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Title and Subtitle REVIEW OF "HOW TO DRIVE" FILM SERIES			
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Abstract The objectives of driver training programs using filmed material are examined, and evidence about the effectiveness of the method is discussed. Desirable features of a sequence of films are identified. A specific examination of the existing "How to Drive" series of films identifies deficiencies in the series, and a final section of the report makes suggestions for a revised series. An annotated bibliography of material examined is included as an Appendix.			
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C O N T E N T S

1. INTRODUCTION
2. REVIEW OF LITERATURE ON DRIVER EDUCATION
 - 2.1 Instruction Manuals
 - 2.2 Experimental Literature
3. AN APPROACH TO DRIVER TRAINING
4. COMPONENTS OF THE TRAFFIC SYSTEM
5. DRIVER TRAINING
6. PROPOSED CONTENT OF REPLACEMENT FILMS
7. PROPOSED REPLACEMENT FILM SCENARIOS

REFERENCES

- APPENDIX A REVIEW OF "HOW TO DRIVE" FILMS :
INTERIM REPORT
- APPENDIX B ANNOTATED BIBLIOGRAPHY
- APPENDIX C DRIVING SCHOOL SURVEY SUMMARY
- APPENDIX D "DRIVER TRAINING MANUAL" Pages 4 and 5
- APPENDIX E "CURRICULUM FOR DRIVER EDUCATION" Pages 4 and 5

1. INTRODUCTION

Programs of driver education, driver training and driver improvement typically include a component of instructional material presented by an audio-visual medium - film or video cassette. The use of standardised audio-visual instruction has some obvious advantages, of which standardisation is perhaps the most obvious; it may also be argued that widespread use of such material for education, advertising, propaganda and entertainment has created a mass audience accustomed to the presentation of information by such means. It is to be expected that recent attempts to develop basic driving skills, understanding of the driver's task and associated responsibilities, and attitudes conducive to safe and orderly behaviour on the highway have employed media techniques to which the target audience is known to be receptive.

Evidence which demonstrates the value of driver education, training or improvement programs has been extremely difficult to obtain, even after exhaustive large scale attempts to test the basic assumptions underlying them.

Doubt about the effectiveness of driver improvement programs is the theme of a large number of evaluative publications. Aims, assumptions, content and methodology have received criticism from various sources. The case for the defence is, by comparison, weak and unconvincing. Lack of agreement on valid assessment criteria and loose application of terminology such as "education" and "training" add confusion to the debate.

The present report does not address the total problem. It is confined to the use of filmed material, specifically the series of "How to Drive" films prepared under the auspices of the Australian Department of Transport and used widely by schools, driving schools and driver improvement agencies. Nevertheless, the report (and the study from which it is derived) have taken account of the climate of scepticism which surrounds the entire topic, and the report is critical at times of the material under review.

The report consists of two parts, comprising a literature review and an outline of a suggested approach to driver training. The literature review summarises the aims, methods and assumptions of Instruction Manuals and experimental reports, with the intention of identifying skills critical to accident avoidance and the means employed in imparting those skills to a novice driver. The suggested approach to driver training attempts to rationalise the elements identified in various sources into a self-contained program. Scenarios for training films as aids to instruction have been formulated. These scenarios indicate preferred content, emphasis and grading of complexity desirable for ab initio trainees.

An Interim Report of a review of the "How to Drive" Film Series is attached as Appendix A, and should be read in conjunction with the main report. An Internal Report of the Australian Road Research Board by D.R. Perry, received after completion of the film review, contains in its introduction a complementary consideration of "The System of Car Control". The British Police driving school at Hendon is generally accepted to be the home of "The System". It is not known to what degree the Australian "System" reflects the Hendon original, and in this report the Australian version is considered in its unique context.

Audio-visual methods of instruction have been subjected to extensive evaluation and critical appraisal since they became generally available for use some 20 years ago. Certain general principles have been established, and some restrictions on their effectiveness have been recognised. In particular, McLuhan's description of film and television as "cold" media has become familiar. In effect, the term implies that the completeness of the presentation which these media provides inhibits the engagement of the viewer's imagination. All the information necessary to reconstruct a scenario is presented and there is nothing for the viewer to contribute. The audience is a passive receiver and there is no active creative input from the viewer, unlike involvement in a radio program, a book, a lecture, or a stage presentation. Evidence from many studies of memory processes has established that some degree of active manipulation, or mental

rehearsal, of information is necessary for recall of material afterwards. In order for an audio-visual presentation to be effective as a form of instruction, it must allow the viewer to identify with the material in such a way that he is participating actively, or the presentation must rely on subsequent recognition rather than recall of the information presented. When the purpose of the presentation is to change attitudes, then the need for personal identification with the material is primary, since some emotional arousal must be achieved. The audio-visual presentation can and should be more than a "canned lecture".

Both characteristics of effective audio-visual presentation are well known to advertisers, but their application to a relatively simple message of the advertising kind is an easy matter. Applying them to complex progressive development of driving instruction is extremely difficult. In the report, these characteristics are not addressed directly, but it should be borne in mind that they are implicit in the criticisms made and in the suggestions offered for an updated approach.

2. REVIEW OF LITERATURE ON DRIVER EDUCATION

2.1 Instruction Manuals

Instruction Manuals constitute the first of two distinct categories of Driver Education literature. Although approaches vary, manuals are almost universally preoccupied with "attitude", apparently on the assumption that those who do not want to have accidents, will not. Teaching of technique is based on presentation of facts and figures, or on post-hoc analysis of conflict situations. This latter approach is evident in "Driving: A Guide for Improving your Skill", a Canadian publication. The method of "real scene" analysis has much potential as an aid to decision making, although this technique lends itself more readily to the motion picture where the dynamics of the situation may be better appreciated than in the 'static' booklet form.

The "Driver Training Manual" (Harrison, 1970) is of particular interest because its content is closely related to that of the "How to Drive" series of films. It presents a highly structured and almost

ritualistic set of procedures - "The System of Car (or Motor Cycle) Control" - which to that extent is capable of generalisation to traffic situations subsequently recognised as similar to those described in the manual. Provided the "System" is a valid codification of the driver's task, the operation of recognition memory may be expected to assist subsequent application of the "System" in practice on the road.

The "System" is complemented by a strong appeal to attitude, and facts and figures related to speeds, braking distances, vehicle clearances and sight distances are provided.

The use of facts and figures in instruction is open to criticism from two points of view; accuracy and applicability. The discussion of Braking and Stopping Distances by Harrison (pp. 42-43 and 77-80) provides a case in point. Examination of the assumptions on page 43 throws considerable doubt on the validity of the figures of the graph on page 44, and certainly throws doubt on the assertion that the distances cited are in fact "minimum". Perry (1979), for example, has pointed out the highly disparate results obtained in various braking experiments.

A more important consideration is that of applicability. Statistics reduce to discrete abstractions what is in practice a continuous rate, variable according to perception of relative motion. In circumstances requiring maximum use of braking in order to stop in minimum distance, the actual distance achieved is of academic interest only. In teaching judgment of safe following distances the novice must gain cognitive perceptions of distances and rates of closure, associated directly with the performance of the vehicle in use. The difficulty of judging the precise distance to a particular point is considerably confounded in a moving vehicle.

The precise point at which braking is commenced is not the subject of a discrete "all or none" decision. Braking is a progressive adaptive response to a changing situation and is not greatly informed by symbolic representation of distances and speeds in alphanumeric form. The inclusion of basic facts and figures of this kind

may be valuable as an aid to the development of the dynamic "tracking" skills involved in practice, but little more, and their relationship to real driving behaviour is rather remote. In any event, they are of little value unless they are reliable - a matter about which there is considerable doubt.

Both the manual and the "How to Drive" series employ emphasis on "The Attitude" and "The Traffic Law" to model the behaviour of a road user of absolute virtue. "The Technique" (or "The System" in the film series) combined with "The Attitude" represents the behaviour of a driver of ultimate skill. The link between the skill and knowledge of the driver and the demands of the traffic system is made through "The Attitude". The creation of appropriate models for the novice to emulate is a difficult and delicate matter. Currently, there is considerable scepticism about the presence of traditional virtues in authority figures; there is widespread cynicism about the legal and political institutions of society; social mores, as well as conformity to legal and political authority, are seen to embody a dubious ethic of the "Don't do as I do, do as I say" type. The anti-hero is still the central theme of literature, drama, and film and of television series in particular. The behaviour modelled by television and film characters in vehicle usage rarely conforms to the ideals and values proposed in driver education and training programs. Most obviously, the behaviour of many seasoned, licensed and presumably skilled drivers is patently unlike that which the novice is adjured to acquire and practise.

Novice drivers may thus be influenced to develop conflicting attitudes and values prior to commencing driver training. Fisher (1975), in suggesting that driver training should be detached from the schools (i.e. formal secondary education) speaks harshly on the subject of "Attitude Bashing":

"....and it is too strongly associated with authoritarian attitudes which demand evidence of good attitudes. Pupils are skilled indeed in apeing "good" attitudes and doing what they are told if there is an implied threat that they will be punished for not doing so.

