did report on the increase in licensing costs to the light-duty vehicle driver when that province introduced its graduated licensing system. Ontario's old rate of C$31 covered the knowledge, vision, and road tests and the license itself. New rates for the GDL are C$10 for the knowledge test; C$40 for the Level One road test; C$75 for the Level Two road test and C$50 for a five-year license, or a total of C$175. No data were provided on the actual provincial cost of administering the old and new licensing systems.

For the Commercial Driver's License in the U.S., AAMVA (3) reports state basic fees for a Class A (combination vehicles over 26,000 lbs GCWR) license ranging from $0-$100. There is an additional $5-$150 fee for taking the skills test in some states. Most states allow limited retesting without paying additional fees. And most states charge the

same basic amount for renewal. Given the wide range of fees, it is evident that in some states licensing charges are not based on actual costs to the state. Many states use or permit third-party testing for the skills test portion. Fees for these tests, which range widely, are not generally set by the state.

V. THE YOUNGER DRIVER ISSUE

One major issue is key to the actual effectiveness of the graduated drivers license for either light duty or commercial vehicle operators. That is whether the GDL has been effective because it better prepares young drivers for full licensure or whether it simply delays the time of licensure until they are older, and therefore less likely to have crashes (See "The Younger Driver Safety Record" below). Stated another way, the question is whether it is lack of proper experience or age alone which lies behind the high crash rate for novice drivers. And, when considering extending the GDL to commercial vehicle drivers, does one find that the novice's propensity for crashes is tempered by driving in the working environment, rather than for pleasure?

A. The Younger Driver Safety Record

Williams (38) summed up the younger driver safety issue, saying that 16 to 19-year olds have the highest total crash rate, 20 per million miles, compared with five for all other ages combined. Sixteen-year olds have 43 crashes per million miles, 17-year olds 30, 18-year olds 16, 19-year olds 14. For fatals, 16-19 year-olds as a group have nine per hundred million miles, with 16-year olds having 17, 17-year olds: 13, 18-year olds: 8, and 19-year olds: 7. He believes that both youth and inexperience create a serious young driver problem. Speeding, high nighttime risk, low seat belt use and other teenagers in the car are features of young driver crashes that assist in identifying ways to deal with this problem.

Young/novice light duty vehicle drivers are clearly overinvolved in highway crashes. This also appears to be the case for commercial vehicle drivers. Campbell's research (8) reveals that the fatal crash involvement rates for drivers of large trucks increase with decreasing driver age. Younger drivers are over-involved until about age 27. Commercial drivers under the age of 21 are over-involved by a factor of six in comparison to the overall rate for all commercial drivers, paralleling the pattern found by Williams for passenger vehicle drivers. The general pattern of over-involvement for younger drivers pervades virtually every combination of factors which Campbell examined. Therefore, he concludes that the basic trend shown in the aggregate data is primarily associated with age.

Blower (6) also finds that young truck drivers to be significantly over-represented in the crash population.

B. Age or Experience

Graduated licensing can ease the novice into driving, providing experience in a less-threatening milieu. But if the crash rate is a function of age alone, graduated licensing may have only a minimal benefit.

Mayhew and Simpson (31) found in reviewing the literature that both lack of experience and young age contribute, but it was not clear which was more important. However, their own evaluation of Ontario data suggested that age-related factors are more important than experientially-related factors, particularly for males.

Hirsch and Laberge-Nadeau (24) are much more specific in stating that raising the driving age is the only intervention that reduces young driver collisions.

Waller believes the high rate of crash involvement is often attributed to the lack of judgment of youth. (40) She feels that young learners are not different from older learners in making more mistakes in the early stages of learning. Young drivers have two major causes of crash risk, inexperience and the tendency to engage in high risk behavior. In fact, young drivers may deliberately engage in high risk behavior, choosing not to recognize the risk. Waller believes that licensure at a higher age, or nighttime curfews, are not effective, but the crash rate can be reduced by gradually introducing youngsters into the driving population.

Chira-Chavala and Cleveland (9), found that truck driver experience appeared to be a more important factor than driver age. Experience was especially critical for doubles drivers, particularly for tanker and flatbed doubles.

New Zealand's Land Transport Safety Authority (27), reports that British research shows novice drivers of all ages are more likely to be involved in a crash than experienced drivers of the same age. A study by Forsyth, Maycock and Sexton (1995) estimated one year of driver experience decreased the likelihood of a crash by 38% for drivers under 25 years of age, versus 20% for 25-year olds. They also quote Catchpole, Cairney and Macdonald (1994) as commenting that, although age and maturity are both important, actual driving experience is critical to becoming a safe driver.

Gregersen and Bjurulf (21) believe that actual driving skill is only a part of a complex structure of factors involved in crashes. They report that Maycock et al. (1991) found that the safety risk during the first years of driving decreased by 59% due to experience and 31% due to age and that age is more important for younger drivers. They state that similar results were found by Cooper et al. (1995) in Canada and that Ferdun et al., in studying over 10,000 young drivers, showed that experience was of primary importance, but age was an especially important factor among young men. They also report that Michels and Schneider (1984) studied traffic violations in Geneva and concluded that experience is of greater

importance than age. Based on all these studies, Gregersen and Bjurulf conclude that experience and age are both vitally important, but that experience is more important, at least for those 17 and older.

Gregersen and Bjurulf note that experience affects crash risk by slowly "automating" more and more of the driver's activities so a larger percentage of the time can be spent interacting with traffic rather than controlling the vehicle. Experienced drivers also perceive and react to risk situations more quickly. While experience improves driver scanning behavior and car control, Duncan et al., (1991) are reported to have found a deterioration in such behaviors as following distance, mirror checking frequency, and stopping for intersections sooner.

C. Driving for Work or Recreation

As to whether a young/novice driver behaves differently depending upon whether he/she is driving as part of a job or for pleasure, Preusser (38) states that young age is an issue primarily when engaged in recreational driving, and less of an issue when engaged in purposeful driving activity. The issue can best be solved by limiting "recreational" driving until the person is older, i.e., providing full licensure at an older age. He states that graduated licensing systems can address both the age and experience issues by delaying recreational types of driving and encouraging supervised practice driving.

Using the logic that only those crashes for which the driver was responsible are relevant to the consideration of driver safety, Cooper (9) found that the culpable crashes per driver rate was much lower for those involved in business/commercial driving.

However Campbell (8) found in studying fatal truck crashes the same essential pattern of younger driver over-involvement that is seen in passenger vehicle crashes.

D. Minimum Age of Interstate Commercial Vehicle Drivers

As mentioned above ("Driver Shortage," p. 12), some trucking companies may make their support of a graduated license for commercial drivers contingent on lowering the age for driving in interstate commerce from 21 to some intermediate age. However, within the trucking industry opinions differ on the advisability of using younger drivers.

The ATA Driver Issues Task Force (4) feels that the federal minimum age of 21 years to drive in interstate commerce is the most critical barrier to employment in the trucking industry. Unlike other industries with which it competes for workers, trucking is then unable to attract young candidates, particularly those directly out of high school. The industry's inability to recruit these drivers contributes to the perception that truck driving is a second or

third-choice career. The Task Force believes that an individual who is qualified to drive within the borders of a state should not be automatically disqualified from interstate driving.

On the other hand, Johnston and Reed (26) found in their survey of 14 major motor carriers, that almost all firms agree that younger drivers should not be tapped as a source of potential recruits. Most reported greater safety and other problems with younger drivers and none favored lowering the driving age to 18. In fact, most of the companies surveyed in that study required drivers to be older than state and federal minimums, several setting a minimum age of from 22 to 24.

VI. EFFECT ON RESEARCH DESIGN

Nothing was found during the literature search which would cause TRI to request any modification in the project, as previously planned and documented.

Appendix A

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Appendix B

Notes from Relevant Publications

1. "AAA Calls for Safer Highways with Graduated Licensing," *PR Newswire*, April 26, 1995.

"AAA recommends that all graduated licensing programs make provisions for:

1. Establishing relevant and timely restrictions on driving, particularly on nighttime driving during early stages of licensure.
2. Imposing meaningful sanctions against serious or cumulative traffic violations, especially those involving driving while impaired by alcohol or other drugs.
3. Granting additional driving privileges only after development of skills, values and attitudes which lead to safe driving habits, violation-free driving records and increased driving proficiency.
4. Convenient access to supplemental training programs, preferably utilizing state-of-the-art instructional technology."

2. AAA Government Relations, *Graduated Licensing System: Learning the Skill, Earning the Privilege*, March, 1996.

Two notebooks of information from IIHS, NHTSA/AAMVA, NAII (Natl. Association of Independent Insurers), including articles, draft state legislation (from NAII), sample testimony before state legislatures, TRB Circular 458.

3. American Association of Motor Vehicle Administrators, *Commercial Driver Licensing, A Summary of State Practices and Procedures*, February 1997.

Class A basic fee ranges from $0-$100. Skills test extra ($5-$150) in some states. Most states allow limited retesting without paying additional fees. Most states charge same basic amount for renewal.

Many states have third-party testing for the vehicle skills test. Fees for these tests are generally not set by the state. AZ sets a maximum of $50 for the skills test and has 160 contract agents with 375 testers. GA also sets $50 maximum (skills test only), CO sets maximum of $100 and allows third-party to rent equipment. ID has only 3rd-party examiners for skills test (they get $30, State gets $5). KS has four sites for third-party testing with fee not regulated by State. State license fee for CDL is $14 plus $10/endorsement, $3 "exam" and $2 "photo." In LA all skills tests given by third-party testers. MI skills tests available through third-party testers only at 280 sites (knowledge test available at 186 state licensing offices) for approximately $75, prices vary as they are established by third-party tester. MN has 54 third-party skills testers testing only their own drivers. MS has 72 third-party skills testers, 100% open to public. 20% of total tests are administered by third-party testers. Fees not regulated by state. MO charges $5 for skills test, but 20 third-party testers fees range from $10 to $275. NE has 52 third-party skills testers with $100 fee. State seems to include skills test in $40 CDL license fee. NV has five state skills test locations and 56 third-party skills test companies. In NM all skills testing is done by third parties. NC has 160 third-party testers at 300 different sites, but generally they may test only their own employees. OR has 300 third-party skills examiners representing 46 companies; only employees of the certified tester may be tested by their company. 25% of skills tests are administered by third-party tester. PA has 115 third-party skills testers, 75% of which are open to the public. RI skills test is administered by Community College of RI. SD third-party examiners do all class A and B skills tests - maximum charge $80. TN has 53 contract third-party skills test agents with 111 examiners. They may charge up to $75. UT has 113 certified third-party skills testers, half will test outside their organizations - $50 fee. VA has 99 third-party skills testers allowed to test their own employees only. WA uses only third-party testers for skills tests, has 121 third-party skills testers open to public, 17 for company employees only. Cannot charge more than $50 per skills test. Some other states also use third-party testing to various degrees.

Alaska CDL learner's permit requires: 1) must be 17 years old, 2) be licensed for one year, 3) pass commercial knowledge test, 4) valid for two years, 5) must be accompanied by qualified licensed driver to operate. Certainly includes CDLIS/NDR check too.

