# DUAL MODE TRANSPORTATION: EMERGING LEGAL AND ADMINISTRATIVE ISSUES

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## I. INTRODUCTION

The time has passed when new technology could be deposited on society's doorstep and unashamedly left there with the expectation that others would devise piecemeal solutions for each development's collateral consequences. The need for early assessment of the implication of new technology has received considerable attention in the past few years.[1] Nuclear energy fueled power plants, the SST, snowmobiles, and other recent major technological innovations all carry with them significant implications which hindsight, and the commentators, tell us we should have anticipated and objectively evaluated.[2] This essay is a first step in the assessment of administrative, legal, and social policy issues raised by proposed dual mode transportation systems. A dual mode system is defined as "a system of ground vehicles which can operate either under manual control over existing streets and roadways or under automatic

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1. See, e.g., Symposium—Technology Assessment, 36 *Geo. Wash. L. Rev.* 1033 (1968); Huddle, Political Adaption to a Technology Surfeited·Society, 47 *Denver L. J.* 629 (1970). In his introduction to the Symposium, Harold P. Green writes that:

> The problem of social control over technology is by no means a new one. Technological advance has typically produced social problems. In the past, these social problems have been met and dealt with primarily on an ad hoc basis. The first phase of societal response to such social problems has usually been the extension and application of old legal principles to the new problems. Our judicial system has worked out on a step-by-step, trial and error basis new rules of law to mesh new technologies into the fabric of our overall societal structure. When these rules of law have seemed to our legislative bodies to be inadequate, or to be developing too slowly for protection of society, our legislative bodies have superimposed statutory standards of conduct and liability or provided for outright government regulation.
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> This approach to social control over technology has typically represented a process of response to problems which have become apparent, and not infrequently in the case of the legislative response it comes only after some major crisis or catastrophe has occurred. As Congressman Daddario points out, we may no longer be able to enjoy the luxury of merely responding to demonstrated adverse social effects. The population explosion, coupled with the powerfully destructive agents of modern technology, makes it much more difficult for society to tolerate even the temporary existence of technological hazards.

Technology Assessment and the Law: Introduction and Perspective, 36 *Geo. Wash. L. Rev.* 1033.

2. See, Wollan, Controlling the Potential Hazards of Government-Sponsored Technology, 36 *Geo. Wash. L. Rev.* 1105 (1968); Baram, The Social Control of Science and Technology, 47 *Denver L. J.* 567 (1970).

Instead of prognostication, we tend to react with after-the-fact restrictions on the use of new technology. See, e.g., Exec. Order No. 11644, 37 Fed. Reg. 2877-78 (1972) in which President Nixon announced Federal controls on the use on public lands of off-road recreational vehicles—motorcycles, minibikes, trail bikes, snowmobiles, dune buggies, etc.

control over a network of guideways. . .using either self-contained power or power derived from the guideway."[3] Such systems would increase the flow of vehicles between heavily traveled points linked by restricted-access dual mode automated guideways. Vehicles would leave the guideway at exits in the vicinity of their destinations to travel the rest of the way under manual control on existing streets. No dual mode system or prototype has yet been constructed. The dual mode transportation system concept is one of several new systems currently being developed and evaluated by the U.S. Department of Transportation. The Department's goal in developing and demonstrating entirely new transportation systems is "to apply the best of advanced technology to urban mass transportation service."[4] Other new technology systems include personal rapid transit systems (PRT) which would provide express transportation service from origin to destination in small automated vehicles over a guideway system,[5] demand-responsive transit systems, which would provide door-to-door service in response to customers' telephone requests,[6] and the urban tracked air cushion vehicle (TACV), designed to provide high speed transportation in highly congested corridors.[7]

It is the purpose of this essay to identify potential difficulties in the establishment and operation of a dual mode system, and to suggest alternative solutions. Because it represents only a preliminary analysis, it should neither be considered a comprehensive catalogue of issues, nor a complete compilation of solutions.[8]

## II. What is a Dual Mode Transportation System

To facilitate preliminary feasibility studies of the dual mode transportation concept, the Dual Mode Study team of the Transportation Systems Center, a part of the U. S. Department of Transportation, has selected four archetypal systems for in-depth analysis: a pallet system, a dual

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3. "Research and Development Program to Investigate Dual Mode Transportation System Technology," PSA-5403 *Commerce Business Daily* 11 (Sept. 14, 1971).