It has been suggested that "attitude bashing" in America has done more to discredit driver education than anything else." (p.22)

Driver education must reappraise its approach to attitude if it is to be effective in achieving practical aims. The psyche of the young driver has been explored and explained, generally with negative undertone, as demanding immediate modification, shaping, guidance or repression. (See, for example, the group of papers on the "Young Driver Seen Through the Eyes of..." presented at the National Road Safety Symposium, 1972). Fisher continues:

"Current curriculum research indicates that this emphasis (on attitude) is now shifting. Pelz and Schuman have developed a concept called "Driving Development", which is based on the evidence that the only way young drivers will improve their driving is by driving. No amount of "preaching" in the world will help him pass through that dangerous period when he is experimenting with driving, perhaps using his vehicle as an expression of his own hostility.

All that can be done is to increase the individual's awareness and assist the natural learning process by informing him how personal attitudes do in fact affect the driving performance. He can then learn to recognise his own emotions and understand the effects of anger, exhilaration, fatigue and alcohol on his driving responses. The basic principle is self discovery through active participation. This is another educational principle long ignored by driver education experts. Adolescent behaviour is basically egocentric and unless an experience directly impinges on his own world he will not identify or absorb the moral of the lesson." (p.22)

A Swedish driver training manual, "Curriculum for Driver Education", (National Swedish Road Safety Office, Undated), provides an example of a program structured on practice, with specified levels

of ability and degrees of knowledge applicable at various stages within the curriculum. Pages four and five of this publication are reproduced as Appendix E.

By combining practical experience with theoretical issues, and specifying "Degrees of knowledge (ability) stated in the objectives" this approach recognises that skill development, aided by appropriate knowledge, is the primary objective of driver training.

Comparison of the objectives of "Driver Training Manual" with those of "Curriculum for Driver Education" suggests that a confusion of aims has occurred. There is a tendency to modify "attitude" rather than skill as a means of altering behaviour. In this context, the interchangeability of terminology becomes an issue. It may be that "attitude" is the valid concern of driver education, whereas driver training relates to the acquisition of skill. Interestingly, the attitude oriented Australian publication is a "Driver Training Manual", whereas the skill oriented Swedish publication is a "Curriculum for Driver Education". It is proposed here that attitude modification is not the means of skill acquisition. Driver education and driver training must be separately defined and consensus of the various interest groups must be reached on the aims and methods of each.

A young adult learns to drive at a time when he is testing the bounds of his social environment and may, in the process, discover hypocrisy and double standards in the values to which he has been socialised. He may discover through experience that some laws are arbitrary, repressive and unjust, and has no reason to suppose that road law is different. Eventually, he may challenge and test the limits of social attitude and law. He will discover that social censure, if it exists, is hollow, and that law enforcement is of low capacity and inefficient. The notion of self-imposed restraints ignores the reality of task demand. For the experienced driver who is satisfied with his level of skill and can recognise the onset of adverse conditions, the perceptual motor requirements are clearly submaximal (Naatanen and Summala, 1976), leaving a "buffer" of reserve capacity. The novice, who has no spare capacity and lacks

knowledge, is under constant pressure to develop skill quickly. An attitude of caution must be overcome in order to reach an acceptable level of practical ability. The critical factor is the inability of the novice to recognise the onset of conditions that exceed his capacity. Rather than attempt to modify attitude, driver training should perhaps concern itself with providing knowledge and experience that will allow the novice to expand the inherent limitations of his ability in safety. The novice must be shown - realistically - how his ability will develop and what he can expect from himself and his vehicle at logical points of progress.

A brief telephone survey of various driving schools on 9th and 10th of August, 1979, indicated that few if any training aids or manuals are considered universally applicable or appropriate for driver training. A summary of this survey is attached as Appendix C. Responses may indicate that a need exists for production of a manual directed towards practical skill acquisition.

2.2 Experimental Literature

The second category of driver education literature is that of experimental reports. In general, these arise from attempts to improve methods of imparting knowledge or skill. Many methods are directed at drivers classified as "problem", "alcoholic", "criminal", or "accident prone" by some legal or medical institution.

"Attitude" tends to receive detailed attention in this environment. A classroom experimental approach predominates. Review of the literature indicates a tendency on the part of the experimenter to depend on the laboratory to determine ways of enhancing skill. In spite of evidence suggesting inferiority of the concept, driving simulator development flourishes. (See, for instance, Williges and Triggs, 1977). It is suspected that a considerable proportion of all laboratory work is research for its own sake, with commercial rather than scientific motivations. This view is supported strongly by Fisher (1973).

Simulator development for accident avoidance training has been

carried out by Hatterick, Pain and Bathurst, who have submitted reports independently and in co-operation. Hatterick and Bathurst (1976), in a statistically oriented paper, have provided definitions of conflict situations, identified avoidance tactics and listed recommendations. This positive approach has unfortunately suffered from the inherent restrictions of the laboratory, which led the authors to conclude that their findings are not applicable in practice. (See, for example, conclusions Seven and Nine). Lack of statistical significance in this research may indicate that the authors have identified tasks related to routine vehicle control, which in fact have high practical significance.

Schuster (1978) provides an example of in-class accident avoidance approaches. Skill questions in multiple-choice format were administered to High School pupils. Initial effectiveness in accident reduction is noted, with subsequent regression apparently due to the influence of experience. Fisher (1975) cites a comparable program by Pelz and Schuman in which increased accidents and violations in the first year were followed by regression to the mean level in the second. The ambiguity of these results may be related to the confusion of "driver education" with "driver training", in that in both cases the subjects received the former but not the latter, leaving practical experience to random factors.

In a paper pertaining to simulator study, Hatterick and Pain (1977) have provided information, in the form of several categorical statements, defining accident situations, response selections, perceptual requirements and simulator oriented learning objectives. These statements and definitions are of interest in that they suggest practical driver training content. Barrett, Alexander and Forbes (1973) refer to this concept of practicality as "trainability". In applying "trainability" to the literature as a filter, elements of skill training for accident avoidance can be identified, and are outlined later in this report.

In a preferred approach to driver training it is proposed that the skills critical to accident avoidance are in fact the skills

employed in routine vehicle operation. It is a common conclusion in the literature that the traffic system incorporates three dynamically interactive elements; the driver, the vehicle and the environment. (E.g. Wildervanck, Mulder and Michon, 1978). The role of the driver in this model is that of perception, decision and response, (e.g. Barrett, et.al. 1973 and Donges, 1978). Thus driver training should be concerned with facilitating the acquisition of skill in these three facets of the driver's role, with consideration for the influence of vehicle and environment. The inherent instability of the traffic system has been identified by Cumming and Cameron (1969) who propose that stability is maintained by the continual intervention of the driver. Degree of success in maintaining stability is directly related to skills of perception, decision and response.

The implicit assumptions of the "Driver Training Manual" and the "System of Car Control" that all road situations are basically similar and that hazards can be negotiated by following procedures is intuitively dubious and has been indirectly refuted by Hatterick and Bathurst (1976). A new approach to Driver Training is necessary, and separation of the aims and methods of Driver Training and Driver Education is desirable.

3. AN APPROACH TO DRIVER TRAINING

The differentiation of driver training and driver education has already been discussed. It is assumed that Driver Education comprises behaviour modification, instruction in road law, and in system constraints, and that Driver Training is directly concerned with the acquisition of cognitive and psychomotor skills required for vehicle control. The basis of the approach is the driver-vehicle-environment system.

A central problem of the driver-vehicle-environment system is that of reducing the rate and severity of accidents. The system is currently 'machine centred' in the sense that the driver is expected to adapt to the demands of the vehicle and the roadway. While successful effort is being applied to the construction of highways with consideration for the human factor, vehicle manufacturers, except in

the case of some luxury vehicles, make only 'coarse' provision for skill limitations. No manufacturer currently produces a dynamically forgiving vehicle especially for the novice driver. Vehicles currently in use for driver training and during the early experience phases of motoring are 'fail-unsafe'. For instance, anti-locking devices for brakes are available only on expensive, luxury vehicles. The finding of Hatterick and Bathurst (1976) and other researchers that forty-five percent of accident avoidance attempts result in locked brakes cannot be lightly overlooked, nor can the findings of Foldvary & Potter (1970) in respect of high powered vehicles and inexperienced drivers. Until design of vehicles for novices or graded licenses provide better matching of man and machine, it is the role of Driver Training to assist the novice to develop skills appropriate to the machine-centred traffic system.

4. COMPONENTS OF THE TRAFFIC SYSTEM

Components of the traffic system have been identified as:

- (a) driver skills, comprising Perception, Decision and Response;
- (b) vehicle performance capacity, and (c) roadway environment.

Perception. Perception is related to an information processing capacity peculiar to the individual. A driver must selectively perceive the information relevant to vehicle control. Harrison (1968) observes:

"Until a driver knows what to look for and how to read the road and traffic pattern he can't know when to make his moves. One of the chief causes of accidents is failure of drivers to recognise hazards while they still have time to take defensive action to avoid them." (p.24)

Some examples of the application of perceptual skills include judgment of: (a) intervehicle closure and speed of travel, (b) clearance between drivers' vehicles and other vehicles or objects, (c) direction of vehicle motion, and (d) surface condition.