4. American Trucking Associations Driver Issues Task Force, "Interim Report on Critical Driver Issues," June 1996.

"The most critical barrier to employment in the trucking industry is the requirement that drivers must be 21 years of age to drive interstate. Thus, unlike the other industries we will compete with, trucking is unable to attract candidates directly out of high school and other candidates between the ages of 18 and 20. The Task Force believes the industry's inability to recruit from this pool contributes to the perception that truck driver is a second or third-choice career."

"The Task Force believes that an individual who is qualified to drive within the borders of a state should not be automatically disqualified from interstate driving....the industry (should) carefully study the results of the Wisconsin apprenticeship program, which provides training to high school graduates and leads to jobs with Wisconsin motor carriers. Based on the results of the Wisconsin program, the industry may want to consider advocating a change in the minimum age requirement for interstate driving."

"Inadequate training of new drivers is another often-cited reason why industry turnover is so high. While the Task Force does not support mandatory entry-level training, it is clear that the industry must do a better job of training new drivers and retraining experienced drivers, in order to ensure that drivers are equipped to do their jobs safely and efficiently. Driver surveys have also indicated that drivers are interested in non-driving training as well, such as personal financial management, running a business, and general information about the trucking industry." "The Task Force supports the efforts of the Training and Development Alliance to develop voluntary curricula for entry-level and experienced driver training. Motor Carriers should also explore opportunities to obtain state or federal funding to conduct in-house training for entry-level drivers."

5. Arnold, Kerry, Executive Officer, New Zealand Road Transport Association, personal correspondence, July 31, 1997.

A full light duty vehicle license is good for life except that biannual retesting begins at 71 years old. "For truck drivers most go through the car licensing phases before applying for a truck drivers licence which is available at 18 years of age. They can get a heavy trailer licence and the truck licence at the same time by virtue of a few simple questions and a quick drive around the block with a testing officer. The heavy truck licence covers vehicles from 3.5 tonne GVM upwards, there are no intermediate categories. The smart alecs get a licence in a 2 axle 5 tonne truck and a 2 axle heavy trailer and next day they can be potentially driving a 44 tonne 8 axle 'B' train or 39 tonne tractor semi. Regrettably there are some trucking industry employers who think this is okay but most fortunately require some evidence of experience in a smaller truck before giving a multi axle unit to young drivers.

"The new system outlined in the publication you have requested (Land Transport Safety Authority, "Driver Licensing Proposed Policy") provides for a graduated system to impact on all vehicle licence categories, but in particular there are multiple weight thresholds for truck driver licences. Moving from one threshold to another can occur based on documented experience over a specified time frame, or as we have submitted to LTSA by competency assessment if the driver takes an accelerated learning programme at an approved truck driver training institution."

6. Blower, Daniel, "The Accident Experience of Younger Truck Drivers," May 1996.

"Young truck drivers are significantly over-represented in the accident population. The primary evidence for this statement comes from two studies of national fatal truck involvements and a study of truck accidents in Michigan," done by Dr. Ken Campbell of UMTRI in 1991 and 1988.

"The literature on young male passenger car drivers points to excessive risk-taking and skill deficits as major factors in their high accident rates. Examination of moving violations, the accident record, and particular accident types provided evidence that young truck drivers have similar problems."

"In sum, analysis of traffic violations, the computerized record of traffic accidents, the accident typology, and case review of a simple of police reports all produced evidence of the following problems among younger truck drivers:

- excessive and unsafe speed;
- overly aggressive driving, as in following other vehicles too closely;
- failing to anticipate and provide for the unexpected actions of other road users, as in both rear-end and backing accidents;
- maintain proper vehicle control, as in low-speed turning and backing accidents;
- possible attentional overload, as in some of the loss of control accidents."

"In a sense, the answer to many of these problems is experience. The two main differences between younger and older drivers are age and experience. Experience includes knowledge of the wide variety of behaviors of other road users, strategies for coping with other road users, a knowledge of how your own vehicle is going to perform, as well as the low-level skills of driving such as lane-keeping and maintaining headway that are learned so well as to be automatic and unconscious."

"The problems of youth, excessive risk-taking and over-estimation of ones own driving abilities, are more difficult to address. Interestingly, the evidence in the literature about young passenger car drivers as to the efficacy of driver's training is mixed."

"Effectively addressing the two problems of age and experience of young truck drivers is difficult....But it is likely that the problem of experience can be overcome through practical training that gives real-world experience. Motivational factors such as risk-taking and aggressive driving must be addressed as well, and the study in Sweden [which "showed training that provided the trainees with experience of the limits of their skill led to less over-estimation of driving abilities." (20)]...may suggest a useful approach.

Looking at "all" violations (both involving cars and trucks) younger drivers have a far higher numbers. But violations in trucks alone are about the same, although the author tries to explain this away because young drivers have 30% less exposure and some recent violations may not be on the record. Table 11, showing hazardous actions in truck involvements, indicates younger drivers do make mistakes which training could affect, particularly backing problems, and speed too fast for conditions. The author looks at this table, a similar NC table for all accidents, and tables of violations charged in two-vehicle accidents in MI and NC for truck involvements and says "This is strong evidence that young drivers make driving errors at a higher rate than older drivers, and that the over-involvement of young truck drivers is not a matter of exposure or a different driving environment. Instead, the over-involvement of young truck drivers in traffic accidents is because they make driving errors at a substantially higher rate than older, experienced truck drivers."

The author shows data indicating "...that night travel does not play a large role in explaining the over-involvement of younger drivers." Likewise "...there is no evidence...that difficulties in coping with weather accounts for the over-involvement of young drivers in traffic accidents." Detailed accident "typology" charts for MI and NC truck accidents show higher frequencies for younger drivers in single vehicle loss of control accidents, truck backed into other vehicle and truck rear-ending other vehicle. Other data, such as young drivers having over 30% of their MI expressway accidents on ramps, compared to 21% for older drivers, argue that young drivers may not be able to control their vehicles as well, do not know the limits of the vehicles, or purposefully drive beyond their limits.

Also of interest re graduated licensing: "Many environmental factors are known to be associated with increased risk (for all truck drivers). For example. bobtails have much higher accident rates than tractor-semitrailers. Compared with Interstate roads, U.S. and state routes increase accident risk per mile traveled by about a factor of two, and all other roads increase risk by about a factor of seven [Blower, 1993]. Time of day and area type (urban or rural) are also known to be associated with differences in accident risk, with accident risk higher at night and in rural areas. In addition, characteristics of truck operations probably have an impact. For example, large fleets are more likely to have an active safety program. Construction firms that operate in urban areas have a different accident exposure than less-than-truckload freight haulers."

In Michigan, "Younger drivers, aged 18 to 21, make up only about one percent of all CDL-holders, and drivers 22 to 24 are only about three percent of CDL-holders." "About 53 percent of young (18-21) drivers have Class A licenses and an additional 43 percent have Class B licenses. The comparison group of experienced drivers, age 30 to 49, is heavily weighted toward Class A, with about 71 percent A licenses and 26.5 percent Class B licenses. Also, it should be noted that, while in general only a small percentage of the driving population has a CDL, it is much smaller for younger drivers than older ones. Less

than half a percent of all drivers 18 to 21 have a CDL, compared with less than two percent for 22 to 24 year olds and about five percent for drivers age 30 to 49."

In Michigan "...about 64 percent of young drivers drive straight trucks compared with 52 percent of older drivers. About 48 percent of the experienced drivers primarily drive tractors, compared with 36 percent of younger truck drivers. Young drivers also drive fewer miles per year than older drivers....Drivers 18 to 21 estimated their average travel at about 29,000 miles per year, 22 to 24 at 34,000, and drivers 30 to 49 at 37,000 per year. Note that the averages are calculated across all truck types and all types of operations." Younger drivers tend to drive more during the day and more of their travel is local than older drivers. "Over 87 percent of the mileage of younger drivers is during the day, compared with about 78 percent for older drivers." In both the 6 pm to midnight and midnight to 6 am time periods, 18-21 year old drivers drive about half as much as drivers in the 30-49 age group. "Drivers in the 18 to 21 age group accumulate almost 70 percent of their mileage in local trips. Local trips account for about 58 percent of the travel of the other age groups....The proportion of travel on trips of more than 500 miles is over twice as great for the older drivers than for the youngest age group....Local trips are typically...in urban areas with a relatively high traffic density....Longer trips are primarily on Interstate-quality roads, which have relatively lower accident risk...."

Table 5: Company type by age group

	18-21		22-24		30-49	
company type	n	%	n	%	n	%
interstate for hire	68	11.17	92	19.21	137	21.01
interstate private	111	18.23	128	26.72	157	24.08
intrastate for-hire	43	7.06	21	4.38	28	4.29
Intrastate Private	387	63.55	238	49.69	330	50.61

"The reader should bear in mind that the survey attempted [to] cover all types of truck drivers, a large fraction of whom are farmers, work in construction, or some other similar activity. Yet the table clearly shows older drivers are about twice as likely to work for an interstate freight hauler as the younger drivers, who more typically work for smaller, local firms." "Drivers in the younger age group are much more likely to work for small companies than more mature drivers. Almost 43 percent of younger drivers work in companies with one to five trucks, and over 62 percent in companies with ten or fewer. Fewer than seven percent work for companies with more than 200 trucks. In contrast, over 18 percent of older drivers work for the largest trucking companies [>200 trucks], and over 31 percent work in fleets larger than 50 trucks." Younger drivers were less likely to have received driver training of any type (even in-service).

"In sum, the survey validated some of the prior expectations and overturned others. About 90 percent of young CDL-holders currently drive a truck. As to the accident risk of the environment in which young truck drivers operate, the results do not consistently point to a high-risk or low-risk environment. Most drive straight trucks on local trips for small, intrastate private firms. Straight trucks have somewhat lower accident rates than tractor-semitrailers. Local trips, at least for non-farm operations, are probably mostly on urban, non-Interstate quality roads. While urban accident rates are generally lower than rural, Interstate and similar limited access roads are the safest roads in the highway system....Similar, there is some evidence that large trucking firms have lower accident rates than smaller one(s), private companies as a whole may have lower rates than for-hire trucking companies....On the other hand, young drivers have relatively little night travel, while more experienced drivers travel significantly more at night, when the accident risk is much higher. Most consistent with the high accident rates of younger drivers are the findings on driver training. While overall few drivers have much formal truck driver education, younger drivers have less than others, particularly from driver training schools or the military. Possibly most important of all, older drivers have much more experience in driving a truck."

7. British Columbia Ministry of Transportation and Highways, *Task Force on Commercial Vehicle Safety, Report to the Minister of Transportation and Highways*, April 2, 1997.

In the wake of three fatal truck runaway accidents, the Minister of Transportation and Highways in October 1996 established a Task Force on Commercial Vehicle Safety. Recommendations covered the following areas:

- Driver Licensing Standards
- Enforcement of Safety Regulations
- Monitoring and Evaluating Carriers
- Shipper Standards
- Driver's License Sanction Process
- Carrier Incentives
- Commercial Vehicle Inspection Programs

Among the 12 Driver Licensing Standards recommended were:

- Introduce a graduated licensing system.
- Explore implementation in greater detail to determine implications for reciprocity with other jurisdictions and grandparenting of existing commercial drivers licence holders.
- Elevate the graduated licensing proposal to the Canadian Council of Motor Transport Administrators for discussion.