4. Hearings before the Subcommittee on Department of Transportation and Related Agencies Appropriations of the House Committee on Appropriations, 92d Cong., 2d sess., pt. 2 at 824 (1972).

5. Id. at 826. Models of four PRT systems were to be displayed at the U.S. International Transportation Exposition at Dulles International Airport in late May, 1972.

6. Id. at 828.

7. Id. at 831.

8. Omitted from this discussion, for example, are issues relating to the financing of dual mode systems. Should they be paid for out of general tax revenues, special purpose bonds, a trust fund supported by user charges, etc.?

mode bus, a dual mode version of the private automobile, and a dual mode rental vehicle. These systems are described below to the extent necessary for this analysis.

*A. Dual mode pallet system*

In a pallet system conventional automobiles would operate in the manually-controlled mode on existing streets as they do now. Automobiles would become automated vehicles by being driven aboard individual automated pallets which would then move along a guideway carrying vehicles, their drivers and their passengers to their destinations. A forerunner of such a dual mode system now in existence is the railroad's "piggyback" flatcar service, in which truck trailers are driven to rail terminals, placed on railroad flatcars for long hauls, then driven off the flatcar onto conventional roadways.[9] (Each dual mode pallet would probably be operated and be controlled independently, however, rather than as part of a train.) Another example is "Autotrain" service, in which trains containing passenger lounge cars and auto-carrying flatcars transport vehicles and drivers between Washington, D.C. and Florida.[10] Of course neither piggyback nor Autotrain service qualifies as a true dual mode system because pallets (flatcars) must be linked together in trains, do not move under automatic control, and because drivers and passengers do not remain in their vehicles.

*B. Dual mode bus system*

A dual mode bus may be a bus of any convenient size controlled by a driver while operating on existing streets, but which also functions automatically upon its restricted guideway. Once the dual mode bus entered the automated guideway, its driver would become superfluous, and would probably be required to leave the bus to perform other assignments. When the bus arrived at its terminal, perhaps after making intermediate stops at fixed stations along its guideway, a second driver would board to resume manual control for off-guideway operations.

*C. Dual mode private and rental vehicle systems*

In a dual mode privately owned vehicle system, all vehicles would be owned by private individuals, just as automobiles are now owned. The

9. For a description of "Trailer-on-flatcar" (TOFC) service, see 49 C.F.R. § 1090 (Practices of For-Hire Carriers of Property Participating in Trailer-on-Flatcar Service).

10. *N. Y. Times*, Oct. 24, 1971, § 10 (Travel), p.4.

system differs from a dual mode rental vehicle system only in the identity of vehicle owners: in a rental system one or a relatively few entities would own all vehicles and rent them to drivers for various lengths of time. Both rental and privately owned vehicles would resemble contemporary automobiles, and would be capable of automated operation on restricted-access guideways and manual operation on the existing street network. Once a vehicle entered the guideway approach ramp all control over it would vest in the guideway operator. Drivers would not regain control until their vehicles exited at preselected stations.

## III. National Regulation v. Local Control

A preliminary issue in the establishment of any dual mode transportation system is the necessary degree of centralized control over system design, construction, or operation.[11] If a uniform nation-wide system were envisaged, a greater degree of centralized control over design and operation would be required than if several discrete systems were planned.

### *A. The need for uniform nation-wide control*

In general, the need for uniformity in both design and operation of a dual mode system is determined by the number of separate guideway networks on which a vehicle is expected to operate, and by the degree of interaction between vehicle and guideway in a particular system. For example, it is most unlikely that a dual mode bus would operate on a guideway configuration other than its own system's, and so there would be little need for uniformity among all dual mode buses and their guideways. On the other hand, dual mode automobiles could be expected to operate on guideways anywhere in the country, and therefore vehicle and guideway design and operation should be uniform nationwide. If a dual mode system required only that vehicles ride passively on a moving guideway, a pallet system, for instance, vehicles would need to meet only minimal design standards (e.g., wheel base, axle length, height, etc.). But if vehicles must interact actively with the guideway in the automatic mode, all dual mode vehicles must be standardized throughout the system.