Since the traffic situation is dynamic, the rate at which the driver can select and interpret relevant information is a critical determinant of his performance. It is a truism in this area of

applied psychology that nothing can be done in zero time; there is an inevitable delay between the onset of a stimulus and the selection of an appropriate response. In any skilled performance there is opportunity to anticipate changing information demands, to assess the probabilities of alternative stimulus events, and to prepare for their occurrence. In an important sense, success in reducing reaction time is an indicant of highly developed skill. When the driver is achieving this kind of anticipation, the mismatch between his capacity and the demands of the task is minimal and his performance maintains the stability of the driver-vehicle-road system.

Decision. In this context, decision is the translation of perceived information into an appropriate choice of response. Again, the finite time occupied by the translation process may be shortened in two ways; first, the availability of a repertoire of practised responses allows a programmed sub-routine of actions to be triggered by an incoming stimulus, so that a coherent series of response actions is "run-off" as a sequence instead of as a number of discrete actions; second, a realistic assessment of the probabilities of action is built up, so that the information actually processed is reduced (Welford, 1976). Both processes result in considerable time savings, and both derive from increasing skill. The speed and quality of decision are enhanced when situations are known and familiar.

Since the real traffic environment is, to the novice, unfamiliar and unpredictable, there is a prima facie argument to support the concept of practical training in a controlled environment. The opportunity to develop a repertoire of appropriate responses to realistic stimulus situations without real risk to life and property should be highly beneficial. Bryant (1969) states:

"The driver often finds himself in a situation where it is uncertain what the correct course of action may be. In such cases the field of safe travel may undergo rapid change and suddenly become much less than the minimum stopping zone. Primarily, the driver has insufficient time in which to reach the appropriate decisions. In most cases his speed, the rate of transition of the field

of safe travel, is such that the rate of comprehension of the information is inadequate".

Where environmental demands and vehicle performance together requires decisions at a rate beyond the capacity of the driver, instability is present in the system.

Response. The choice of response is the end product of perception and decision. Clearly, the process does not end with a choice of response; the resulting action must be executed by the effector systems, and controlled, or modulated, by a continual series of feedback signals until the entire response sequence has been successfully completed. Increasing skill is accompanied by the organisation of typical response sequences into virtually autonomous sub-routines controlled largely by internal feedback, each sub-routine executed ballistically without conscious intervention or major modification. The result is typically the creation of a reserve of capacity which allows the skilled driver to plan ahead, monitor the traffic situation or, less productively, to engage in conversation, listen to the radio or enjoy the scenery.

On occasion, reserve capacity may be diverted, or deployed, in such a way that the demands which the driver makes of himself and his vehicle are increased. (Nataanen and Summala, 1976). Increased skill does not necessarily mean increased safety, but it creates a possibility of safety which is not available to the unskilled and inexperienced driver.

Typical response selections include:

- (a) braking versus moving laterally,
- (b) moving right versus moving left,
- (c) accelerating versus braking,
- (d) choosing a braking technique,
- (e) moving from or towards a conflicting vehicle, and
- (f) choosing among types of collisions.

Vehicle Performance. The design parameters and mechanical condition of a vehicle provide finite limitations on acceleration, braking, stability and response time. Within fairly broad limits,

steering ratio, tyre stiffness, suspension and other parameters of interest to the skilled enthusiast have relevance to safety only in critical situations which the novice driver is unlikely to encounter. But there is reasonable evidence that the novice driver may experience difficulty or danger when the primary parameters of vehicle performance are poorly matched to his abilities (Foldvary and Potter, 1970). In general, it seems that a combination of inexperienced driver and high powered vehicle is dangerous. An under-powered vehicle with poor braking performance appears to be much less of a hazard. Given that the driver is limited in his capacity to perceive, decide and respond, it seems that vehicle performance may exceed the skill of the driver.

Cohen and Preston (1968), for example, have alluded to the possibility.

"It may be supposed that what a driver undertakes on the road depends largely on what he thinks, believes or imagines he can successfully do with his vehicle; in other words, on the driver's estimate of his own skill.. A man who overestimates his driving capacities is looking for trouble. If he underestimates them, he will drive inefficiently". (p.34)

and

"For the greater the skill of the motorist, the faster he may be inclined to travel, the more difficult and hazardous the manoeuvres he will be tempted to undertake, and the worse the disaster if he fails. If a man can drive safely at 30 m.p.h. and attempts to drive at 40 m.p.h. he may well find himself in a collision. But if he can, as a rule, drive safely at 60 m.p.h. and attempts 70 m.p.h., the crash is likely to be far more disastrous"

Foldvary and Potter (1970) have shown that a highly disproportionate number of accidents involve an inexperienced driver and a powerful vehicle. These findings support the concept that instability will be present in the system when vehicle performance exceeds driver skills.

Roadway Environment. The environment in which a vehicle moves includes:

- (a) physical nature of road surface and dimensions,
- (b) legal parameters and classifications,
- (c) hazards, including opposing and conflicting traffic flow,
- (d) speed and volume of accompanying traffic,
- (e) nature of terrain and abutting development,
- (f) social environment, eg. peer group, attitudes to alcohol, recklessness,
- (g) weather conditions,
- (h) time of day or night.

Environmental capacity is the ability of the roadway environment to absorb the kinetic energy of a vehicle. Environment dictates safe dynamic limits; in particular, speed is adjusted to suit prevailing conditions.

Changing environmental factors place demands on driver skills and constraints on the exercise of vehicle performance capacity. Examples of environmental influence are night driving, with the risk of 'over-driving' headlights, and vehicles or pedestrians which violate the field of safe travel.

5. DRIVER TRAINING

The aim of driver training, it is suggested, is to develop driver skill in utilising the performance of his vehicle without exceeding the safe constraints of the roadway environment. In other words, the driver has to learn what he can safely do with his vehicle under the highway and traffic conditions normally encountered.

Central to this aim is the concept of "trainability". There is little value in including elements of behaviour, however desirable they may be, which are not amenable to a training approach. The work of Pelz and Schuman, to which Fisher (1975) made reference, suggests that a training program should attempt to provide basic information and elementary skills, leaving their integration to a later stage of maturation and adaptive learning. Properly conducted programs of

selective enforcement may have a role to play at this later stage.

Each element and sub-element must be capable of explanation, demonstration and practice. Appeal to abstractions such as "attitude" should be avoided, as should the rote learning of complex mnemonics and the tendency to "ritualise" procedure, the preferable emphasis being on understanding of the factors involved. There are three interacting system elements.

1. Driver skills: an understanding of the fundamentals of perception, decision and response, sufficient to support the principles applicable to vehicle movement on the highway.
2. Vehicle performance: understanding of the interaction of the three aspects of driver skills as they relate to four components of practical motoring:
 - (a) Starting; including all actions necessary prior to movement,
 - (b) Driving; maintaining the vehicle in motion with controlled speed and constant direction,
 - (c) Steering; controlled variation in speed and direction,
 - (d) Stopping; controlled deceleration, stop and shut-down of engine.
3. Roadway environment: understanding the environment in which the vehicle moves in order to:
 - (a) recognise the onset of adverse conditions,
 - (b) predict a specific point of impact;
 - (i) intersecting
 - (ii) head-on
 - (iii) rear-end
 - (iv) adjacent
 - (c) perceive and extrapolate the relative locations of other objects,
 - (d) determine viable highway, roadway and roadside vehicle placement alternatives,
 - e) select and execute appropriate driving strategies.

In support of the aim of driver training suggested above, a training manual structured around the principles discussed is required. A brief telephone survey on 9th and 10th August, 1979, indicates that no particular training manual is currently in general use. A summary of this survey is attached. A new manual could be designed in conjunction with, and complementary to, a revised series of films to replace the "How to Drive" series.

6. PROPOSED CONTENT OF REPLACEMENT FILMS

Review of the "How to Drive" film series indicated critical deficiencies in the assumptions underlying the overall approach to the series, and in the content of the individual films. The literature review and search for tasks critical to accident avoidance outlined in this paper have given some insight into what should be trained. It is possible to suggest replacement alternatives.

Welford (1976) argues that ".....training does not increase basic capacities but improves the use made by them by improving the efficiency of coding of incoming data and outgoing action in both space and time". The role of films as training aids should be, from this point of view, that of isolating from conflicting or distracting stimuli the essential aspects of practical motoring. The trainee, when engaged in actual practice, should benefit from reduction of uncertainty as to cause and effect, with greater capacity available for the task at hand and reduced risk of "information overload" in the practical situation.

Training films should not, therefore, be conceived in isolation, but should be intricately interwoven into a complete training syllabus. It is recognised that any of the films may be used for special purposes in isolation from the complete syllabus, and each must therefore be complete in itself. But each has to play its part in the overall sequence. It is considered that these two purposes may be achieved by the production of a smaller number of films than the original 13, each film being somewhat longer in duration than the original. The extra time in each film may be used for two purposes; first is a

brief revision of previous material, so that the increasingly complex tasks illustrated throughout the series are "grafted" logically together. The second is to allow repetition of sequences, during which additional explanation and demonstration may be included.