Many of the Task Force recommendations were in response to a coroner's jury recommendation "that the trucking industry and the B.C. Government enter into a joint training programme for new drivers and new B.C. licence applicants. The programme would be akin to an apprenticeship and cover a minimum period of 6 months. This programme could be combined with a multi-step licence that would ensure that the driver was completely trained and conversant in all areas of the operation of a commercial vehicle."

Another recommendation was to adopt a standard mandatory curriculum for commercial vehicle driver licence training in BC.

8. Campbell, Kenneth L., "Fatal Accident Involvement Rates by Driver Age for Large Trucks," *Accident Analysis and Prevention*, Vol. 23, No. 4, pp. 287-295, August 1991.

Abstract- Survey data on large trucks involved in fatal accidents and on the travel of large trucks provide estimates of fatal accident involvement rates by driver age. The analysis is focused on the implications of lowering the minimum age for drivers of commercial trucks operating interstate from 21 to 19 years. Fatal accident involvement rates for drivers of large trucks are found to increase with decreasing driver age. The younger drivers are over-involved until about age 27. Drivers under the age of 21 are over-involved by a factor of 6 in comparison to the overall rate for all drivers. Other factors known to have significant influences on the probability of involvement in a fatal accident were examined to determine their association with the over-involvement of younger drivers. The general pattern of over-involvement for younger drivers pervades virtually every combination of factors examined. Thus, it is concluded that the basic trend with driver age shown in the aggregate data is primarily associated with age and is not associated with the other factors examined. The results of this analysis substantiate an elevated risk of fatal accident involvement for younger drivers of large trucks.

1980-84 TIFA (Trucks Involved in Fatal Accidents) fatal accident data and the 1986 NTTIS (National Truck Trip Information Survey) exposure data by driver age are used. Nearly 98% of the drivers in fatal accidents over this period were male. "The overall trend...and in particular the over-involvement of younger drivers is very similar to the findings of Williams (1985)...." for passenger vehicle drivers.

Looking at specific factors, both younger and older drivers are overinvolved by about a factor of two at night (9 pm - 6 am). Overinvolvement rates of 19-20 year olds are quite similar in single-unit and combination trucks, "when compared to the overall rate for the respective vehicle type." Campbell looked at younger drivers across eight travel categories, made up of various combinations of road type (limited access vs non limited access), area type (rural vs urban) and day vs night and found "The younger drivers were over-involved in each driving environment." Likewise, splitting into groups of single unit vs combination in inter and intrastate driving "results do not vary appreciably from the 2.15 rate for the aggregate. The overall trend of over-involvement pervades every type of vehicle and operation examined."

"About 25% of the drivers under 21 were changed with a violation in connection with the accident as compared with only 15% for truck drivers of all ages in fatal accidents." "The factors that are associated with the younger drivers suggest a lack of maturity and judgment."

"If one is considering lowering the minimum driving age for commercial vehicles, then the significant finding of this analysis is that the younger drivers are over-involved in virtually all of the conditions examined in this study. They are over-involved in the day just as much as at night, on all types of roads, and in both rural and urban areas. Furthermore, younger drivers are over-involved as drivers of commercial vehicles to about the same degree as when they are drivers of passenger vehicles. The fact that they are employed to drive commercial

vehicles apparently does not alter the essential pattern of over-involvement that is shown when they drive passenger vehicles."

9. Chira-Chavala, T., and Donald E. Cleveland, "Casual Analysis of Accident Involvements for the Nation's Large Trucks and Combination Vehicles," *Traffic Accident Data, Driver Performance, and Motor Vehicle Update*, Transportation Research Record 104, Transportation Research Board, 1985.

"The effect of driver experience appeared to be more prominent than driver age. Experience was found to be important for all three age groups considered. Drivers with less than 1 year of driving experience showed higher accident rates than did drivers with 2-4 years or over 4 years of driving experience. Driver experience appeared more critical for doubles than for singles, especially for 2-axle-tractor tanker and flatbed doubles."

10. Cooper, Peter J., Mario Pinili, and Wenjun Chen, "An examination of the Crash Involvement Rates of Novice Drivers Aged 16 to 55," *Accident Analyses and Prevention* 27:89-104, 1995.

Authors represent the Insurance Corporation of British Columbia and used accident data from that province in the study. Samples are large.

Abstract - There is general agreement in the literature that both age and driving experience correlate with aggregated accident risk for driver populations. The very young and beginning drivers have been classified as groups that are overrepresented in crashes, but unfortunately the former is often used as a surrogate for conclusions concerning the latter. The research that we undertook examined the interactions of various driving exposure and accident characteristics with both culpable and nonculpable crash involvements for 149,000 British Columbia novice drivers between the ages of 16 and 55. In assessing the results of our enquiry we were unable to substantiate that any of the supposed 'risky' driving situations often proposed for graduated licensing system exposure restrictions (such as nighttime curfews, no highway driving, etc.) more adversely affected drivers in their first as compared to subsequent two years of driving, even though some (such as alcohol presence) were significantly correlated with accident fault assessment. The results did, however, suggest that license restrictions or some other form of sanction applied following initial traffic law contraventions could address a substantial proportion of subsequent crash involvement likelihood. When considering only young novices (aged 16 to 18 years), the results were not greatly different, although for these drivers the carrying of passengers was found to be significantly more associated with first-year crashes than with those in subsequent years."

"The concept of graduated licensing for novice drivers has received considerable attention. This concept is based upon the reasonable premise that driving proficiency is enhanced through experience but that certain types of early exposure to risk before adequate proficiency has been gained increase the chance of collision involvement. The proposed solution is to restrict exposure by novice drivers to 'low-risk' situations through application of such things as nighttime curfews and freeway driving prohibitions....But one of the major shortcomings of the underlying justifications is that they are often based on aggregate research concerning young drivers but not specifically novices."

"It seems evident that both age group and experience are correlated with driver crash risk." Novices may tend to drive less. Accident risk as defined by "fault" may be a function of amount of driving undertaken. "All of this underlines the need to examine...the effects of driving experience independent of age group."

"Culpable" (responsible for crash) first-year novices had significantly more crashes than second and third year novices. "For nonculpable involvement the situation was actually

reversed." "While for culpable involvements novice drivers were substantially more at risk than the general driving population, in terms of nonculpable involvements their rate and that of the population were essentially the same." "Both culpable and nonculpable involvements exhibited a significant decrease with increasing age at licensure as well as a change with years of experience, thus seeming to confirm the general belief that both age and experience are important factors in accident risk. It can be observed...that the difference in culpable crash involvement rates between novices and the general driving population at a given age showed no signs of decreasing until past the age of 40 or so." "The role of exposure to risk ...is an unknown factor." For culpable accidents, first year novices accidents per driver started at .20 for 15-20 year olds and dropped off to less than .10 for first-year novices aged 40 and above. Nonculpable accident rate for first, second and third-year novices started around .10 and continued to drop to age 55 (oldest group in study) at about .05. "Postponing licensure for 16- or 17-year olds for anything less than four years will not make them better first-year drivers." "The net long-term effects of reducing exposure for novice drivers should certainly be in the direction of reducing crashes, but the same could be said for non-novices or any other subset of drivers."

"For culpable crash involvements there were no significant interactions found between... [day of week and time of day] and noviceness...." "We found no significant novice effect associated with culpable accidents in high (70 km/h+) speed zones." "For culpable involvements there was a significant interaction between alcohol and year or driving...but the interaction showed alcohol to be significantly less of a problem, proportionally speaking, with newly-licensed novices, than with those having more years of experience."

The culpable accidents per driver rate was much lower for those involved in business/commercial driving (rates of $<= .005$ compared to rates of $> .01$ for other uses). This isn't nearly so clear with logistic regression models used later in the paper.

"Although more than half of serious, first-time crash involvements for novice drivers are not proceeded by an 'early warning' indication (previous convictions), the conviction of novices for traffic violations offers an opportunity for useful intervention. There is a potential for affecting the subsequent probability of occurrence of over 40% of their crashes during the first three years of licensure."

Novice drivers' high accident rate seems to be a high rate of culpability. "Higher culpability proportions were associated not only with those engaging in occasional driving but also with those driving for a living. Lack of experience as defined by a short licensing time, combined with probable low travel exposure, seemed to represent the major problem, and such an indication calls into question novice licensing concepts that proposed forced exposure restrictions." "In the final analysis, our research uncovered only one area in which driving restrictions seemed reasonable for young novices. This was the carrying of passengers."

"Based on the results of our study, it seems evident that if novice drivers are to be treated as a single group in applying licensing programs, there is a limited basis on which to justify initial 'blanket' driving restrictions for all." "An alternative...would be to have restrictions applied following demonstrated nonperformance as evidenced by traffic law violation convictions or at-fault accident involvements."

"The higher crash rate for novices than for non-novices argues persuasively for some type of differential licensing treatment. The only question to be answered relates to what form a novice driver licensing system should take. The concept of applying initial driving restrictions that are 'gradually' relaxed with increasing experience is intuitively appealing but not necessarily appropriate. Jurisdictions that choose this path should be prepared to support with some substantive analyses the specific restrictions to be imposed."

11. Curley, Tom. "Easing Teens into the Driver's Seat," *USA Today*, April 21, 1997.

On April 1, Michigan became the 21st state "to curb young drivers under a growing trend known as 'graduated driver licensing'." Pat Waller, director of UMTRI, "is credited with developing graduated licensing two decades ago." Michigan's program allows "teens just shy of their 15th birthday" to get "a learner's permit, which allows them to practice driving with a licensed driver over 21. Teens have to stay at this level for at least six months. Parents must certify that they have supervised 50 hours of driving, including 10 hours at night. Teens must also take an introductory driver's education course at school or through a private company." At age 16, teens with a clean driving record move to the second level, which allows them to drive without supervision, except between midnight and 5 a.m. A road test and an advanced driver's education course are required for this level. "Level Three is a regular license without restrictions. Only 17-year olds who have spent at least six months at Level Two are eligible. They also must be accident- and violation-free for 12 consecutive months."

Michigan students and parents are quoted as supporting the licensing change.

12. Driver/Education, "Ontario's New Deal in Licensing, Training" June 1994.

Ontario's, first in North America, full-fledged graduated driver licensing system (GDL) was fully implemented as of June 6, 1994. Old rates of $31 covered the knowledge, vision, and road tests and the license itself. New rates are $10 for the knowledge test; $40 for the Level One road test; $75 for the Level Two road test and $50 for a five-year license, or a total of $175.

The level Two road test is being developed by consultants Engel and Townsend, under contract to MTO. The prototype is based on the CDL road test, developed by the same organization.

GDL requirements:

Level One (entry, minimum of 12 months or 8 months with driver ed. certificate)

- minimum age 16
- pass vision and knowledge tests
- can drive on public roads with fully licensed driver with at least four years' experience in front passenger seat
- no driving from midnight to 5 am
- 0 BAC
- passengers limited to number of seatbelts available
- cannot drive on high-speed expressways

Level Two (lasts 12 months)

- must pass road test
- can drive any time of day or night without accompanying driver, on any Ontario road
- 0 BAC
- every passenger must wear seatbelt

Full License

- must pass advanced driving test.