Policy arguments exist for and against uniform design and centralized operation of dual mode systems. First, production of uniform vehicles

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11. It is assumed throughout this essay that the Federal Government would exercise control over a uniform national dual mode system either directly, through a Federal administrative agency, or indirectly, through a Comsat-like public-private corporation, or through detailed regulation of private industry.

and guideways should result in scale economies and rapidly provide a large body of knowledge on the workings of that system. It can be argued, however, that only through installation of demonstration systems of various designs can it be known which system, or which combination, is best. Second, centralized control may exclude States and localities from control over this new system: this would represent a departure from other Federally-assisted transportation construction and operation programs, which have heavily involved the States. Federally aided highway projects,[12] for example, are initiated, planned, and developed by the States.[13] States supervise project construction[14] and assume responsibility for maintaining completed projects;[15] the Federal role is limited to technical review of project plans[16] and disbursement of funds.[17] Urban Mass Transportation projects are likewise initiated and planned by States and local public bodies, subject to Federal approval.[18] Furthermore, complete Federal dominion of dual mode bus systems seems particularly inappropriate for local collection-and-distribution route determinations. Federal control is also inconsistent with current administration policies favoring local autonomy and revenue sharing with States and localities to fund transportation improvements.[19]

12. The four Federal-aid highway systems are the primary, secondary, Interstate, and urban systems. 23 U.S.C.A. § 103(a).

13. 23 U.S.C.A. §§ 105, 302.

14. 23 U.S.C.A. § 114.

15. 23 U.S.C.A. § 116.

16. 23 U.S.C.A. §§ 105, 106, 109.

17. 23 U.S.C.A. §§ 120, 121.

18. Urban Mass Transportation Act of 1964, as amended, 49 U.S.C.A. §§ 1602-1603.

19. See, e.g., President Nixon's special message to Congress, "Revenue Sharing for Transportation," H. R. Doc. No. 92-71, 117 Cong. Rec. H. 1750, 1751 (daily ed. March 18, 1971).

> The hard fact is that the best mixture of transportation modes is not something that remote officials in Washington can determine in advance for all cities, of all sizes and descriptions, in all parts of the country. Nor do the Federal officials who grant money for specific projects understand local needs well enough to justify their strong influence over how local projects should be planned and run. . . .
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> Community organizations, concerned individuals and local units of government should not have to shout all the way to Washington for attention. Community standards and community transportation goals are changing and some of those who only five years ago welcomed the prospect of a new highway or airport are now protesting in front of bulldozers. Transportation planning and appropriations mechanisms must be flexible enough to meet the challenge of changing community values. This flexibility can best be achieved by concentrating more decision making power in the States and the localities.

### *B. Requirements for centralized control*

If system-wide operational uniformity were required, it would probably entail detailed control far exceeding existing regulation of ground transportation vehicles and guideways. The sophisticated electronic equipment necessary for safe automatic operation of dual mode systems would be much more complex than, say, mandatory safety and air pollution emission equipment now required on automobiles.[20]

To regulate vehicle design, the dual mode central administrator could issue detailed specifications for vehicles to be constructed by private manufacturers.[21] As long as vehicles conformed to these requirements, they could be built in various models differing only in non-essential features. If more control were needed, the administrator could create limited monopolies by licensing qualified producers to make standardized vehicles. Only vehicles built by licensed manufacturers could then be allowed on the dual mode guideway. Or, the administrator could fabricate vehicles himself. Parallel degrees of control are available to regulate guideway construction. The administrator could issue detailed guideway construction standards which States must follow,[22] or personally direct guideway construction.

### *C. Precedents for national regulation*

Current Federal transportation regulatory and aid programs supply

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20. See, National Traffic and Motor Vehicle Safety Act of 1966, 15 U.S.C.A. §§ 1381-1410, and implementing motor vehicle safety standards 101-301, 49 C.F.R. § 571.21. These standards establish requirements for control switch identification and location, windshield wiping and defrosting mechanisms, brake systems, lights, tires, mirrors, crash impact protection, etc.
See also, National Emissions Standards Act, 42 U.S.C.A. § 1857-f, authorizing establishment of exhaust emission standards for new motor vehicle engines.