The basic approach to be used is to present to the trainee the operations which he himself must carry out as seen from his position behind the wheel. This approach encourages individual identification with the driver portrayed in the film and provides material which may be subsequently retrieved from memory by a recognition process. As far as possible the requirements of driving are to be presented from the "inside out" viewpoint, with external views of the vehicle and other traffic used only to analyse and illustrate the results of the trainee driver's actions. The objective is to assist the transfer of the information presented to the trainee's subsequent driving practice. Conformity to legal constraints, traffic signs, traffic signals and the requirements of other road users will be introduced en passant, within the highway context, as essential components of the task to be performed.

The six films outlined in the final section of this report do not supply all the needs of a training sequence. There is no special attention given, for example, to reversing, parking and similar low speed manoeuvres, nor to the different techniques required for driving a vehicle with automatic transmission. These matters might well be the subjects of additional films, if a full training syllabus is required. The objective has been to provide, through the media of film, the basic information required before a trainee driver commences practical driver training.

7. PROPOSED REPLACEMENT FILM SCENARIOS

Film No. 1 : Introduction to Driving

Aim: To familiarise a mechanically unsophisticated novice with the electrical and mechanical systems of a vehicle as they relate to practical driving.

Method: Illustrate and explain each independent system using models and practical illustration:

- (a) Starting. Key in ignition, follow electrical circuits through battery to petrol pump, distributor, starter motor to fly-wheel and crankshaft. Show four-stroke principle of pistons including carburettor operation, culminating in completely started engine.
- (b) Driving. Use and operation of clutch, selection and operation of gear, transmission and differential, with drive wheels moving vehicle forward.
- (c) Steering. Hands on wheel, through linkage to front wheels and suspension, showing action of tyre in slow speed turn with appropriate steering wheel manipulation.
- (d) Stopping. Footbrake through master cylinder to disc brakes on front wheels, drum brakes on rear. Illustrate correct braking procedure and action of brakes for a smooth stop at slow speed. Show hand-brake operation.
- (e) Revision. Illustrate short drive (approx. 200 metres) at slow speed, explaining each system. Finish with car in service station checking fuel, oil, water, battery, tyres, clutch and brake fluid-automatic transmission fluid. Review all systems again as car leaves service station.

Objectives: At the end of the film the novice should have sufficient knowledge of the mechanics of the vehicle systems to enable:

- (i) Starting
- (ii) Driving
- (iii) Steering
- (iv) Stopping

Film No. 2 :

Aim : To introduce components of the Traffic System.

Method: Demonstrate slow journey without influence of other traffic, a stable environment containing static hazards. Illustrate interaction of Driver Skills, Vehicle Dynamics and Environmental Limitations.

- (a) Driver Ability. Explain and demonstrate Perceptions, Decisions and Responses applicable to leaving service station (revision of Film No. 1), and subsequent journey.
- (b) Vehicle Dynamics. Review the vehicle systems of Film No. 1 as they apply to acceleration, speed, stability and braking, at normal suburban road speed.
- (c) Environmental Limitations. Describe and illustrate the physical capacity of the environment to absorb the kinetic energy of the vehicle.
- (d) Loss of control. Depict the effect of excessive speed, acceleration, and braking showing skidding, loss of adhesion, directional instability and other factors affecting loss of control at normal driving speeds.

Objectives: The novice should have a realistic expectation of the performance requirements of himself and his vehicle in a low demand environment.

Film No. 3 : Suburban Driving

Aim: To introduce a moderate demand environment illustrating routine driving activities and associated perceptual skills.

Method: Journey through suburbs, negotiating simple hazards.

Illustrate:

- a. Intervehicle closure,
- b. clearance between drivers' vehicles and other vehicles or objects,
- c. direction and speed of motion in straight driving and direction changing,
- d. cues in roadway environment,
- e. field of safe travel,
- f. minimum stopping zone

Objectives: The novice should obtain an enhanced understanding of the interactive effects of Driver Skills, Vehicle Dynamics and Roadway Environment.

Film No. 4 : Conflict Situations

Aim: To introduce the novice to the common conflict situations and illustrate avoidance using straight braking or acceleration technique.

Method: Illustrate five conflict situations:

- a. Lead. Rapid closure with a vehicle or object ahead.
- b. Following. Rapid overtaking by a following vehicle.
- c. Intersecting. Approach of two vehicles at right angles.
- d. Converging. Convergence of two adjacent vehicles.
- e. Oncoming. Approach of two vehicles on a (head on) collision course.

Objectives: The novice should recognise the common conflict situations and have a good knowledge of simple avoidance techniques.

Film No. 5 : Advanced Conflict Avoidance

Aim: To illustrate traffic environment demanding a high degree of driving skill.

Method: Demonstrate:

- a. Recognition of significant perceptual antecedents to conflict situations.
- b. Perception and extrapolation of the relative locations of other objects.
- c. Selection and execution of appropriate evasive manouvres:
 - (i) braking versus moving laterally,
 - (ii) moving right versus moving left,
 - (iii) accelerating versus braking,
 - (iv) moving from or towards a conflicting vehicle,
 - (v) choosing among types of collisions.

Objectives: The novice should gain an insight into the requirements of defensive driving.

Film No. 6 : City/Freeway Driving

Aim: To illustrate modern, high speed dense traffic conditions and techniques.

Method: A "conducted tour" through a city a peak hour, with thorough analysis of successive situations, consideration and demonstration of technique.

Objectives: The novice should have a realistic expectation of the demands of intense driving situations and general knowledge of the requirements and limitations of driver ability, vehicle performance capacity and roadway environment in these conditions.

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REVIEW OF "HOW TO DRIVE" FILM SERIES

INTERIM REPORT

Preamble

The thirteen films of the "How to Drive" series have been reviewed in terms of content, clarity and impact. Initial observations were recorded for each film, including a summary of impressions and comments on particular points of interest in sequence of occurrence. The substance of this report evolved from group discussions and review in terms of the initial observations.

Criticism was levelled at content and omission of content. Several factors were identified as affecting clarity and impact.

Review

Several fundamental misconceptions adversely influence the strategy of the series. It is apparent that the target audience has not been adequately defined, relatively important information is not weighted proportionately in time and depth of treatment and a set of procedures is mistakenly represented as a 'system'.

Lack of definition of a target audience results in inconsistency of depth of technical explanation. This is immediately apparent in Film No. 1 "Understand the Car" and Film No. 2 "Inspecting the Car". The technically unsophisticated user, while gaining an overview of vehicle mechanics, learns nothing about the effect of the various systems on practical driving and is probably unconcerned with the excessively detailed inspection depicted in Film No. 2. The detail in this film might more reasonably be incorporated as a revision segment of Film No. 1, in a routine service station context where appropriate facilities are available.

Subsequent films dealing with specific aspects of the driving tack ("Starting Up, Moving Off and Stopping", "Steering, Gear Changing-Braking", and "Hill Starts, Reversing and Parking") assume that Film No. 1 has adequately covered the requirements of mechanical understanding. These films thus ignore vehicle dynamics, the "how" is shown in isolation from cause and effect.

The first six films are apparently intended to provide the knowledge pre-requisite to efficient total control of a vehicle in a driving

environment, which is depicted in Film No. 7 as "Driving to a System". Omission of content and lack of depth of treatment are apparent in these lead-up sequences. Film No. 3, "Starting Up, Moving Off and Stopping", places little emphasis on clutch control and generally ignores braking procedure. Film No. 4, "Steering, Gear Changing and Braking", depicts and describes push-pull steering with very shallow and unconvincing explanation of advantages for control. Geer changes use 'double-de-clutch' method without adequate explanation of the role of accelerator and engine speed. Commentary states that the method is "not necessary". Braking is treated superficially.

At no time in the first six films is vehicle dynamics considered in terms of cause and effect.

Film No. 6, "Road Observation", gives distorted and unrealistic impressions of speed, due mainly to the inherent limitations of the medium. Obscurity of dashboard instruments prevents appreciation of speed in relation to perception and response. Peripheral vision is not considered. Commentary implies a fixed focus of vision determined by speed, a fault common to novice drivers which this film should be concerned to eliminate.

Film No. 7, "Driving to a System", is apparently a key element in the series, being the first film to depict the practical driving situation involving the individual aspects covered in the preceeding films. The validity of the content of this film is highly suspect and is subject to severe criticism from philosophical, theoretical and practical points of view.

The "System" described in Film No. 7 erroneously depicts the dynamics, 'open' skill of driving as a discrete 'closed' skill. The "System" as described is in practice a set of procedures useful in helping to maintain stability in the inherently unstable traffic environment. The valid role of these procedures is in assisting the driver to progress logically from one point in the "system" to the next. Detailed observations on Film No. 7 are cited below with reference to the position of the videotape memory counter.