13. Driver Training and Development Alliance, "Report on the 1997 Driver Training and Development Forum," April 10-11, 1997.

Brian Mclaughlin reported that FHWA is likely to publish a follow-on notice on entry level driver training by the Fall of 1997. There is agreement that the CDL has been successful but that it now is in need of enhancement. FHWA and AAMVA are looking at CDL issues.

There may be a role for a graduated commercial licensing system. Mike Smith of NHTSA reported that it seems to be effective in reducing light vehicle crashes. The ATA Foundation is doing research on the subject and also on providing a compendium of management guidelines to identify at-risk drivers and implement countermeasures.

Breakout sessions discussed: Using the CDL to Improve Driver Training; Reaching Less Responsive Motor Carriers with Training Initiatives; and Assessing Driver Risk Factors.

Debra Christenson of the Gallup Organization reported on initial results of their 1000 driver interviews for the ATA Foundation, that the five most important predictors of job satisfaction seem to be the care managers give, recognition of a job well done, hours worked, steadiness of the work, and company training programs.

Lana Batts, president of PTDIA, reported that they are reviewing and revalidating the knowledge and skills standards needed to be a professional driver, and expect that new standards will be in place by July 1997.

Erika Jones of the law firm of Mayer, Brown & Platt, addressed liability exposure in case of accidents and how a good training program can help reduce the exposure.

14. Driver Training and Development Alliance, "Summary report on the Driver Training and Development Forum," April 18-19, 1996.

Discussion of *Assessing the Adequacy of Entry-Level Commercial Motor Vehicle Training in the Private Sector* which had just been released. Brian McLaughlin of FHWA noted that "...the agency has discussed the possibility of instituting a graduated licensing system as part of the Commercial Driver's License (CDL) program. This would allow drivers to 'ease into' the industry, and acquire increasingly higher levels of CDL over time."

Gary Putnam of Amoco Fabrics and Fibers raised a number of provocative questions about training and the FHWA study findings, such as "how do we know that training prevents drivers from being in accidents?" and "Shouldn't we consider how those drivers with outstanding safety records got their training?"

A panel discussed potential funding sources for entry-level training.

The Canadian Human Resources Council has developed a comprehensive classroom and on-the-job training program for professional drivers, which requires close to 600 hours of instructional time and costs between $900 and $2500 per student. It is not yet implemented.

Breakout sessions reviewed the draft *Driver Training and Development Resources Guide*. Sessions discussed the importance of training the driver trainer and better human relations between management and drivers. The ATA's Driver Issues Task Force reported on driver turnover and diver referrals and background checks. A group of speakers reported on emerging training technologies; computer-based training, simulators, TV-based multi-media training. The final presentation focused on current industry/government driver research.

15. Dueker, Richard L., *Assessing the Adequacy of Commercial Motor Vehicle Driver Training: Final Report, Volume I, Executive Summary*, Applied Science Associates, July 1995.

Abstract - The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Public Law 102-240, mandates that the Federal Highway Administration (FHWA) report to Congress on the effectiveness of public sector efforts to ensure adequate training of entry-level drivers of Commercial Motor Vehicles (CMVs). The FHWA must initiate a rulemaking process to determine whether it is in the public interest to require the training of entry-level CMV drivers. The results of this project will be used by the FHWA Office of Motor Carriers as one input in the rulemaking process.

This report describes the outcomes of surveys and other data collection activities conducted in the heavy truck, motorcoach and school bus sectors. The surveys included 164 industry representatives, 122 driver training programs (including fleet-operated programs) and 464 drivers. In addition, the report summarizes and analyzes the response to the...FHWA...ANPRM titled, *Training for All Entry-Level Drivers of Commercial Motor Vehicles (CMVs)*. This ANPRM was published in the 21 June 1993 issue of the *Federal Register*. A total of 96 letters, signed by 104 persons, were received in response to the ANPRM. The responses came from truck driving schools, truck fleet operators and their associations, truck drivers and concerned individuals, trucking union and services organizations, a motorcoach association, school bus fleet operators and an association, state governments, and others.

Analysis, conclusions and recommendations are focused on five research areas considered important in support of FHWA's decision-making on the issue of mandated CMV driver training. These areas are: the existence/effectiveness of private sector programs, the magnitude of the accident problem, the effectiveness of training as a solution to the problem, the impact of mandating training and the existence/effectiveness of other government programs.

This report will be of interest to anyone concerned about the training of heavy truck, motorcoach and school bus drivers, and whether such training should be federally mandated.

"Are the three private sectors - heavy trucks, motorcoaches and school buses - effective at ensuring adequate training for their entry-level drivers? The conclusion of this study is that none of the three private sectors are effectively providing adequate training." Of the companies they surveyed or who responded to the ANPRM, 21.6% of heavy truck motor carriers had formal training for entry level drivers (compared to 62.5% for motorcoaches and 71.2% for school buses). 37.5% of the truck training was judged "adequate." Therefore only 8.1% of truck carriers hiring entry-level drivers provided "adequate" training (.216 X

375). "Adequate" training was provided by 18.5% of motorcoach carriers and 23.7% of school bus carriers.

Training for new drivers comes from other sources than the motor carrier. 61.7% of the 141 heavy truck drivers in the sample received entry-level training, 47.5% from proprietary schools, 7.8% from publically-funded schools, and 6.4% from military or company-operated schools. Weighting that by the percent the author considered "adequate," a total of 31.1% of entry-level truck drivers are considered to have "adequate" training. The total number is 18.2% for motorcoaches and 34.5% for school buses (these carriers don't generally have the option of going to a public or proprietary school for training).

"Even (some of) the smallest carriers offered formal training....several adequate or better heavy truck and motorcoach programs were operated by small carriers."

Truck fatal accident rate from 1980-1990 decreased at about the same rate as all vehicles. Therefore no evidence was found indicating improved truck driver training had a special effect.

On the question of "the effectiveness of training as a solution to the (accident) problem," "...this study found no evidence of a relationship between adequacy of the training the driver reported receiving and his/her frequency of accidents."

"What implications for decision-making can be derived from these contradictory findings? The answer to this question seems to be that, while adequate training is a necessary condition for the reduction of CMV accidents, it is not a sufficient condition. Something more has to happen in order for training to have its effect." "This suggests that a *combination* of....the Training-base strategy [which regulates the content of training] or the Performance-based strategy [which regulates the outcome of training] should be combined with the Industry-based strategy." The Training-based strategy involves requiring the training of entry-level CMV drivers. Performance-based requires passing more comprehensive knowledge and skills tests to obtain a CDL. Industry-based training would achieve a reduction in accidents by a "carefully structured set of cooperative FHWA-industry initiatives intended to encourage better training of CMV drivers."

16. Federal Highway Administration, "Training for All Entry Level Drivers of Commercial Motor Vehicles (CMVs), Advance notice of proposed rulemaking, 58 FR 33874, June 21, 1993.

SUMMARY: The FHWA is requesting comments from interested parties concerning the need to require training of all entry level drivers of commercial motor vehicles (CMVs). This action is in response to section 4007 of the Motor Carrier Act of 1991. If the FHWA determines that it is not in the public interest to issue a rule that requires training of all entry level drivers, section 4007 requires the agency to submit a report to Congress on the reason for the decision, together with the results of a cost-benefit analysis conducted as part of the rulemaking proceedings.

Good, short summary of history of FHWA involvement in CMV driver training from the 1980s, including development of the model curriculum, PTDIA, and the CDL. Questions are asked on the adequacy of entry level training provided, number of drivers trained. entry level driver training cost/benefits and other than entry level training.

17. Federal Highway Administration, "Training of Entry-Level Drivers of Commercial Motor Vehicles," Notice of availability and request for comments, 61 FR 18355, April 25, 1996.

SUMMARY: Section 4007 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)...directed the Secretary of Transportation to report to Congress on the effectiveness of the efforts of the private sector to ensure adequate training of entry-level drivers of commercial motor vehicles (CMVs). With this notice, the Federal Highway Administration (FHWA) is advising members of the general public that copies of the study entitled "Assessing the Adequacy of Commercial Motor Vehicle Driver Training: Final Report" and a cost-benefit analysis of requiring entry-level training for CMV drivers are now available from the National Technical Information Service (NTIS) .... The agency is also requesting comments from the general public regarding the content and conclusions of the final report and cost-benefit analysis."

There were 104 responses to the ANPRM of June 21, 1993 "but no consensus was reached on the issue of mandated entry-level driver training. The heavy truck and bus industries were against..." it because "the existence of uniform licensing standards rendered training unnecessary. The International Brotherhood of Teamsters and the trucking schools were in favor of the training requirement."

The cost-benefit study "showed that the cost of mandating entry-level training for 360,000 drivers a year in the heavy truck industry would be $4.5 billion over a 10-year period. The societal benefits of fewer accidents, reduced health care costs, and reduced delays caused by accident-related traffic congestion over the same 10-year period were estimated to range from $5.8 to $15.3 billion."

The Executive Summary of the adequacy study is included in the *Federal Register* notice.

18. Ferguson, Susan A., et al., "Teenage Driving Practices and Licensing Laws: Differences in Four States," Insurance Institute for Highway Safety, April 1994.

Abstract - A survey of high school seniors was conducted in four contiguous northeastern states with substantially different laws regulating the ages at which teenagers can learn to drive and obtain a license. The age at which these students first drove on a public road tended to be younger (often much younger than the legal minimum age for practice driving) when state law allowed practice driving and licensing at younger ages. It was also younger for males, for teenagers with poorer school grades, and for those whose parents had less formal education. The age at which these students obtained a learners permit and became licensed tended to be younger in states that allowed practice driving and licensing at younger ages, for teenagers in suburban or rural, as opposed to urban, communities, for those with better school grades, and for those whose parents had more formal education. Graduated licensing systems, which allow young drivers to be exposed gradually to increasingly complex driving environments, are one method for limiting teenage motor vehicle crash exposure. State laws and regulations that delay the age at which practice driving is permitted, provided learners permits that are valid for long periods of time, and establish a higher minimum licensing age can be used to limit teenage motor vehicle crashes.

19. Glamser, Deeann. "Commercial Driver's Licensing Makes the Grade," *Traffic Safety*, National Safety Council, May/June 1997.

Five years after the CDL went into effect it is drawing praise. "The rules apparently are getting problem drivers off the road." "Almost everyone contacted by *Traffic Safety* magazine about the CDL program echoed that opinion" (that the CDL had a positive but unquantifiable impact) adding up to safer highways. "AAMVA took the first nationwide look at CDL effectiveness when it surveyed states in 1994. The majority of state traffic officials and law-enforcement offices were pleased with program results. 'CDL did a tremendous amount of good,' says Sheila Prior, AAMVA associate director of driver services."

20. Gregersen, Nils Petter, "Young Drivers' Overestimation of Their Own Skill—An Experiment on the Relation Between Training Strategy and Skill," *Accident Analysis and Prevention*, Vol. 28, No. 2, pp. 243-250, March 1996.