21. See, e.g., 32 C.F.R. § 255 (Department of Defense Policies and Procedures for Assuring the Quality of Production of Complex Supplies and Equipment): "Complex supplies and equipment must be produced under regulated conditions if adequate assurance of quality is to be realized. Systematic control of manufacturing processes by the producer is an essential prerequisite for assuring the quality of such items. Likewise, it is essential that the Government verify systematically that such control is, in fact, established and exercised by contractors." 32 C.F.R. at § 255.3.

22. The Secretary of Transportation now has authority to establish minimum guideway standards for other transportation modes. See, e.g., Natural Gas Pipeline Safety Act of 1968, 49 U.S.C.A. §§ 1671-1684. Section 1672(b) requires the Secretary to adopt minimum Federal safety standards covering "design, installation, inspection, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities."
See also, 23 U.S.C.A. § 109(b), authorizing the Secretary of Transportation to set geometric and construction standards for the Interstate highway system.

precedents for various degrees of centralized (Federal) control of specific transportation modes. Federal control of civil air transportation provides one example of extensive centralized control of facilities design and operation (but not necessarily the most appropriate administrative method for exercising control). That control, exercised by the Civil Aeronautics Board and the Federal Aviation Administration over private industry and individuals, determines terminal and intermediate cities,[23] reviews tariffs,[24] regulates air traffic,[25] prescribes minimum design, materials, performance and maintainence standards for aircraft,[26] establishes pilot certification requirements,[27] and in all other aspects assures the safe and efficient utilization of the airspace.[28] The dual mode central administrator could be given comparable authority over the dual mode system. The Federal highway aid program presents a model for regulation of a dual mode system with less centralized control. As described above, States carry out Federally aided highway construction projects in compliance with minimum Federal technical standards (e.g., geometric configuration, capacity to handle predicted traffic volume, construction techniques, and regulatory, informational, and safety markings).[29] States control the basic matters of project location and design, project construction, and maintenance.[30] Finally, if nationwide design and operational uniformity for dual mode systems were not necessary, Federal participation could be limited to construction of a variety of dual mode system demonstrations. Local governments could then decide whether or not to construct a dual mode system, where to put it, and which one suits their needs.

## IV. Routine Operational Issues

Operation of a dual mode system will pose several administrative problems. First, who should be allowed *access* to the automated portion of the system? Ideally, a dual mode system should be accessible to any licensed driver possessing minimal driving skills. If entry were at all complicated, however, safe and efficient operation would dictate that vehicle operators be trained to bring their vehicles into the system properly. This issue is of particular importance in systems open to large

23. Federal Aviation Act of 1958, as amended, 49 U.S.C.A. § 1371(e)(i).
24. 49 U.S.C.A. § 1373.
25. 49 U.S.C.A. § 1348(c).
26. 49 U.S.C.A. § 1421(a).
27. 49 U.S.C.A. § 1422.
28. 49 U.S.C.A. § 1348(a).
29. 23 U.S.C.A. § 109.
30. 23 U.S.C.A. §§ 105 (planning), 106 (design), 114 (construction), and (maintenance).

numbers of potential vehicle operators, for example, systems involving some variant of today's automobile. If the system were national in scope, a nationwide driver training and licensing program should probably be required.[31] Training should be given to all persons above a minimum age, or at least to all persons holding licenses to drive today's manually-controlled automobiles.