<u>Counter Position</u>	<u>Comment</u>
035	Commentary takes gross liberties with the concept of "system". Communication patterns are mentioned in terms of the aircraft but not subsequently dealt with in terms of motor vehicle user.
042	Commentary implies all road hazards are precisely alike and can be negotiated from rigid procedure.
049	Model is inappropriately lit, causing shadow.
052	Model and vehicle are out of scale.
063	Mnemonic is unnecessary, imposes superfluous learning demand and reinforces rigid application of procedure, implying discrete, rather than dynamic, nature of the driving environment. This form of instruction seriously impedes the development of spare cognitive capacity in an already overloaded demand situation.
066	"Mirrors and Signals" - no provision in the system for response resulting from observation.
076	"Safe approach speed" remains undefined.
090	"Gears and Mirrors" - no provision in the system for response resulting from observation.
095	"Clear view into the crossroad" is demonstrably impossible because of the scale of the model. No consideration is given to approaching traffic, to which the vehicle is legally obliged to give way.
103	"Acceleration points A1 and A2" are invalid, misleading and confusing. Their position is depicted differently in subsequent demonstrations. These "points" at best apply only in a "no evasive action" situation. If evasive action (stopping) is necessary no provision is made for advancing the vehicle to point A2. The implication is that acceleration is a discrete rather than graded pressure action, braking is also depicted in this way. No provision is made for slowing the vehicle by reduced acceleration.
135	Commentary states "This is the system applicable to a right hand turn. Exactly the same system is applicable to every change in road and traffic conditions". There appears to be little justification for this categorical statement.

<u>Counter Position</u>	<u>Comment</u>
139	Demonstration "along clear straight road" does <u>not</u> depict the model situation.
160	The demonstration is unnecessarily confounded by inclusion of "Points S1 and S2 - S for Skid". This entire sequence is more appropriately considered in subsequent films: "Cornering and Overtaking" and "Skidding".
161	Skidding will occur at any time "incorrect acceleration, coarse steering or harsh braking" is applied, not only between points S1 and S2 as stated.
170	Commentary states that changed conditions should not cause change from the system, however the practical highway sequence shows the system applied discriminantly. (e.g. evasive action and braking). Commentary states that "although the system has six features, not all are applicable to every situation". This is a literal contradiction of earlier commentary (counter position 135) and leaves the novice in a sad predicament of indecision. If the object of driver training is to reduce uncertainty, the "System of Car Control" has achieved precisely the opposite effect.
220	"Mirrors all clear" - however there are vehicles in the range of vision.
245	"Correct approach speed maintained", however there is no indication of what this speed is or why it was chosen.
246	"No mirrors required"!! How do we know this, unless we check our mirrors?
255	Vehicle leaving kerb is completely ignored.
265	Excessive use of second gear.
268	Car described as passing "outside" actually moves to the left, thus "inside".
273	Commentary fails to perceive or totally disregards the overtaking taxi, thus the situation is certainly not "all clear" to overtake the vehicle ahead.
376	"Check mirrors" - apparently no perception of the heavy vehicle following.

<u>Counter Position</u>	<u>Comment</u>
279	"Mirrors - all clear behind" - failure to observe vehicle overtaking in outside lane. This series of highly dangerous situations (counter position 246 onwards) graphically illustrates the inadequacy of the "System of Car Control" in coping with routine driving conditions.
288	Table of "Considered - Applied" aspects of the "System" from hindsight is an unnecessary and misleading exercise. The "System" is in reality a set of procedures to be applied continuously in a dynamic situation. The figures quoted are, if correct, open to criticism in that they significantly under-represent the total demand of the driving task.

Films Eight and Nine, "Cornering and Overtaking" and "Skidding", while containing comprehensive coverage of the subject matter, suffer problems of clarity and impact due to deficiencies in presentation of models, illustrations and explanations. A serious omission of content is the linking of the practical situation to the mechanics of the vehicle systems, particularly the dynamics of acceleration and braking.

Film Ten, "In Dense Traffic" suffers seriously from a dated and inappropriate concept of "dense traffic". In general, the advice in the film is out of touch with reality. Specific comments have been listed in sequence of videotape counter:

<u>Counter Position</u>	<u>Comment</u>
025	Cartoon 'teaser' is of doubtful value, placing emphasis on protection of the vehicle without considering the practical aspects of conflict avoidance. The recommended 'safety cushion' of one car length per ten miles per hour is totally inappropriate advice in conditions of dense traffic.
064	The conditions depicted are quiet suburban streets with light traffic and parked cars, not "dense traffic".
095	The concept of giving oneself "time to think" in dense traffic is no substitute for intelligent anticipation and heightened perception, decision and responses. The driver must tune himself to situational demand, he can have little influence on the 'time' element in his environment without creating a hazard for other drivers.

<u>Counter Position</u>	<u>Comment</u>
125	"Easy and Relaxed Safety" is a totally unrealistic concept in modern traffic conditions.
138	Car cutting across and pedestrian moving between stationary vehicles are observed far too late for action if necessary. No mention is made of what effect these incidents have on driver response.
150	"Check mirrors before intersection" - no mention is made of why this is necessary, what might be observed or what action might be appropriate. This is apparently a mechanical requirement without purpose.
160	Use of handbrake at intersection is both unnecessary and undesirable in the circumstances.
172	Commentary implies mental activity in dense traffic is liesurely. There is no practical or theoretical basis for this attitude.

Film Eleven, "Night Driving" is of doubtful value from content, clarity and impact points of view. The procedure for overtaking at night is of little practical use. The complexity of the method probably causes many safe opportunities to be missed simply because of the excessive time and space required. Flashing of headlights is a dangerous practice due both to the possibility of dazzle from side and rearview mirrors and the annoyance factor to the driver ahead who has perceived the headlights of the overtaking vehicle and has deduced the intention to pass by observing the indicator signal.

Film Eleven distorts perspective and relative visibility, giving an unrealistic image of night conditions. Although stopping the car is depicted as a means of overcoming drowsiness, no mention is made of the insidious effects of warm air from the heater and lack of fresh air. The need for adequate ventilation is ignored. Aspects such as 'overdriving' of headlights and correct alignment of high and low beams are omitted.

Film Twelve, "Remembering it All", is not, as the title implies, a revision film. Little or no recapitulation occurs until the final stages of the film, which consists of very superficially described driving sequences. The film is more directly concerned with a propaganda campaign defining the 'perfect' or 'ideal' driver, who apparently transcends the inherent imperfections of ordinary mortals. If the aim is to positively motivate the novice, the result is a somewhat wide credibility gap.

Film Thirteen, "Automatic Cars", requires updating of attitude (automatic cars are now a taken-for-granted phenomenon) and inclusion of explanation of three speed transmission. Demonstrations, illustrations and models suffer from problems of scale and poor lighting. "Expert driver" use of left foot on the brake is information of doubtful value, as is the recommendations for use of low gear. The concept of an automatic choke is new to the series and is not adequately explained.

The need for a separate film dealing purely with automatic cars is questionable, the techniques might be conveniently incorporated in other films as a matter of routine.

Omission of Content

The most significant criticism of the "How to Drive" film series is omission of content. The films use contrived circumstances to show only optimum driving conditions. The novice is given no indication of the onset and avoidance of conflict situations and there is no coverage of prediction, action or reaction applicable to intersecting or converging vehicles. There is no coverage of the methods of negotiating busy controlled and uncontrolled intersections or 'T' junctions requiring various 'give way' rules. Traffic signals are ignored in the series.

Of the thirteen films, only four deal with practical motoring; Films Seven, Ten, Eleven and Thirteen. The theoretical and practical content of these films is both quantitatively and qualitatively inadequate. The total omission of skills of self preservation in favour of an appeal to attitude is the most serious deficiency in the series.

Conclusion

Lack of definition of audience and specific aim, combined with questionable content and omission of vital information imply that the "How to Drive" film series is inadequate for the task of driver instruction.

APPENDIX B

ANNOTATED BIBLIOGRAPHY

Author unknown. Curriculum for Driver Education: Private Car/Light Lorry. National Swedish Road Safety Office, Driver's Licence Department. (Undated).

A detailed, structured curriculum for drivers licence candidates, including theory, on-road practice and training objectives with specified degree of knowledge/skill required.

Author unknown. Driving: A Guide for Improving your Driving Skill. Ontario Department of Transport, Ferguson Black, Queens Park, Toronto, 1970.

A driver improvement manual including case history analysis and review exercises (multiple choice questions). A useful concept of analysis of perception, decision and response for incorporation into training films.

Author unknown. "Attention Lapses in Drivers as a Cause of Accidents", In Current Medicine for Attorneys, Ed. 96, Vol.24, 1977, pp 23-24.

Speculation on the relationship between age and speed as a cause of accidents, specifically performance inconsistent with age: "slow, younger subjects" and "older folks who function too fast" are exposed to more accidents. Indirect implications for driver training include revision of the concept that young drivers should be forced into arbitrarily restrained circumstances.

Author unknown. "A New Defense View - 'De-emphasise' Negligence: Causes of Accidents 'Other' than Negligence" In Current Medicine for Attorneys, Ed.97, Vol.24, 1977, pp 25-27.

Recognition in a legal setting of the interaction of vehicle, driver and highway conditions as affecting the traffic system.

Barret, G.V., Alexander, R.A. & Forbes, J.A. Analysis of Performance Measurement and Training Requirements for Driving Decision Making in Emergency Situations. Rochester University, June, 1973.

The purpose of the study was to determine the feasibility of developing procedures to measure driver decision making performance and the feasibility of improving that decision making performance through training. The study consisted of five interrelated tasks. Critical driving situations were identified and driver decision making requirements were analysed within a human information-processing framework. A review of measurement devices and training techniques revealed serious deficiencies with respect to decision making. Four specific dimensions were identified as related to effective decision-making. A classification-training model was developed and related to a probabilistic policy making cost-benefit model. A comprehensive research and development plan is proposed for four separate groups of drivers.