Abstract - Young drivers' accident involvement may be explained by a number of different factors, one of which is that they tend to overestimate their skill in driving a car. This study is based upon the assumption that the degree of overestimation is related to the type of training the driver has received. In an experiment, two different strategies for training have been compared with regard to their influence on estimated and actual driving skill, as well as the drivers' degree of overestimation of their own skill. One of the strategies, used in the "skill" group was to make the learner as skilled as possible in handling a braking avoidance manoeuvre in a critical situation. The other strategy, used in the "insight" group was to make the driver aware of the fact that his own skill in braking and avoidance in critical situations may be limited and unpredictable. The experiment was carried out at the Bromma driving practice area in Stockholm. Low friction had been simulated by using "Skid Car" equipment. Fifty-three learner drivers were randomly divided into two groups. Each of the groups was taught on the basis of one of the strategies. The training session was 30 minutes long. One week later, the drivers returned to take part in a test of their estimated and actual skill. The "skill" group estimated their skill higher than the "insight" group. No difference was found between the groups regarding their actual skill. The results confirm the main hypothesis that the skill training strategy produces more false overestimation than the insight training strategy.

"Together, these findings may well explain why there is an inadequate accident reducing effect of many driver training programmes. From tradition and common sense, it has been assumed that increased skill is equivalent to increased safety....If it is accepted that skill training may lead to overestimation, it is obvious that traditions in driver training must be changed, or complemented."

"It is obvious that a car driver needs skill to be able to drive the car at all. However, the level of this basic skill, the relations between different levels of skill and self-assessment and the way in which the necessary skill should be learned, are not clear. There are several important aspects of this learning process that ought to be investigated further, such as differences between skill acquisition through training courses and through long-term experience. Skill training may also be effective from a safety point of view if it is combined with insight training, to make the driver aware of the practical limitations of the skills he has learned."

21. Gregersen, Nils Petter, and Per Bjurulf, "Young Novice Drivers: towards a Model of Their Accident Involvement," Accident Analysis and Prevention, Vol. 28, No. 2, pp. 229-241, March 1996.

Abstract - There are two main purposes of this article. The first is to present a model of young drivers accident involvement, including the most important processes in the development of their driving behaviour. The model describes the relations between the learning process, the individual preconditions and the social influence and how these are related to driving behaviour and accident involvement through different processes such as skill acquisition, self assessment, information processing, feedback and motivation. The second purpose is to present a state-of-the-art report for the different aspects of the model by referring to some of the literature on young drivers.

"Today we believe, however, that skill, traditionally defined, is only a limited part of a rather complex structure of factors [involved in accidents]." There are studies showing both that drivers who learn without professional teaching have higher and lower accident rates.

"Maycock et al. (1991) found that the initial risk during the first few years decreased by 59% due to experience and 31% due to age factors. The Maycock figure also shows that age-factors are more important at younger ages." Similar results were found by Cooper et al. (1995) in Canada. The younger the driver, the more dominant the age factor. "In a study of over 10,000 young drivers, Ferdun et al. (1967) showed that age was of secondary importance next to experience, but that age factors were especially important among young men. Michels and Schneider (1984) concluded from a study on violations among drivers in Geneva that experience is of greater importance than age. If all these studies are taken into account, it seems that experience as well as age related factors are of vital importance. It also seems clear that experience is of greater importance than age, at least from 17 years of age."

Experience affects accident risk by slowly "automating" more and more of the driver's activities so he can spend a larger percentage of his time interacting with traffic rather than controlling the vehicle. Experienced drivers also perceive and react to risk situations more quickly. However Duncan et al., (1991) found "experience makes the driver better in scanning behaviour and car control, but worse in...other aspects (such as following distance, mirror checking frequency, stopping for intersections sooner)."

Norway evaluated a two-phase graduated licensing system and did not find the expected accident reduction (Glad 1988). They changed to a two-year practice period between 16 and 18, a system also used in Sweden, France, Belgium and other countries "to increase experience while driving with an instructor."

Younger drivers "...underestimate the risks and overestimate their skills as drivers." If a driver feels he is skilled and "...able to handle a dangerous situation, the situation is no

longer equally dangerous....these findings are complex, since the drivers are not motivated to drive more carefully than they believe is necessary."

"It may be concluded that experience is of greater importance than age-related factors, with the exception of the lowest driver ages of 15 years where age factors seem to be more important."

22. Hagge, Robert A., and Patricia A. Romanowicz. "Evaluation of California's Commercial Driver License Program," *Accident Analysis and Prevention* 28:547-559, 1996.

Abstract - "This study evaluated the traffic-safety impact of the California Department of Motor Vehicles' Commercial Driver License (CDL) program. The program, initiated on 1 January 1989, began a new commercial license classification and endorsement system, implemented stronger licensing standards and more comprehensive tests of knowledge and driving competency, required drivers to report specific violations to employers, and provided for more stringent post-licensing sanctions on negligent operations. The effect of the program on fatal and fatal/injury accidents involving heavy vehicles operated by drivers licensed in California was assessed using intervention time-series analysis. The results indicate that the CDL program did not have a statistically significant effect on either accident measure."

Initially a higher percentage of applicants failed the knowledge and skill test than previously. The subsequent decrease in failure rate indicated that drivers were studying and practicing more to pass the tests, "thereby increasing their driving competency."

The data analysis suggests "that the CDL program probably had little or no effect on nationwide fatal accidents or California fatal/injury accidents." p. 558.

23. Hans, Mick, "Graduated Licensing — Training Wheels for Young Drivers," *Traffic Safety*, National Safety Council, March/April 1996.

"NHTSA first endorsed graduated-licensing efforts in 1977. The National Safety Council, the American Association of Motor Vehicle Administrators and IIHS also are advocates. In the same spirit, the AAA Foundation for Traffic Safety recommends that young drivers be taught a broad-based curriculum that focuses more on safe driving attitudes and behavior than on basic operator skills."

Includes short questionnaire from random sample of readers sent advance copy of article. Strongly favors graduated licensing and parental participation in hands-on training. Reader comments include opinion that parents may not be best teachers or role models for new drivers.

24. Hirsch, Pierro, and Chaire Laberge-Nadeau, "Critique of Mayew D.R. and Simpson H.M. (1990) New to the Road Young Drivers and Novice Drivers: Similar Problems and Solutions?" Laboratoire sur la Sécurité des Transports, Université de Montréal, October 1995.

Abstract - This critique examines whether or not Mayhew and Simpson provide sufficient scientific evidence to justify their recommendation of graduated Licensing, which they themselves describe as a "palatable" alternative over the inevitable safety gains of raising the driving age. Examples of biased reporting and logical flaws in argumentation are presented. The paper concludes with a brief discussion of a deeper bias that potentially influences traffic safety studies.

Mayhew and Simpson "seem to have had their own agenda, one much more intent on inflating the role of 'experience' versus 'age' than on actually exploring new theoretical avenues or expanding on underdeveloped approaches." They should have given more consideration to the "risky driver hypothesis," that "more aggressive adolescents try to obtain a licence at an earlier age."

Of the "various programs and countermeasures that have been applied over the years and around the world to the problem of young driver collisions, very few...were ever evaluated and the results of those that were showed mixed findings or marginal successes, with one notable exception: **The only known intervention that effectively reduces young driver collisions is to raise the driving age.**"

Hirsch and Laberge-Nadeau "submit that it is very probable that this report [Mayhew and Simpson] was written to provide scientific justification, however tenuous, for the adoption of graduated licensing legislation" thereby overstating the importance of experience and understating the importance of age.

"Overall I find that the New to the Road report is vastly informative as a reference work but flawed as an argument for the validity of graduated licensing." "The causes of young driver collisions are still not understood and, therefore, there is no reason to believe that graduated licensing has broken from the traditional 'shot in the dark' approach to programming."

25. Interstate Truckload Carriers Conference and American Trucking Associations, Inc., "1994 Driver Shortage Survey," October 16, 1994.

Data represent 225 of the 414 ITCC motor carrier members with annual gross revenues over $4 million who were mailed the 15-question survey. Results indicate...

- Carriers in all revenue categories experienced recruitment and retention problems areas of the north central states and the southcentral states were a problem area of most large carriers.

- Driver turnover rates improved in the first half of 1994. Turnover rate was proportional to carrier size -- small carriers reported 10-33% turnover while most medium and large carriers reported turnover from 34-75%.

- "The number of drivers short concentrated in the range of 1 to 25 drivers for companies utilizing up to 350 power units with a small increase in the percentage of drivers short as the number of power units operated increases."

- 93% of respondents said they had turned down loads due to driver shortages.

- Carriers using OOs reported more drivers short than carriers using employee drivers.

- "The most frequently mentioned methods to reduce turnover were 'improve dispatcher relations' and 'more base pay.'"

26. Johnston, William B., and David Reed, "The Shortage of Drivers and Mechanics -- What can be Done?" The Hudson Institute, October 19, 1988.

There is a truck driver shortage because of declining supplies of qualified workers, growth in the demand for drivers, and competition from other industries. About 300,000 new drivers are needed each year to replace those leaving the industry. Total demand for drivers will increase 16-23% from 1988 to 2000, leading to a need for about 450,000 new drivers annually. "LTL carriers had few problems compared to TL carriers."

Of the 14 major carriers interviewed:

- "Almost all companies report that the number and quality of their applications has declined."
- "The most severe shortages are concentrated among truckload carriers."
- "The shortages are worst in the Northwest, the Mid-Atlantic, and parts of the Midwest."

Most of the causes of the driver shortage will grow worse, including the low number of young men available. Higher standards will drive out candidates, and more attractive jobs will be available. Two strategies, recruitment and training, and keeping good drivers, will help solve the problem. The former emphasizes intensive recruitment, extensive screening, testing and training, but often does not follow up with improved pay and working conditions, and so, loses most of those it recruits. The latter looks at the drivers it has as assets and tries to keep them through good pay, less time away from home and regular hours, improved supervision quality, making drivers strakeholders in the company and improving the amenities, equipment and working conditions of drivers. Both methods are probably needed, hopefully combined, to solve the problem.

"One source of potential recruits that almost all firms agree should not be tapped is younger drivers. Most companies reported greater safety and other problems with younger drivers, and most required drivers to be older than state and federal minimum. No company favored lowering the driving age to 18."

In addition to the things individual companies must do, the industry as a whole needs to "convince the public that it cares about safety and that its drivers are responsible and helpful." "A much bolder program of image advertising should be considered."

27. Land Transport Safety Authority, *Driver Licensing Proposed Policy*, New Zealand, March 1997.

This driver licensing review document is a proposal, with a deadline of May 16, 1997, for receipt of public comments. "At this stage these proposals are not government policy, and the government has no views at this point on the detail of how a new driver licensing system might look, other than to say that it should provide an important next step in improving road safety."