Before vehicles are permitted to enter the automated portion of the system, they should be required to conform to necessary safety standards. (This requirement could be relaxed in pallet dual mode systems, where vehicles would be passive and would not interact with the guideway.) If dual mode vehicles were under the control of the system administrator, as dual mode buses and rental vehicles would be, it should not be difficult to maintain and inspect them periodically.[32] Coercing private owners of dual mode vehicles to maintain them and have them inspected might present a problem, however. Automated pre-entry electrical and mechanical inspection of all vehicles would provide an incentive to adequate maintenance of privately owned vehicles. Any vehicle failing this inspection would not be permitted on the guideway. (To avoid becoming clogged with rejected vehicles, entrance ramps should provide alternative routes for vehicles failing inspection.) In addition to this quick check, more frequent vehicle inspections than the one or two per year required for automobiles[33] may also be necessary. These inspections should include complete checkout of the dual mode mechanism, as well as testing of conventional safety features—brakes, tires, etc. Inspectors could attach computer-coded stickers to each vehicle complying with inspection

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31. In 1926, the National Conference of Commissioners on Uniform State Laws promulgated a proposed uniform statute to govern licensing of motor vehicle operators. Uniform Motor Vehicle Operators' and Chauffeurs' License Act, 11 U.L.A. 77-97 (1938). By 1949, 20 states had adopted this uniform code. The commissioners declared the law obsolete and withdrew it in August, 1943. 11 U.L.A. (1949 pocket supp. at 7). The National Committee on Uniform Traffic Laws and Ordinances issued their version of a uniform driver license law in 1968. Uniform Vehicle Code and Model Traffic Ordinance 69-92 (rev. ed. 1968). Section 6-110 requires the state department of motor vehicles to examine each applicant for a driver's license to determine eyesight, reading ability, knowledge of traffic laws and safe driving practices, and driving ability.

32. Firms renting automobiles now follow elaborate vehicle inspection procedures to avoid liability for accidents involving their cars. See, e.g., *Clarkson v. Hertz.*, 266 F. 2d 948 (C.A.5, 1959); *Stevenson v. Hertz Corp.*, 356 Mass. 723, 252 N.E. 2d 212 (1969); Anno.: Liability of bailor of automotive vehicle or machine for personal injury or death due to defects therein, 46 ALR 2d 404, 443-46 (1956).

33. See, e.g., Mass. Gen. Laws c. 90, § 7A, requiring semi-annual inspection of automobiles; New York Vehicle and Traffic Law § 301, requiring only annual inspection of motor vehicles.

standards to indicate the date of the inspection, thoroughness (i.e., was it a major or minor inspection), possible trouble areas to be watched, etc. Vehicles without proper inspection stickers, detectable by the central computer as they enter the automated portion of the system, could be barred from the guideway, or even made subject to criminal sanctions, just as violators of existing auto inspection regulations now are.[34] A system-wide network of maintenance (and inspection) stations would be necessary to check dual mode vehicles regularly. To insure mechanics' and inspectors' qualifications, the dual mode system administrator could supervise training these personnel and either license maintenance and inspection stations or operate them himself to insure necessary quality standards.

## V. Non-Routine Operations: The Cost of Accidents

Thus far the discussion has assumed routine operation of the dual mode system. Indeed, system designers assure that fail-safe computers will minimize the possibility of accidents. While the possibility of an accident may be remote, should one occur, it could impose enormous dollar costs on the operators and occupants of the high-speed, close headway, automated dual mode vehicles involved. Planners should therefore evaluate alternative accident liability and compensation schemes appropriate for each type of dual mode system; schemes which would compensate accident victims for their losses, deter future accidents, satisfy social needs to penalize wrong-doers, all without deferring use of the dual mode system.[35] Without such policy guidance, courts in each jurisdiction in which a dual mode system operates will be forced to allocate accident costs on a case-by-case basis, adapting and applying traditional legal theories. As courts grope for a satisfactory body of law to apply to dual mode accident litigation, their missteps may result in grossly inequitable accident cost distributions in individual cases.[36] "Furthermore, the particularistic nature of the case law system is at best a form of 'incremental planning' with minimum integration into general rules that can guide the future actions of individuals, industries, and government agencies."[37] The fol-

34. See, e.g., New York Vehicle and Traffic Law §§ 306, 512; Mass. Gen. Laws c. 90, §§ 2, 23. Computerized detection and review of inspection stickers should result in better enforcement of vehicle inspection laws than now available.