Bathurst, James, R. Jnr. "A Realistic Approach to Automobile Accident Avoidance Training" In Society of Automotive Engineers, Warrendale, Pa., 1977.

A different approach to training automobile accident avoidance driving skills is being developed. It is structured to provide students with the opportunity to practice selecting and implementing effective crash avoidance strategies in response to realistic conflict situations that often precede actual accidents. Two new teaching techniques have been developed to provide this realistic experience in dealing with both single-car (the student driver's) and two-car situations. These techniques are used to administer a seven-module driver training course that has also just been developed.

Bryant, J.F.M. "The Human Factor" In Clark, N. & Pretty, R.L. (Eds.) Traffic Engineering Practice, Transport Section, Department of Civil Engineering, University of Melbourne, 1969 (2nd ed.).

Identifies and defines physical, psychological and physiological aspects in a "Model of the Motor Transportation System". Specifically concerned with "Acquisition, Decision and Reaction" by the driver.

Cohen, J. & Preston, B. Causes and Prevention of Road Accidents. Faber & Faber, London, 1968.

Criticises the conventional belief in driver education that a motorist and his vehicle are functionally independent. Advises greater emphasis on physiological capacity of the individual in driver education programs. A comprehensive treatment of the factors contributing to driving demand, including roadway environment, physiological and psychological factors, and vehicle dynamics.

Cumming, R.W. & Cameron, C. "Driver Response to Traffic" In Clark, N. & Pretty, R.L. (Eds.) Traffic Engineering Practice, Transport Section, Department of Civil Engineering, Univ. of Melbourne, 1969 (2nd ed.).

Considers the Human Decision Maker in the traffic system, specifically in terms of information processing, readiness and reaction time. Defines driving as a skill involving Perception, Decision Making and Control.

Dees, W.C. "Accident Causation Factors" Police Chief, V.45, No.9, 1978.

A study of accident involvement of police vehicles. Subjective analysis of findings suggests environmental factors as a major contributor to accidents.

Donges, E. "A Two Level Model of Driver Behaviour". Human Factors, 1978, 20(6), 691-707.

In calculating the performance of the driver-vehicle system and in establishing design criteria for favourable vehicle dynamics, a

quantitative description of driver steering behaviour such as a mathematical model is likely to be helpful. The steering task can be divided into two levels: (1) the guidance level involving the perception of the instantaneous and future course of the forcing function provided by the forward view of the road, and the response to it in an anticipatory open-loop control mode; (2) the stabilisation level whereby any occurring deviations from the forcing function are compensated for in a closed-loop control mode. This concept of the duality of the driver's steering activity led to a newly developed two-level model of driver steering behaviour. Its parameters were identified on the basis of data measured in driving simulator experiments. The parameter estimates of both levels of the model show significant dependence on the experimental situation which can be characterised by variables such as vehicle speed and desired path curvature.

Ellingstad, V.S., Hagan, R.E. & Kimball, K.A. An Investigation of the Acquisition of Driving Skill. University of South Dakota, 57069, 19 .

Criticises inefficiency of current driver education methods. Physiological orientation from Schleisinger (1967) identifies "a guidance, or perceptual task and a control task". Does not identify a specific accident reduction approach.

Expert Group on Road Safety. Report of Discussions at the National Road Safety Symposium. Commonwealth Dept. of Shipping and Transport, Canberra, 1972.

Questions and issues arising from papers presented at the National Road Safety Symposium. Deals with safety issues of traffic engineering and the impaired driver. Heavy "attitude modification" approach to the young driver as a special case. No specific conclusions or recommendations.

Expert Group on Road Safety. The Road Accident Situation in Australia - A National Review. A report to the Minister for Shipping & Transport. Aust. Government Publishing Service, Canberra, 1972.

Critical review of local and overseas driver education programs. Throws doubt on quality and effectiveness of current training methods. General approach is "cure" rather than "prevention". Makes for specific remedial recommendations.

Expert Group on Road Safety. The Road Accident Situation in Australia Since 1975. A report to the Commonwealth Minister for Transport, Aust. Government Publishing Service, Canberra, 1977.

Statistically oriented problem definition. General attitude is to depend on "future research" to isolate particular aspects relating to road safety. Makes few specific remedial recommendations.

Expert Group on Road Safety. Papers presented at the National Road Safety Symposium, conducted by the Commonwealth Dept. of Shipping & Transport. Canberra, 1972.

Various papers dealing with specific aspects of the traffic system and accident involvement. Particular emphasis on "attitude" in "The Young Driver Seen Through the Eyes of...." series. E.R. Hoffman deals with vehicle dynamics as contributing to accidents ("An Evaluation of Measures to Reduce Accident Occurrence"). "The Effectiveness of Driver Training" (J.B. Boulton) defends current driver education in general terms. Aspects of road design and engineering, lighting and safety barriers and vehicle design discussed in general terms with reference to "Driver Ability".

Fisher, Roslyn, M. "Young Driver Research. A Report on the Methods Used to Evaluate the Driving Performance and Training of Young Drivers". Victorian Automobile Chamber of Commerce, 1975.

A comparative investigation and evaluation of driver training. Evaluation includes recognition of the failure of the "attitudinal" approach, strong criticism of "laboratory" type programs and the need for attention to practical aspects of the driving task. A strong leaning to a "Perception, Decision, Response" model can be identified, with emphasis on perception.

Foldvary, L.A. & Potter, D.W. Accident Risk Associated with Design Characteristics of the Car. Australian Road Research Board Proceedings, V.5, p.3, 1970, pp 139-189.

Identifies high accident involvement of inexperienced drivers in high performance vehicles. Implications for driver education in teaching limits of driver and vehicle potential.

Geurin, N.S. "Traffic System Considerations", In Clark, N. & Pretty, R.L. Traffic Engineering Practice. Transport Section, Dept. Civil Engineering, University of Melbourne, 1969 (2nd ed.).

Identifies human, vehicle and environmental components of the traffic system.

Goldstein, L.G. Driver Improvement : A Review of Research Literature. Prepared for the California Traffic Safety Education Task Force, 1973.

Examines critically the available research literature relevant to the improvement of the highway performance of drivers who are characterized by unusually high rates of violations and/or accidents. Identifies areas of interest for scientific evaluation, makes no specifically applicable recommendations.

Harrison, W.W.D. Driver Training Manual : A Text Book for the Commonwealth of Australia. Joint Auspices, 1970 (2nd ed.).

An authoritative, comprehensive look intended to provide information on all aspects of the driving task, including technical and statistical specifications. Currently in use in all Australian states with supplementary information on particular laws appropriate to each state.

Hatterick, G.R. & Bathurst, J.R. Accident Avoidance Skill Training and Performance Testing. URS/Matrix Research Co., Falls Church, Va., 1976.

The purpose of the study was to determine the feasibility of training drivers to acquire skills needed to avoid critical conflict motor vehicle accidents, and to develop the procedures and materials necessary for such training. Basic data were derived from conduct of in depth accident investigations and task analyses of driver behaviour. A specification was prepared for curriculum development and performance measurement, and a prototype bimodal simulator was developed as a training tool for acquisition of key perceptual and decision making skills. A concept was also defined for behind-the-wheel training on an Advanced Drivers Range. Results to date indicate that the program should continue to complete materials development and training of drivers.

Hatterick, G.R. & Pain, R.F. Skill Training for Collision Avoidance. URS/Matrix Co., Falls Church, Va.

The purpose of this two-phased study was to determine the feasibility of training drivers to acquire the skills needed to avoid critical-conflict, motor-vehicle accidents and to develop the procedures and materials necessary for such training. Basic data were derived from in depth accident investigations and task analyses of driver behaviour. A specification was prepared for curriculum development and performance measurement. A prototype bimodal simulator was developed as a training tool for acquisition of key perceptual and decision making skills, and a concept was defined for behind-the-wheel training on an advanced driving range that included surrogate vehicles to create critical traffic conflicts. Results of the study indicate that such training is theoretically feasible and, if implemented on a large scale, could result in a substantial reduction of multivehicle accidents.

Helander, M. "Drivers' Steering Behaviour during Traffic Events: A Case of Perceptual Tropism?" Human Factors. 1978, 20(6), 681-690.

Seventy-five drivers participated in test runs, driving a total of 1,500 km. Mean value and 1 standard deviation of steering wheel angle were plotted for several traffic events from 10 s before the event until 10 s after. The second before meeting an oncoming car, there was a 1° shift in steering wheel angle to the left, thereby moving toward the oncoming car. The peak value was obtained at the instant when the oncoming car passed. The original steering wheel position was regained 1 s after the meeting. The behaviour was more pronounced on narrow roads than on wide roads, and it was unaffected by driving experience. The behaviour is explained by the perceptual similarities of the oncoming car and, in analogy with tropistic behaviour noted in lower organisms, the phenomenon is called perceptual tropism. The findings introduce a new dimension to analyses of steering behaviour. More important, the obtained results suggest that there are interactions between visual and motor behaviour.

Jones, M.H. California Driver Training Evaluation Study. Summary of Final Report to the Legislature of the State of California. School of Engineering and Applied Science, Univ. of California, Los Angeles, 1973.