A major review of driver licensing began in 1994, with the object of identifying best practice in other countries, evaluating possible improvements to the driver licensing system, and investigating how licensing procedures could contribute to the reduction in death and injuries. "Although the road toll has been decreasing since 1987, New Zealand still has one of the worst road safety records among OECD countries. Our 2.5 road deaths per 100,000 of population (compared with 1.5 road deaths for the best-performing countries in the world) leaves New Zealand as the sixth-worst of 26 OECD countries." (p. v.) [editors note: "OECD in Figures, 1997 edition," Supplement to *The OECD Observer, No. 206, June/July 1997, lists NZ as having 16 killed in road accidents per 100,000 of population. Statistics for 29 countries are listed. Starting from worst: Portugal - 29; Greece - 21; Luxembourg - 17; Hungary - 16; US - 16; NZ - 16.]*

Some of the major proposed changes are: raise the minimum licensing age from 15 to 17 for light duty vehicles and motorcycles [editors note: wonder if increasing minimum age will decrease effectiveness of graduated license?]; change the one licence for life (i.e., 71 years old) to one renewable every ten years; introduce a GDLS for heavy rigid and combination-type vehicles in place of the present single class of licence to drive heavy trade vehicles with an extra class to drive heavy trailers; widen the licence endorsement system beyond dangerous goods (the only present endorsement); and introduce a 10-yearly medical assessment for heavy vehicle drivers (none required now).

At present Class F license allows driving of any vehicle over 3500 kg (7700 lb) and class L allows towing of trailer over 3500 kg (7700 lb). The new system would have classes for MR (medium rigid), HR (heavy rigid), MC (medium combination) and HC (heavy combination) vehicles to avoid the problem of passing the test in relatively small vehicle and being permitted to drive largest vehicle.

Why change to a graduated license class system [for heavy vehicles]?

The heavier a vehicle, the greater is the likelihood of death or serious injury to its occupants and other road users if it is involved in a crash. Drivers of large vehicles, therefore, need to be experienced and competent to minimise the possibility of their causing a crash.

Some classes of driver licence currently allow drivers to operate a variety of vehicles without necessarily having demonstrated their competency to do so. Driving heavy vehicles is a specialised skill. It is distinct in many ways from, and more demanding than, operating smaller vehicles. The dynamics and handling characteristics of all vehicles change as their weight increases. The addition of a trailer further alters the way in which a vehicle behaves on the road. Drivers need to be aware of these differences and have appropriate training and experience to ensure that they can safely drive such vehicles.

Chira-Chavala and Cleveland (1985), cited in Pearson and Ogden (1991), found that driving experience appeared to be a more relevant factor in truck crashes than the age of the driver. Drivers with less than one year of driving experience showed higher crash rates than did driver with two-to-four years' or more than four years' driving experience.

The proposed system would enable drivers to build their skills incrementally so that licence holders have the opportunity to gain experience driving 'smaller' vehicles before being permitted to drive 'larger' vehicles.

Obtaining a graduated truck driver's license - "*Statement of Philosophy*: Licence holders should build their skills and gain experience driving smaller vehicles before being entitled to drive larger vehicles with different handling characteristics."

Proposal:

Applicants for a Class MR [medium rigid] licence must hold and have held a full Class L [new light vehicle license] for at least 12 months

Applicants for a Class HR [heavy rigid] licence must hold and have held a full Class MR licence for at least 12 months, or a full Class MC [medium combination] licence for at least 6 months

Applicants for a Class MC licence must hold and have held a full Class MR licence for at least 6 months

Applicants for a Class HC [heavy combination] licence must hold and have held a full Class HR for at least 6 months.

"At present, a first application for heavy trade vehicle and heavy trailer licences can be made at age 18 years."

At present periodic (annual apparently) medical checks are required for drivers of passenger vehicles and vehicle recovery vehicles (and drivers over 71 every five years) only. The proposal would require medical checks every five years for those drivers and driving

instructors and testing officers. Medical checks for holders of MR, MC, HR and HC licenses (medium and heavy rigid and combination vehicles) would be required every ten years.

A "fit and proper person check" (check of past criminal offences, mental health or behavioral problems, etc) would be extended to all bus and taxi drivers (previously it was only for small buses and taxis), driving instructors and testing officers

Endorsement of Driver Licences - *"Statement of Philosophy*: An endorsement system is an effective means of separating driving requirements from non-driving requirements. The licence classes relate to driving requirements and road safety risks. The endorsement system relates to non-driving elements such as personal safety risks to passengers.

Proposal:

> Introduce a system of driver licence endorsements for licence holders who undertake specified driving activities

To obtain the "P" endorsement to transport passengers, such as buses, the prerequisites would be:

> Hold and have held a Full licence for at least two years
>
> An advanced driving assessment, if not already undertaken
>
> A medical certificate
>
> A Fit and Proper Person Check
>
> An industry-based knowledge test

To obtain a "D" endorsement to transport hazardous materials or dangerous goods the current requirements to complete an approved course would continue.

"International research has not established a significant correlation between a driver's test scores and the number of crashes that person subsequently has." However driver testing should be continued since there is strong public support for retaining testing and making it more comprehensive and challenging. Testing shows that drivers meet minimum skill and knowledge levels and acts as an incentive of novices to practice driving skills and learn rules of the road and assures sufficient visual and mental abilities.

Why Retain the GDLS?

The GDLS (graduated driver licensing system) provides a safer learning environment by allowing people to build up driving experience in less risky situations. In a

graduated process, novice drivers and riders are sent the message that driving is learned over a period of time.

The GDLS has worked. According to researchers Frith and Perkins (1992), the introduction of the GDLS was accompanied by a substantial drop in casualties in the target group, without evidence of any increased unlicensed driving. This effect appears to have lasted for about two years before partially dissipating. There is a continuing 8% reduction in the proportion of crash-involved drivers who are aged 15-19 years.

Another evaluation of the GDLS by Langley, Wagenaar and Begg (1966) showed that its introduction was closely followed by substantial reductions in car crash injuries for all age groups, especially 15-19 year olds (23% reduction). They estimated that a 7% reduction in the number of 15-19 year olds hospitalised as a result of crashes could be attributed to the GDLS.

In summary, the GDLS has worked as a package. It is not known, however, what contribution each of the specific elements of the package has made to road safety. Issues identified during the review have led to recommendations for some modifications to be made to the System.

"A number of jurisdictions have followed New Zealand's example and adopted some form of graduated licensing. These jurisdictions include all Australian states, and Ontario and Nova Scotia in Canada. In the United States, Alaska and North Carolina are currently introducing a graduated licensing system and many others are currently considering the introduction of one. As yet, the United Kingdom has no form of graduated licensing."

Why extend the GDLS to all novice drivers?

Although most research has focused on the crash involvement of younger drivers, United Kingdom research suggests novice drivers of **all** ages are at greater risk of being involved in a crash than experienced drivers of the same age group. Forsyth, Maycock and Sexton (1995) estimate that the reduction in crash liability for drivers under 25 years of age with one year of driving experience is 38%. The reduction in liability for a 25 year old, after the first year of driving, is approximately 20%-....Catchpole, Cairney and Macdonald (1994) comment that although age is highly related to crash involvement, and the maturity of a driver is also important, actual driving experience is critical to someone becoming a safe driver.

Page 30 answers the question of why compulsory professional training is not proposed for novice drivers by providing a good, short summary of worldwide research indicating that professional driver training has not been shown to be effective in improving accident rates.

28. Langley, John D., Alexander C. Wagenaar, and Dorothy J. Begg. "An Evaluation of the New Zealand Graduated Driver Licensing System," *Accident Analysis and Prevention* 28:139-146, 1996.

Authors are from the University of Minnesota and the Injury Prevention Research Unit of the University of Otago Medical School, Dunedin, NZ

Abstract - "Young drivers have a disproportionately high risk of experiencing a road traffic crash. On 1 August 1987 a Graduated Driver's Licensing System (GDLS) was introduced in New Zealand. This system was designed to give young drivers (i.e. 15-24 years inclusive) experience in driving while being excluded from high risk driving situations. We sought to determine the impact of the GDLS on serious injury crashes. The source of the injury crash data was New Zealand's Health Information Services' national public hospital inpatient morbidity data files for the years 1979-1992 inclusive. We disaggregated the occupant data into three age groups 15-19 years, 20-24 years, and persons 25 years of age or older and compared their trends in injury. In order to determine whether the incidence of motor vehicle crashes was simply following trends in other injury events we also included two 15-19 year old non-traffic injury comparison groups. Using time series analysis we showed that the introduction of the GDLS was closely followed by substantial reductions in car crash injuries for all age groups, especially 15-19 year olds (23% reduction). After considering effects for older occupants we speculate that the effect is likely to be substantially less than 23%. An analysis of licensure data suggests that the reduction in crashes may, in large part, be attributable to an overall reduction in exposure."

Taking into account other factors (general reduction in injury accidents, worsening economic conditions) a "conservative estimate (of effectiveness for 15-19 year olds) would be 7%. This conservative estimate assumes that other factors had an equal impact on all age groups. Since this seems unlikely the effect is likely to be between 7% and 23%." "The injury reductions shown here could be due to reductions in population for the 15-19 and 20-24 age groups and thus support an exposure reduction hypothesis...." "The findings produced here suggest that one of the principal effects of the GDLS on crashes may have been indirect through a reduction in overall exposure."

29. Lynn, Cheryl, and Charles E. Tompkins, *The Feasibility and Effectiveness of Provisional and Graduated Licensing Strategies as Alternatives to Full Licensing for Young Drivers in Virginia*, Virginia Transportation Research Council, October 1995.

The following "Opportunities for Change in the Driver Licensing Process" are set forth "roughly in order of effectiveness and economic feasibility" with no recommendation as to acceptance. In all cases the author's indicate they are effective countermeasures:

1. Institute nighttime driving restrictions for teenage drivers.
2. Institute a program of accelerated penalties.
3. Provide for a conviction- and crash-free period before granting full licensure.
4. Institute passenger restrictions for young drivers.
5. Institute special driver improvement programs for young drivers.
6. Mandate primary enforcement of safety belt use for young drivers.
7. Consider increasing licensure age.

"Opportunities for Change in the Learner's Permit System" are:

1. Create a minimum period for which the learner's permit must be held.
2. Increase the qualifications required of the accompanying driver.

30. Mayhew, D.R., and H.M. Simpson, *Effectiveness and Role of Driver Education and Training In a Graduated Licensing System*, The Traffic Injury Research Foundation, 1996.

Some jurisdictions give a "time discount" in obtaining a graduated license, for education/-training, assuming that it "provides safety benefits equivalent to those that would have accrued from gaining experience under the restrictions imposed by the graduated licensing system."

"The review of scientific evaluations performed to date provides little support for the claim that driver instruction is an effective safety countermeasure."

There is some promise that a reconceptualization of driver education/training might make it more effective in decreasing the crash risk of young drivers. Emphasis should be "...placed on those skills that have been shown to be related to collision involvement." But "...regard-less of their skill level, young people are relatively immature and unmotivated to drive safely...."

"*...we would not recommend that jurisdictions introduce driver education/training into their graduated licensing system if there is no precedent for doing so.*" This recognizes that past studies do not support the value of education/training but that it is already an integral part of both regular and graduated licensing systems in some areas.

It may be that young drivers can be motivated to use the safe driving skills they acquire in education/training through the phased graduated licensing program, which "...can demand a collision- and violation-free driving record before the novice can exit from its limitations." However "if a full license is automatically issued on turning 18, there may be little incentive to use the knowledge and skills acquired in training to drive safely."

A multiphase education/training regime is suggested, assuming that early in the licensing process the young driver is concentrating on basic control of the vehicle. Later he may be more able to absorb safety-related information.