35. See, *Harper and James, The Law of Torts* 743 (1956 ed.).

36. Green, *supra* note 1 at 1036.

37. See, Note, The Role of the Courts in Technology Assessment, 55 *Cornell L. Q.* 861, 872 (1970). But see, Judge (now Chief Justice) Warren Burger, Seminar: The New Biology and the Law, 21 *U. Fla. L. Rev.* 427, 433 (1969), "The law's assignment in society is not

lowing discussion applies alternative accident compensation schemes to the four types of dual mode systems, and evaluates their efficiency as allocators of accident costs.[38]

*A. Accident compensation schemes for bus and pallet dual mode systems*

1. Accident cost allocation under the fault system

To recover accident costs under existing common law principles of fault and negligence, an injured bus or pallet passenger must initiate a law suit against persons who may be legally liable to him. Candidates for liability include the dual mode system operator, who is responsible for automated operations and perhaps for vehicle and guideway design and construction, the bus or pallet manufacturer, the guideway builder, electronics fabricators, or makers of component parts for any of these manufacturers. The injured plaintiff must prove the following elements of his action to establish each defendant's liability: (1) A legal duty or obligation requiring the defendant to conform to a certain standard of conduct (in general, to act reasonably); (2) Defendant's failure to conform to that standard; (3) A causal connection between the conduct and plaintiff's injury; and (4) Actual losses.[39] Injured passengers on dual mode buses or pallets would most certainly sue the dual mode system operator, the only entity they have dealt with directly in connection with dual mode operations. Because pallet and bus dual mode systems provide passenger service to the public akin to existing passenger common carrier service,[40] dual mode accident victims may take advantage of several special rules

one to anticipate needs. The law responds after a problem arises, and that is as it should be."

The suggestion that planners actively review alternative accident cost distribution schemes should not be construed to intimate that common law theories are inadequate to deal with dual-mode accident litigation. But the decision to opt for the traditional approach should be a conscious one made after all alternatives are considered.

38. Much of the discussion which follows relies on analysis developed by Professor Guido Calabresi of Yale. See Calabresi, Some Thoughts on Risk Distribution and The Laws of Torts, 70 *Yale L. J.* 499 (1961); Calabresi, The Decision for Accidents: An Approach to Nonfault Allocation of Costs, 78 *Harv. L. Rev.* 713 (1965); Calabresi, Fault, Accidents and the Wonderful World of Blum and Kalven, 75 *Yale L. J.* 216 (1965).

39. Prosser, *The Law of Torts* 143 (4th ed. 1971).

40. A "common carrier by motor vehicle" is defined by the Interstate Commerce Act, 49 U.S.C.A. §303(a)(14), as "any person which holds itself out to the general public to engage in the transportation by motor vehicle in interstate or foreign commerce of passengers. . . ." A bus or jitney is a common carrier. 13 Am. Jur. 2d Carriers §14 at 570.

of law designed to facilitate accident victims' recovery from common carriers of passengers.

(a) Duty of care. Instead of the duty to act reasonably which the law imposes on most individuals, common carriers of passengers are held to a higher standard of care. Passenger carriers holding themselves out to serve the general public owe their patrons the highest duty of care consistent with operation of their service.[41] If courts applied this rule to dual mode bus or pallet system operations, it could be argued that the absence of a driver or attendant aboard the bus or pallet in the automated mode constituted evidence of negligence. The system operator could respond to this argument by contending that his dual mode system was designed to maximize safety without the need for human interference, and that a driver aboard the vehicle would be unable to respond to emergencies quickly enough to be of use. The presence of a human driver would therefore constitute a safety hazard, the system operator would conclude. Plaintiffs could respond that the failure to provide for human control was evidence of negligence itself.

(b) Defendant's failure to conform to his duty of care. Establishing the precise manner in which a defendant common carrier's conduct deviates from the duty owed can be a difficult or impossible burden on an injured plaintiff. He lacks information as to proper modes of operation, proper maintenance methods, etc. To overcome this problem of proof, plaintiffs may employ the doctrine of *res ipsa loquitur* ("the thing speaks for itself") to establish a common carrier's liability. Under this doctrine, the occurrence of an accident involving an instrumentality within the defendant's control and without plaintiff's active participation creates a presumption (or at least permits a jury to infer[42]) that the accident re-

41. The generaly rule has been summarized as follows:

> A majority of courts uphold an instruction to the jury which exacts of a common carrier of passengers for hire toward the passenger, the highest degree of care and forethought consistent with the practical operation of the business. [Footnotes omitted.]