A cost-benefit study was made of driver training in ten high school districts and fifteen commercial driving schools. Groups compared were: certified secondary school instructors vs commercial driving school instructors, standard vs long training, and simulator instruction plus three hours vs six hours in car. There were small but statistically significant differences in training variables in favour of the commercially trained students, those in the long and the non-simulator programs. Large variations in costs occurred within both school districts and commercial schools.

Klein, D. & Waller, J.A. Causation, Culpability and Deterrence in Highway Crashes. Dept. Transportation, Washington, D.C. Automobile Insurance and Compensation Study. July, 1970.

Two scholars in the field of highway safety view the issue of driver fault in the light of the available scientific evidence dealing with driver behaviour, causes of automobile crashes and deterrents to hazardous driving. The analysis is set in the context of a discussion of the state of the art of highway safety.

MacDonald, W.A. & Hoffman, E.R. Steering Wheel Reversal Rate Related to Driving Task Demand. Australian Road Research Board, 1978.

Generally supports the concept of Driver Ability, Vehicle Dynamics and Roadway Environment as components of the traffic system. Reversal rate dependent on the level of task difficulty relative to the drivers' capacity.

Marek, J. & Sten, T. Driver Behaviour and Traffic Environment: A Critical Examination and a Point of View. Institutt for Psykologi og Sjøulforskning. Norges Tekniske Logskole, Trondheim, Undated.

Strong criticism of current driver education. Emphasis on driver physiological capacity and vehicle dynamics in environmental situations.

Matthews, M.L. "A Field Study of the Effects of Drivers' Adaptation to Automobile Velocity." Human Factors, 1978, 20(6), 709-716.

A roadside survey of vehicle velocities was carried out by radar on a four lane, median divided highway with a 50 mile per hour (80 km/h) legal speed limit. Northbound traffic on the highway had been previously exposed to expressway conditions with vehicle speeds in excess of 96 km/h, whereas southbound traffic had been previously exposed to an urban highway with speeds of about 64 km/h. Northbound traffic velocities exceeded those of southbound traffic by an average of 6.9 km/h, which, it is argued, is the result of drivers of northbound vehicles being exposed to conditions under which velocity adaptation occurs. An analysis of the data by

vehicle category indicates that while large cars are driven significantly faster than small cars under all conditions, the magnitude of the velocity adaptation effect is greater for drivers of small cars.

McGuire, Frederick, L. The Doubt About Driver Education. Educata, January 1969, Gallert Pub. Co.

A comparison of accident statistics as official records with information obtained in confidence shows considerable differences in accident involvement, with a tendency for formally trained drivers to have more accidents than informally trained drivers. Severe biases in reporting were identified (in Mississippi, 52% of all accidents reported, of female accidents, 33% reported, of male accidents, 66% reported). The point was also made that volunteers for driver education were typically those who were most likely to have fewer accidents regardless of training. The goals of driver education are questioned.

Naatanen, R. & Summala, H. Road User Behaviour and Traffic Accidents. University of Helsinki, North Holland Pub.Co., 1976.

Discusses Driver Education, the young driver and 'attitude training' propaganda campaigns, perceptual motor skills in relation to accidents and spare capacity development. Introduces a model of driver decision making. A comprehensive treatment of factors contributing to driving demand, including environmental, physiological and psychological factors and vehicle dynamics.

Newsome, L.R. Decision Making in Driving. Paper delivered to the Ergonomics Society of Australia & New Zealand Annual Conference, 1975.

A model for decision making: each option has costs (C) and utilities (U) with a probability of success (P), therefore $P(U) - P(C) = \text{result}$. Decision Rule: if result positive, proceed; if result negative, do not proceed.

Olsen, R.A. "The Driver as Cause or Victim in Vehicle Skidding Accidents" In Accident Analysis and Prevention. Vol.10, pp. 61-67, 1978.

The implication, if not the evidence, that drivers are the principal causative factor in vehicle skidding accidents is widespread. This conclusion is discussed and refuted. There are several potential sources of information or knowledge which might allow the driver to prevent skidding, to avoid initiating a serious skid, to detect an incipient skid, and to control a skidding vehicle that have not been explored or developed. With the current lack of information supplied them, drivers are more often the victims of chance conditions rather than the causes of preventable losses of control. More comprehensive models of driver potential as a controller are called for, and a research program is outlined for developing the types and quality of information which potentially are available for better system performances.

Pelz, D.C., Schuman, S.H. Motivational Factors in Crashes and Violations of Young Drivers. Text of spoken presentation, American Public Health Association Meetings, Minneapolis, Minnesota, 1971.

Crashes and violations of young drivers have high correlation with emotional crises, alcohol, smoking, aggression, etc. Supports "Driver Ability" concept - ability to perceive and decide debilitated by other mental activity. Information processing is overloaded.

Perry, D.R. Driver Instruction: Some Issues in Pre- and Post-Licence Instruction in Australia. Australian Road Research Board, Internal Report AIR 1045-2, 1979.

This report reviews briefly some issues relating to pre- and post-licence driver instruction in Australia. The system of car control taught at the Hendon School for Metropolitan Police drivers in England is shown to form the theoretical basis for driver instruction and licensing in Australia. However the extent to which even commercial pre-licence instruction utilises this framework is a matter of debate. Current instruction and licensing procedures would appear to require revision and generally higher standards are encouraged. Some statements made in a previous review of driver instruction (Cameron and Macdonald 1973) are revised in the light of current knowledge and a typology of post-licence instruction is proposed. In particular a distinction is drawn between carcraft courses that emphasise car handling and roadcraft courses that try to improve perceptual and judgmental skills. The exposure-liability model developed by Nasse (1977) was used on Victoria accident statistics in conjunction with the typology of post-licence courses to explain the equivocal findings on the value of post-licence instruction as an accident countermeasure. The possibilities for improving the standard of driver instruction in Australia were examined and a case is made to raise the standard of current licensing procedure while introducing a comprehensive training course for driving instructors.

Ritter, P. Planning for Man and Motor. Pergamon Press, 1964.

A Volume for the Town Planner (384 pages). Deals with "Training" and "Emotional State" in five lines each. Devotes one page to "Perception". Also considers Roadway Environment in terms of "Road Furniture".

Schuster, D.H. "Cognitive Accident Avoidance Training for Beginning Students". Journal of Applied Psychology, 1978, Vol.63, No.3, pp. 377-379.

Programmed instruction/testing was used to teach safety techniques to high school students in driver education (N = 192). The independent variable was training feedback/testing, which had four levels: (a) no test and no feedback; (b) test with an IBM answer format, but no item feedback; (c) test with a punchboard answer format and immediate individual feedback; and (d) double testing with punchboard answer format and training. This device registers a response and indicates the correctness of the choice immediately. If initially wrong, a student continued working until that item was correct. Separate analyses of variance were done for (1) number of driving accidents

and (b) moving violations year by year in the 3 years following training. For the first year only, the punchboard-twice drivers had one fourth the accidents of the no-test control drivers.

Welford, A.T. "What Can Be Trained?" Journal of Human Movement Studies. 1976, 2, pp. 53-56.

The role of training is viewed within an information-flow model of the human sensory-motor system. It is argued that training does not increase basic capacities but improves the use made of them by improving the efficiency of coding of incoming data and outgoing action in both space and time. Some implications for training procedures are briefly surveyed. A model relating arousal to stress is outlined and the effects of training discussed in relation to individual differences of stress effect and the arousal levels optimal for tasks of differing difficulty. It is urged that the trainer's task is to adjust his methods so as to secure efficient coding and optimal arousal for individual trainees.

Wildervanck, C., Mulder, F. & Michon, J.A. "Mapping Mental Load in Car Driving". Ergonomics, 1978, Vol.21, No.3, pp. 225-229.

Brown (1982) in defining a good driver as "one who maintains sufficient spare capacity to deal with an unexpected but possible event. This mental capacity is a characteristic of the driver, whereas mental load is determined by interaction with the other two components of the system-trinity; the vehicle and the environment; in other words, the driving task. The driver has a certain amount of information-processing capacity, usually more than enough for the driving task, thus leaving some spare capacity which decreases when driving imposes greater demands.

Williges, R.C. & Triggs, T.J. Simulation of Driver Training. Monash University Human Factors Group, Department of Psychology, Monash University, Melbourne, 1977.

Provides a conceptual model of the driving task. Lists twenty-seven Driving Tasks used by Skettel and Horner (1972) involving Driver Skill components. Conclusions confined to use of simulation in driver training, with summary of for and against arguments. Cites policy of Mt. Lawley (W.A.) driver instruction as "behind-the-wheel" on public streets because the view is expressed that 'two-thirds' of the gain in improving good judgment concerning traffic events and real world situations." (p.44).

Zeller, A.F. "Accidents and Safety, In K.B. De Greene (Ed.) Systems Psychology. New York: McGraw-Hill, 1970, pp. 131-150.

"The most commonly designated cause of accidents is human error. Some attempts have been made to characterise human behaviour in terms of psychological categories. As approaches to coding accident causation, however, these have not been particularly successful. (Webb, et.al., 1958)".

"A more fruitful approach is to analyse human error in terms of a total man-machine system interaction....."