Developing a program addressing critical skills is easier than designing one **effectively** addressing lifestyle and related psychosocial factors.

"A time discount should not be offered for driver education/training."

"...NHTSA's agenda for developing an improved novice driver education program (Smith, 1994) is premised on the assumption that it will be an integral part of a graduated licensing system."

An excellent review of studies on the effectiveness of driver education/training on safety, and on recent driver education/training developments and their relevance to driver licensing, particularly the graduated licensing concept.

31. Mayhew, D.R., and H.M. Simpson, *New to the Road*, Traffic Injury Research Foundation of Canada, 1990.

This study determined that the magnitude of the young driver safety problem in Canada had not materially changed over the past ten years. In reviewing the literature on whether the problem was lack of experience of new drivers or age itself, it was found that both contribute but it was not clear which was more important. The author's evaluation of Ontario data suggested "...that age-related factors are more strongly associated with collision risk than are those that are experientially related." (p. xii) This is particularly true for males.

"The diversity of countermeasures that has been developed for the new driver is quite impressive but demonstrated effectiveness of these measures is difficult to find. Very few of the regulatory measures have been evaluated in the first place and those that have been show mixed findings or marginal successes. The only exception to this is **increasing the driving age**, for which the evidence appears more consistent. A yet unevaluated but extremely promising countermeasure is **graduated licensing**. This scheme has the capacity and flexibility to address both the age-related and experience-related factors that appear to be associated with the collision risk of both young and novice drivers. Moreover, given the 'hurdle' imposed by the restrictions in graduated licensing it may inadvertently serve as a functional equivalent to raising the driving age for some." (p. xiii) (emphasis in original)

Graduated licensing is useful, not because it discourages driving, but rather it encourages it at low-risk times and circumstances. "The principal objective, therefore, is to provide experience, which is believed to decrease the likelihood of collision-involvement, under conditions that minimize exposure to risk. As experience and competence are gained, the opportunity for exposure to risky situations is gradually phased-in." (p. 123). The value of various restrictions (e.g. night-time driving, BAC, passengers, reduced speeds) "remains unclear" (p. 128) because they have not been adequately tested.

Graduated licensing might bring some people voluntarily to put off obtaining a license. The restrictions of such a license could make it less appealing to some. (p. 134).

The research allows the authors to conclusively state that younger drivers, as a group, are at higher risk of accident, but not "which of the youngest group members are at highest risk" (p. 155), suggesting perhaps that a properly structured graduated licensing system, especially for employment (not light-duty vehicle operation) might select out those younger drivers with the proper characteristics (this is **not** mentioned by Mayhew and Simpson, but seems to fall out from their work).

32. National Highway Traffic Safety Administration (produced in cooperation with the American Association of Motor Vehicle Administrators), "Graduated Driver Licensing System for Young Novice Drivers -- Guidelines for Motor Vehicle Administrators," DOT HS 808 331, January 1996.

"Graduated licensing is a system designed to ease beginning drivers into the traffic environment under controlled exposure to progressively more difficult driving experiences. This system helps improve their driving skills and helps them acquire on-the-road experience under less risky conditions by progressing, or graduating, through driver licensing stages before unrestricted licensure. The system consists of three licensing stages, named by the type of license possessed at each stage: learner's permit, intermediate or provisional license, and full or unrestricted license."

Young people are overrepresented in motor vehicle crashes because of inexperience, high risk-taking behavior and high risk exposure (driving at high risk times or under high risk situations). "A graduated driver licensing system addresses the causes of youth crashes by:

- Increasing the amount of supervised behind-the-wheel driving practice.
- Increasing exposure to more difficult driving experiences through each stage of licensure by gradually removing restrictions, so that new and more complex traffic conditions are encountered.
- Requiring crash and violation free driving performance for a minimum period of time before advancing to the next level of licensing."

Graduated licensing reduces exposure to high risk situations, motivates the candidate by its requirements and educates him through associated driver training and improvement programs. "A graduated licensing system can significantly reduce the crash rate of young inexperienced drivers."

Discussion of 10 potential components of a graduated licensing system:

- testing requirements for licensing
- parent/adult supervised driving practice
- mandatory occupant protection
- zero blood alcohol concentration
- driver education
- youth-oriented driver improvement actions
- demonstrated safe driving performance
- distinctive license
- limiting the number of passengers in the vehicle
- speed and road type limitations

"Under this [a graduated licensing] system young drivers gain driving experience under supervised conditions, are educated through driver training and improvement programs, and are exposed to more difficult driving experiences as restrictions are removed."

Good bibliography of 46 sources.

33. National Highway Traffic Safety Administration, "Questions Most Frequently Asked About Graduated Driver's Licensing," DOT HS 808 496, December 1996.

"A graduated licensing system allows young beginning drivers to acquire safe driving skills and attitudes as they progress or 'graduate' through three stages of licensure.

The three stages are:

- **Learner's permit** where supervision is required at all times in addition to other restrictions.
- **Intermediate License**, which may be called a provisional or junior license, where fewer restrictions are imposed including allowing unsupervised driving during certain hours.
- **Full or unrestricted license** where all restrictions have been removed."

The leaflet suggests the following "Components to consider in the graduated system include:

- Successful completion of a learner's permit phase of licensure for a specified period of behind-the-wheel training including a basic driver education course.
- Requirements that a parent/guardian, or adult licensed driver age 21 or older, supervise basic driving practice and practice sessions during high-risk (nighttime) hours.
- Nighttime driving restriction (e.g. no driving from 10:00 pm to 6:00 am unless under supervision) as a part of an intermediate licensing phase, and possibly as a post-licensing driver improvement action.
- A second level driver education program (e.g. safe driving decision-making skills) after the beginning driver has acquired basic skills.
- Youth-oriented and more rapid driver improvement actions for any violations (e.g. warning letter, driver improvement course, suspension).
- Mandatory safety belt usage by all occupants and limitations on the number of passengers in a motor vehicle being operated by the beginning driver.
- Zero blood alcohol concentration for drivers under age 21.
- Demonstrated safe driving performance, (i.e. having no crashes or convictions for a specified period of time prior to advancing to the next licensing phase),
- Issuance of a provisional license to all drivers under the age of 21 (or age 18) which is distinctive from the regular driver's license (e.g. Marked 'PROVISIONAL,' and/or a different color (e.g. different colored photo background)."

The study also mentions 5% reduction in crashes and 10% reduction in convictions for 16-17 year olds in Maryland, 5.3% reduction in 15-17 year old crashes in CA, 16% reduction in

16-17 year old (male) crashes in Oregon and 8% crash reduction for drivers under 25 in New Zealand.

34. National Transportation Safety Board, "Youth Accident Experience," Safety Recommendation H-93-1 through -9, March 11, 1993.

"The Safety Board concludes that despite improvements in the 1980s, highway crashes among young drivers, including alcohol-related crashes, continue to be a serious and persistent problem. Research indicates that several legislative and policy actions can be effective in reducing the crashes. These include:

- Enacting laws establishing lower BAC levels for youth and administrative license revocation for low BAC alcohol-related youth traffic violations;
- Eliminating deficiencies in, and providing for more vigorous enforcement of, minimum purchase age laws, and decreasing alcohol availability to youth;
- Developing carefully targeted multi-media community information and education campaigns and programs directed at youth, and
- Enacting laws establishing a provisional license system in conjunction with nighttime driving restrictions for young novice drivers.

The Safety Board's experience indicates that the most effective combination is tough, fair laws, vigorous enforcement, and intensive and targeted educational campaigns."

"Therefore, the National Transportation Safety Board recommends that the...." states and other appropriate jurisdictions, among other things, "Enact laws to provide for a provisional license system for young novice drivers." (Recommendation H-93-8).

35. Ontario Trucking Association, "Truck Safety Task Force Report a Road Map for Change: OTA," Press Release, March 10, 1997.

"Graduated License

"Introduce a new Class 'A' graduated driver's license system in accordance with the model developed by the target '97 working group. Elements of the model include:

"Upon application for Class 'A', applicant must have graduated from G program or have at least 2 years driving experience in another country; must meet the same driving record criteria (except criminal record search) as currently used for school bus drivers (less than 6 demerit points, no drinking/driving or other suspension in past year).

"After obtaining Class 'A' for first 500 hours behind wheel (to be verified by log), applicant must maintain zero blood alcohol; be restricted in terms of quantity and type of dangerous goods that can haul (mirror safety rating); may not drive or apply for liquid bulk tanker, double endorsements. Carrier should consider conditioning program for new drivers (in conjunction with fatigue management)."

36. Smith, Michael F., "Research Agenda For An Improved Novice Driver Education Program," National Highway Traffic Safety Administration, DOT-HS-908-161, May 31, 1994.

Abstract - "House Appropriations Committee report for the FY 1994 Appropriations Bill requested the National Highway Traffic Safety Administration (NHTSA), U.S. Department of Transportation to develop a research agenda and plan of action for a strengthened research program in driver education. The report documents previous NHTSA efforts in driver education. It discusses why novice driver education may not be as effective as it could be, and explains why it is recommended that an improved program be an integral part of a graduated licensing system. The report concludes with a plan for research, development and evaluation activities designed to restructure and improve novice driver education."

Includes a very good detailed history of "novice driver education."

The Dekalb County "Safe Performance Curriculum Driver Education Demonstration Project" is discussed in some detail. "In summary, for all practical purposes, there was no significant reduction in crashes or traffic violations for those students who received training compared to students who received no formal training." At the end of the test it was not considered that participants had accumulated enough years driving time for a complete evaluation so Georgia continued to keep records until students had at least four years of experience. After that time "...only one of the training courses (the short one) resulted in any significant reduction of crashes, and not nearly at the level expected of the training."

One conclusion of NHTSA's 1993 Driver Education Risk Reduction Workshop was: "For driver education to be most effective, it should be an integral part of a graduated licensing system and the training should be distributed over time."

Since "current novice driver education does not seem to reduce unsafe driving behaviors by young drivers substantially....New methods and approaches to driver education must be developed (which)...place greater emphasis on experience-related factors that decrease crash risk." (p. 15)

The author concludes that the problem with driver education is when and how it is administered. Students need a grounding in basic vehicle controls skills before they can learn safe driving skills. But "crash reduction from driver education probably comes from the application of safe driving strategies, not from an application of basic vehicle controls." (p. 15). New drivers must also be motivated to learn to drive safely. Getting (and keeping) a driver's license can provide motivation.

A graduated licensing system can provide both sequential learning and motivation. (p. 15) Specifically, the program's first stage would include driver education in basic vehicle handling skills, six months driving with a learner's permit, then passing the basic road test and receiving an intermediate/provisional license. "After at least six months of additional experience...the second stage of the driver education program would be given." This would concentrate on safe driving skills and procedures. This logical progression assures that the novice driver knows enough about how to maneuver the vehicle that he can concentrate on the safe driving skills education when it is given.