Harper and James, *op. cit. supra* note 30, at 947, and cases there cited. See also, 14 Am. Jur. 2d Carriers §916 (1964).

42. In some jurisdictions, the *res ipsa loquitur* doctrine merely allows a trier of fact to *infer* a defendant's negligence, but does not require a finding for the plaintiff when defendant offers no rebuttal evidence. In other jurisdictions, *res ipsa* creates a presumption of negligence which requires the trier of fact to find for the plaintiff unless the defendant rebuts the presumption. Even in those jurisdictions in which *res ipsa* otherwise creates an inference, however, a special rule may obtain in common carrier cases which increases *res ipsa*'s effect to create a presumption. See McCoid, Negligence Actions Against Multiple Defendants, 7 *Stan. L. Rev.* 480, 483-5 (1955); but see, Note, Torts—Application of *Res Ipsa Loquitur* to Carrier-Passenger Cases, 38 *Marq. L. Rev.* 278, 280 (1955).

sulted from the defendant's negligence.[43] The burden then shifts to the defendant to prove he was not negligent. "The conditions usually stated in America as necessary for the application of the principle *res ipsa loquitur* are as follows: (1) The event must be of a kind which ordinarily does not occur in the absence of someone's negligence; (2) It must be caused by an agency or instrumentality within the exclusive control of the defendant; (3) It must not have been due to any voluntary action or contribution on the part of the plaintiff."[44] Automated dual mode bus and pallet operations appear to satisfy these prerequisites: automated operation of buses and pallets would be under the system operator's complete control, with no control in passengers. According to representations of system designers, accidents are most unlikely to occur; if one does happen, it seems reasonable to presume it was caused by negligence. Further, the system operator would have easy access to technical information concerning the system to rebut the presumption (or inference) created by *res ipsa*.

Despite the availability of these special plaintiff-serving rules, it is difficult to predict the outcome of plaintiff's suits against the system operator. On the one hand, application of the common carrier standard of care and the *res ipsa loquitur* doctrine should facilitate accident victims' recovery from the system operator. If the injured plaintiff can point to a specific action by the system operator which caused his injury, he should have little trouble establishing that the action breached the high duty of care owed by the system operator as a passenger common carrier. (As passengers gain experience with use of the system, they should become adept at spotting specific deviations from standard practice, excess speed or too-rapid acceleration, for example.) Difficulties in proving adherence to the common carrier's high duty of care with respect to each of the myriad possible accident causes within the system operator's control should make it difficult for the system operator to rebut the *res ipsa* presumption (or inference).[45] On the other hand, actual litigation experience in the airline industry indicates that any plaintiff's advantage created by the common carrier standard of care and by *res ipsa* may be fleeting. Courts and juries are often quick to find that airline accidents resulted from weather phenomena or other uncontrollable causes for which defen-

43. Historically, the presumption of liability established by *res ipsa loquitur* was available only in actions by passengers against a common carrier. Harper and James, *op. cit. supra* note 31, at 1083-84.

44. Prosser, *op. cit. supra* note 35, at 214.

45. See note 38, *supra* as to the effect of the *res ipsa* doctrine on the allocation of the burden of proof.

dant air carriers are not liable regardless of the high duty owed. Procedural rules in some jurisdictions require plaintiffs to base their case either on *res ipsa* or to allege a specific act of negligence but will not permit plaintiffs to use both concurrently.[46] If a plaintiff suing an airline elects to rely on *res ipsa*, "The evidence adduced by the airline. . .tends to nullify whatever advantage the doctrine might afford the plaintiff. The defendant airline presents an elaborate display, consisting of maintenance, inspection and pilot experience records, which usually convinces the jury that there could not have been a failure to exercise reasonable care and that this must have been one of those 'mysterious mishaps of the air.' "[47] No doubt dual mode system operators would be capable of amassing similarly impressive displays shortly after their systems began operations.[48]

Instead of suing the system operator, an injured plaintiff (or the system operator) could choose to bring suit against the manufacturer of the dual mode vehicle, the guideway fabricator, or perhaps the makers of component parts for alleged defects in their respective products. Cases now hold that "the seller of any product who sells it in a condition dangerous for use is strictly liable to its ultimate user for injuries resulting from such use, although the seller has exercised all possible care, and the user has entered into no contractual relation with him."[49] Problems of proof, how-

46. See, Note, Domestic Commercial Aircraft Tort Litigation: A Proposal for Absolute Liability of the Carriers, 23 *Stan. L. Rev.* 569, 571 (1971).