Identifies physical, physiological and psychological limitations and psychosocial factors as contributing to accidents. Strong orientation to a 'perception, decision, response, model.

APPENDIX C

DRIVING SCHOOL SURVEY SUMMARY

Organisations contacted were:

- VIC.: (a) GVDTC Shepparton
(b) RACV
(c) Olympic Driving School
(d) AAA Action Driving School Pty. Ltd.
(e) Robbies School of Motoring
(f) Knox Driving School
(g) Glenroy Motor School
- N.S.W.: (a) NRMA Sydney
(b) ABC Driving School
(c) Barnes Driving School
(d) Police Driver Training School
- S.A.: (a) Royal Automobile Association
(b) South Australia Driving School
(c) Courtesy Driving School
(d) City and Suburban Driving School
- W.A.: (a) National Safety Council
(b) Ajax Driving School
(c) Defensive Driving School

QUESTIONS:

1. Do you base your driver training curriculum on a text book or training manual? If so, what is the reference?
 2. Do you use the "How to Drive" Film Series?
 3. Do you use films other than the "How to Drive" Series?
- VIC.: (a) GVDTC Shepparton - (058) 211099
1. Yes, "Notes on Driver Education".
 2. Yes, most of the 13 films.
 3. Approx. 12 other films.
- (b) RACV - 6072211
1. Yes, "Notes on Driver Education".
 2. Yes, those which are metric and more recent.
 3. Yes, some recent ones, i.e. metric.
- (c) Olympic Driving School - 5786355
1. No
 2. No
 3. No
- (d) AAA Action Driving School Pty. Ltd. - 8424868
1. No
 2. No
 3. No

- (e) Robbies School of Motoring - 416493
 - 1. No
 - 2. No
 - 3. No
 - (f) Knox Driving School - 8745213
 - 1. Yes, "Driver Education" which has since been revised to become "Notes on Driver Education".
 - 2. No
 - 3. No
 - (g) Glenroy Motor School - 3068909
 - 1. No
 - 2. No
 - 3. No
- N.S.W.:
- (a) NRMA Sydney - (02) 2900123
 - 1. No
 - 2. Yes
 - 3. No
 - (b) ABC Driving School
 - 1. Yes, "The ABC of Driving and How to Pass your Driving Test". Also a free booklet that they publish on road rules, etc.
 - 2. No, because they are antiquated.
 - 3. Yes, approx. 12 of their own films (some imports).
 - (c) Barnes Driving School - (02) 7500000
 - 1. Yes, "The Family Guide to Driver Education".
 - 2. No
 - 3. No
 - (d) Police Driver Training School - (02) 4496155
 - 1. Yes, "The NSW Police Driver Training Manual".
 - 2. Yes, all 13 films.
 - 3. Yes, approx. another 25 films.
- S.A.:
- (a) Royal Automobile Association - (08) 2234555
 - 1. Yes, "Student Driver's Guide".
 - 2. No
 - 3. No
 - (b) South Australia Driving School - (08) 422363
 - 1. Yes, "Driver Training Manual".
 - 2. No
 - 3. No
 - (c) Courtesy Driving School, Broadview - (08) 446457
 - 1. No
 - 2. No
 - 3. No

(d) City and Suburban Driving School - (08) 3824149

1. No
2. No
3. No

W.A.: (a) National Safety Council - (09) 2721666

1. Yes, "The Driver Training Manual".
Each State's safety council has this same
manual, but has a different preface
according to that particular state's road
laws.
2. Yes
3. Yes, approx. 150 films.

(b) Ajax Driving School - (09) 3253633

1. No
2. No
3. No

(c) Defensive Driving School - (09) 3645700

1. No
 2. No
 3. No
-

DRIVER EDUCATION

The ultimate objective of driver education is to provide educational experiences which will give students the skills, knowledge and, above all, proper attitudes necessary for the efficient and safe operation of the motor vehicle.

Classroom instruction is that phase of driver education concerned with learning experiences which not only utilize effective teaching methods such as lectures, discussions, audio-visual aids, but also makes use of psycho-physical aids.

"In car" instruction is that other main phase of driver education which provides learning experiences for the student in progressing through all phases of the actual practical control of a motor vehicle under the expert tuition of a qualified driving instructor.

Objectives

The specific objectives of driver education are:

1. To enable individuals, while at the height of their desire to learn how to drive, to build attitudes leading to co-operative and responsible conduct on streets and highways.
2. To enable them to know, understand the reasons for, and apply in their own driving, the traffic laws of their State or Territory as the case may be.
3. To develop habits, knowledge and skills that will enable them to become good drivers and pedestrians under a variety of changing conditions.
4. To give them an understanding of their own and others' capabilities and limitations as drivers and pedestrians, and enable them to make suitable corrections and compensations for their own limitations.
5. To create in them an awareness of the mistakes made by drivers and pedestrians and enable them to apply techniques to counteract the attendant dangers.
6. To lead them to take an active interest in, and lend support for, community efforts to increase traffic efficiency through channels of motor vehicle administration, education, law enforcement, engineering and legislation.
7. To provide understanding of the construction of a motor vehicle, and knowledge and appreciation of preventive maintenance as a factor in safe and efficient use of motor vehicles.

Driving

Driving a motor vehicle has been described as a craft and an art, a scientific operation calling for immediate decisions that can only be made competently by the driver possessing a wide and thorough knowledge of:

1. The capabilities of the machine he is operating (e.g., how it behaves under acceleration, deceleration, whilst turning or cornering; the part that Nature's laws such as friction, momentum, centrifugal force, kinetic energy, etc., play in the safe, efficient operation of the machine; the techniques that will assist the driver in the safe movement of the vehicle to combat the adverse effects of Nature's laws or conversely to utilise these same influences for safety).
2. Systematic techniques in operating and co-ordinating the controls of the vehicle in terms of position on the road and road conditions (there is a correct technique for all procedures and manoeuvres carried out whilst driving).
3. The laws governing the movement of traffic (without a full knowledge of the correct standard interpretations of the relevant Acts and Regulations/Ordinances a driver cannot safely use the road).
4. The attitude of the driver (the most important factor is a desire to drive efficiently and safely. This can only be achieved if the driver has a thorough knowledge of 1, 2 and 3 above. There are attitudes which are particular to each specific manoeuvre and, therefore, specific attitudes must be cultivated and encouraged in all drivers).

Driver education must be communicated in the same way as many other arts and crafts are taught, that is, by efficient teachers with a wide theoretical and practical knowledge of their subject.

Driver education can only be effective if:

The Attitude

The Technique

The Traffic Law

are learned and applied. They are interrelated and cannot be separated.

One is useless without the other in achieving the safe movement of a motor vehicle.

CURRICULUM		DEGREES OF KNOWLEDGE	
1.1 The development of motorism and the individual's role in traffic	3.4 Meeting and overtaking	Degrees of knowledge (ability) stated in the objectives	
1.2.1 Knowledge of vehicles	3.5 Meeting at crossways	<u>Degree</u>	<u>Description</u>
1.2.2 Construction and equipment of vehicles	3.6 Signs and signals	Orientation	The pupil should generally be able to give an account of the current problems in the field.
1.3 Introductory regulations	3.7 Stopping and parking		
	3.8 Road signs		
	3.9 Level crossing		
	3.10 Vehicle's load		
ELEMENTARIES IN DRIVING			
2.1 Care and control of the car from the aspect of traffic safety	INTRODUCTORY DRIVING-LESSONS IN TRAFFIC	Basic knowledge ability	Basic knowledge without demands that the pupil should be able (have the ability) to independently solve problems in an entirely correct way.
2.2 Driving position, manoeuvre, control and auxiliary instruments	4.1 Safety control		
2.3 Starting, inch driving and stopping, elementary exercises in steering	4.2.1 Driving on roads with little traffic	Knowledge Ability	Having plenty of time at his disposal, the pupil should independently be able (have the ability) to solve problems in a mainly correct way.
2.4 Manoeuvres in inclination	4.2.2 Driving on narrow roads		
2.5 Gear exercises and braking	4.3 Driving in built up areas - Part I		
2.6 Continued exercises in steering and fundamental exercises in backing	4.4 Backing, parking and turning manoeuvres	Good knowledge ability	The pupil should under realistic time conditions independently be able (have the ability) to solve problems in a correct way.
CONTINUED LESSONS IN THEORY (Traffic Regulations)			
3.1.1 Basic rules	CONCLUDING LESSONS IN THEORY		Abbreviations
3.1.2 Instructions in traffic and clearing the roadway for certain road-users etc.	5.1 Driving in built-up areas and on highways		VTF Highway Code
3.2.1 Use of separate lanes	5.2 Lights		VFX Traffic Sign Regulation
3.2.2 The vehicle's place on roads and at intersections	5.3 Driving on slippery road surface		Mark Markings on the Roadway
3.3 Speed	5.4 Regulations on demands for driver's licence, control of vehicles, etc.		SEK Publication regarding warning signs and safety devices at level crossings.
	5.5 Special regulations for military traffic		
	5.6 Procedures at traffic accidents		
	CONCLUDING DRIVING LESSONS IN TRAFFIC		
	6.1 Driving in built-up areas - Part II		
	6.2 Highway driving		
	6.3 Driving at night		
	6.4 Driving on slippery road surface		