A graduated driver license program could provide the motivation for individuals to be safe drivers. "Such a program increases the driving privileges so long as the license holder demonstrates responsible and violation free driving behavior. Graduated licensing allows for progressive learning, and provides the opportunity for novices to gain behind-the-wheel experience under more controlled conditions." (p. 19)

37. The Gallup Organization, "Review of Existing Demographic, Economic and Industry Data," Draft, October, 1996.

Executive Summary -

- Using existing data sources, it is estimated that the number of truck driving positions will grow by an average of 1.1% from 1994 to 2005. Using this growth estimate, the total number of truck driving positions would rise from just under 2.9 million in 1994, to just under 3.3 million in 2005.

- In addition to industry growth, current driver attrition will create the need to hire more drivers. This attrition is estimated to be approximately 17% annually, or 553,000 drivers by the year 2005. This is the number of new hires, annually, that will be required to replace current drivers who decide to leave the industry.

- Taken together, these two factors will lead to the hiring of approximately 6.1 million truck drivers over the period 1994 to 2005.

- The population groups which continue to show the greatest labor force growth are those which have not traditionally been drawn to the truck driving profession -- women and minorities. The trucking profession should continue efforts to recruit more drivers from these segments of the labor force, building on moderate increases over the period 1982 to 1993.

- Men aged 20 to 24 (traditionally the best source for recruiting truck drivers) will expand their labor force participation from 1994 to 2005, after a substantial decline from 1982 to 1993. However, the projected annual growth rate for young men, 0.7%, will still lag behind the projected truck driving professional growth rate (1.1%).

- The number of jobs in the large manufacturing sector is expected to decline in the coming years, potentially encouraging more people to join the truck driving profession. However, the wage advantage truck drivers hold over manufacturing workers has decreased since 1983.

- In terms of jobs, the construction industry is projected to grow at roughly the same rate as the trucking industry in the coming years. In total, construction is expected to employ 5.5 million workers by 2005, some 2.3 million more than the trucking industry. Construction has also maintained its wage advantage over trucking in the past decade: truck driving wages in 1993 were 87% of those in construction. As highlighted by these statistics, and also in-depth interviews conducted with trucking company executives, construction may be the key industry competing with trucking for potential employees.

38. Transportation Research Board, "Graduated Licensing: Past Experiences and Future Status," Transportation Research Circular No. 458, April 1996.

A. "Introduction," Allan F. Williams, Insurance Institute for Highway Safety - Young drivers are a problem group in every motorized society. The problem is a combination of immaturity and inexperience. The traditional approaches of education and training and special penalty systems have serious limitations in reducing the problem. Graduated licensing is one policy with potential for improvement. It has been discussed in the US since the early '70s, was introduced in New Zealand in 1987 and in the '90s has been adopted in some Canadian provinces and discussed in US states. There are questions about what graduated licensing really is, its essential elements, and its acceptability because of the limitations on mobility it introduces. The proceedings of this TRB workshop serve as a sourcebook to states in considering the adoption of graduated licensing systems.

B. "Overview of the Young Driver Problem in the United States," Allan F. Williams, Insurance Institute for Highway Safety - Sixteen to 19-year olds have the highest total crash rate, 20 per million miles, compared with five for all other ages combined. Sixteen year olds have 43 per million miles, 17-year olds 30, 18-year olds 16, 19-year olds 14. For fatals 16-19: 9 per hundred million miles, 16: 17, 17: 13, 18: 8, 19:7. "(T)he combination of youth and inexperience creates a serious young driver problem. Its size is such that additional efforts to control it are needed. Features of young driver crashes...(speeding, high nighttime risk, low seat belt use, other teenagers in the car) can assist in identifying ways to deal with this problem."

C. "Elements of Graduated Licensing," A. James McKnight, National Public Service Research Institute - Most graduated licensing programs involve three levels: learner's permit - a vehicle can be operated only under the supervision of a fully-licensed driver; intermediate license - vehicle can be operated without supervision but subject to certain conditions or restrictions; fully licensed. "Graduated licensing can be expected to reduce the likelihood and severity of motor vehicle accidents among new drivers three ways: by *reducing exposure* to the risks that lead to accidents, by *improving proficiency* so that drivers can better cope with the risks to which they are exposed, and by *enhancing motivation* to avoid risk." Elements of a graduated license might be:

Reducing Exposure	license sanctions	improvement courses
	visible identifier	delayed retest
delayed licensure		
night restriction	**Improving Proficiency**	**Enhancing Motivation**
passenger limitations		
speed limits	multi-level instruction	contingent restrictions
restraint use	multi-level testing	license sanctions
delayed retest	parent guidance	improvement courses

An effective graduated licensing system would take full account of the relationship of these elements to driving safety. Existing systems have not done so. Some seem primarily to discourage licensing, which could be done simply by raising the licensing age. Without guidance as to what works, programs have ben instituted based on political expediency.

D. "Types of Licensing Systems," Dan Mayhew and Herb Simpson, Traffic Injury Research Foundation - The elements of conventional, probationary, provisional and graduated licensing are set out. "In most **conventional licensing** systems all new drivers are treated the same as other drivers. Once the novice passes the vision, knowledge and on-road test, he or she has unrestricted driving privileges." "(T)he only distinction made between a new driver, with a **probationary** license, and another driver is that it takes fewer demerit points to result in license suspension during the probationary period." **Provisional licenses** "encourage young drivers to operate...within the law by subjecting them to tighter license suspension rules...." "**Graduated licensing** systems are distinguished from probationary and provisional systems by their systematic, step-wise approach to full licensing status." (emphasis added).

"Thus, a graduated licensing system can take many forms depending on the restrictions selected, how they are applied and to whom, over what period of time, what sanctions are applied to violators and so on....it is critical to ensure that its features are true to the basic prevention principle of providing opportunities to obtain driving experience under conditions that minimize exposure to risk."

E. "How We License in the United States -- Paths to Licensure," Susan A. Ferguson, Insurance Institute for Highway Safety - Describes light-duty vehicle licensing practices in the US and compares them to graduated licensing systems currently in place in New Zealand, Australia and Canada. Concludes that "It may be that the best solution is for states to mandate a minimum period of supervised driving not to start before age 16, as is currently the case in Ontario, Canada and Victoria, Australia."

F. "Initial Licenses for Young Drivers," David F. Preusser, Preusser Research Group - Young age is an issue primarily when engaged in recreational driving, and less of an issue when engaged in purposeful driving activity. The issue can best be solved by limiting "recreational" driving until the person is older, i.e., providing full licensure at an older age. "Graduated licensing systems can address both the young age and driving experience issues." by delaying recreational types of driving and encouraging supervised practice driving.

G. "Graduated Driver Licensing for Young Novice Drivers United States Experience," James Hedlund and Lori Miller, National Highway Traffic Safety Administration - In 1979, Maryland was the first state to implement features of a graduated licensing system. A 5% reduction in crashes and a 10% reduction in convictions for 16 and 17-year olds was found in a 1983 study. A 1990 study basically confirmed these results. California's graduated

licensing program became operational in October 1983. A 1988 CA DMV study "reported that the licensing system reduced by 5.3 percent the rate of crashes involving 15-17 year old drivers." Oregon's program began in October 1989. A 1991 study "reported a 16 percent reduction in crashes for male drivers age 16-17. No significant differences were found for females." "Based on information gained from the studies on graduated licensing and other traffic safety research, additional components have been added to the original (NHTSA graduated licensing) model and the restricted and provisional stages have been combined to be known as the intermediate license stage." "NHTSA encourages all states to consider a three staged graduated driver licensing system for novice drivers under the age of 18."

H. "The Ontario Experience with Graduated Licensing," Martin J. Walker, Ontario Ministry of Transportation - Graduated licensing was implemented in Ontario in 1994 and because of the short time it has been in place, its results have not yet been measured.

I. "Graduated Driver Licensing in Nova Scotia," James Vance, Nova Scotia Department of Motor Vehicles - Graduated licensing requirements apply to anyone obtaining a license for the first time after October 1, 1994. Results will not be known for a number of years.

J. "Driver Education and Graduated Licensing: How Should They Fit Together?" Lawrence P. Lonero and Kathryn M. Clinton, Northport Association - "The best way to ensure effectiveness of graduated licensing is to support these systems with other coordinated influences, including more effective driver education, parent involvement, and community influences. Graduated licensing permits, and even necessitates, a coordinated, multi-stage structure for driver education, which raises many questions of content, structure, and sequencing."

K. "An Assessment of Graduated Driver Licensing: Pros & Cons," Robert D. Foss, Highway Safety Research Center, University of North Carolina - The demonstrated effects of the GDL are "modest" but "there appears to be sufficient empirical evidence and a sound conceptual rationale to believe that it will have clear, measurable benefits." Implementation concerns include fairness, parents' and teen's views of GDL, and the need for support from the state licensing agency. GDL cannot be expected to solve the young driver safety problem alone, but it can have clear, measurable results. It will also limit young driver mobility, albeit not for long. "The challenge is to successfully navigate the legislative process, addressing the legitimate questions that are raised, to achieve such a system, rather than one that is graduated in name only."

39. Truck West, "Boone Moves on B.C. Safety Report," Vol. 8, Issue 5, May 1997.

The B.C. Task Force on Commercial Safety handed down 32 truck safety recommendations to Provincial Transport Minister Lois Boone. She has already "acted on a handful of the suggestions released late last month" including the decision that "A graduated licensing program will be introduced..."

40. Waller, Patricia F. "Graduated Licensing: Rx for Motor Vehicle Injury Prevention," Symposium on Driver Improvement: Planning for the '90s, Traffic Injury Research Foundation of Canada, Sidney, BC, June, 1990.

The high rate of crash involvement is often attributed to the lack of judgment of youth. But "young learners are not different from older learners" in that they are "characterized by (a) higher error rate in the early stages with diminishing errors as learning progresses."

Young drivers have two major causes of crash risk, inexperience and the tendency to engage in high risk behavior. However, young drivers may deliberately engage in high risk behavior, but rather not recognize the risk.

Young drivers are often issued "provisional" licenses which means they get in more trouble than older drivers if they make a mistake. "I know of no evidence from the learning literature that increasing threat helps inexperience." p. 2. However, threat "may be expected to exert an influence on deliberate undertaking of high risk behavior..." p. 4. Inexperience can be countered by extended practice over a lengthy period of time with the task being easier in the earlier stages. "We don't expect beginning piano students to launch right into a Chopin polonaise."

"The graduated license procedure may be expected to address the problem of inexperience. The provisional license system, that is, the imposition of swifter and more severe sanctions in the event of infractions, may be expected to address volitional risk taking. Provisional license procedures cannot be expected to help inexperience, although they may deter some youngsters from obtaining license until a later age."

"In summary, it is important to recognize that young people are going to learn how to drive. Simply eliminating driver education is not a satisfactory solution. Simply postponing the process is not a satisfactory solution. The question is not so much when they learn as how they learn."

"When they begin the process, they will be more prone to errors than they will when they have become more experienced. We need to devise better methods for assisting them through the learning curve with less lethal consequences than now occur."

Licensure at a higher age, or nighttime curfews, are not effective, but "a more gradual introduction into the driving population will reduce the probability of crash." "A graduated licensing system would entail different levels of licensure, each of which is associated with different levels of driving privileges. Initial practice could occur during daylight hours, preferably in good weather and under favorable traffic conditions. furthermore, a parent of some other responsible adults designated by the licensing authority would be required to be present in the right front seat of the vehicle."