47. Note, Liability of Airlines for Injuries to Passengers, 31 *So. Cal. L. Rev.* 319, 321 (1958).

48. Increased public familiarity with dual mode transportation systems could result in a more critical, less awestricken attitude on the part of juries to defendant system operators' evidentiary displays, giving renewed value to *res ipsa loquitur*. See, Note, Liability of Airlines for Injuries to Passengers, *supra* note 43, at 324.

49. Prosser, The Assault Upon the Citadel (Strict Liability to the Consumer), 69 *Yale L.J.* 1099, 1112 (1960).

The rationale behind this rule of strict liability for defective products has been explained as follows:

> Since the early days of the common law those engaged in the business of selling food intended for human consumption have been held to a high degree of responsibility for their products. As long ago as 1266 there were enacted special criminal statutes imposing penalties upon victualers, vintners, brewers, butchers, cooks, and other persons who supplied "corrupt" food and drink. In the earlier part of this century this ancient attitude was reflected in a series of decisions in which the courts of a number of states sought to find some method of holding the seller of food liable to the ultimate consumer even though there was no showing of negligence on the part of the seller. These decisions represented a departure from, and an exception to, the general rule that a supplier of chattels was not liable to third persons in the absence of negligence or privity of contract. In the beginning,

ever, may make such suits difficult for plaintiffs to win. First, plaintiffs would have trouble identifying defective products after the accident occurs. A defendant could argue that the accident rendered its product defective, and that it was in satisfactory condition prior to the accident. Even if a product were shown to have been defective, it could be difficult to show the defect caused the accident. Plaintiffs could not use *res ipsa* because these products would not be under a single defendant's control.

Instead of attempting to establish liability based on defendants' fault, an injured plaintiff could choose to proceed on a contract legal theory by charging defendants with breach of an implied warranty of merchantability and fitness required of sellers of goods by nearly all states' law.[50] Because the fields of liability-based-on-fault and contract law shade into each other in this area of liability for defective products,[51] plaintiffs may experience many of the same problems of proof described in the preceding discussion. For example, a plaintiff would still have to establish which

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> these decisions displayed considerable ingenuity in evolving more or less fictitious theories of liability to fit the case. . . .
>
> Recent decisions, since 1950, have extended this special rule of strict liability beyond the seller of food for human consumption. The first extension was into the closely analogous cases of other products intended for intimate bodily use, where, for example, as in the case of cosmetics, the application to the body of the consumer is external rather than internal. Beginning in 1958 with a Michigan case involving cinder building blocks, a number of recent decisions have discarded any limitation to intimate association with the body, and have extended the rule of strict liability to cover the sale of any product which, if it should prove to be defective, may be expected to cause physical harm to the consumer or his property.
>
> On whatever theory, the justification for the strict liability has been said to be that the seller, by marketing his product for use and consumption, has undertaken and assumed a special responsibility toward any member of the consuming public who may be injured by it; that the public has the right to and does expect, in the case of products which it needs and for which it is forced to rely upon the seller, that reputable sellers will stand behind their goods; that public policy demands that the burden of accidental injuries caused by products intended for consumption be placed upon those who market them, and be treated as a cost of production against which liability insurance can be obtained; and that the consumer of such products is entitled to the maximum of protection at the hands of someone, and the proper persons to afford it are those who market the products.
> those who market the products.

Restatement (second), Torts 346-50 (comments to § 402A) (1965).

50. Uniform Commercial Code § 2-314. The Uniform Commercial Code has been adopted in all states except Louisiana.

51. It is beyond the scope of this essay to denote the niceties and limitations of each body of law as applied to products liability. See, e.g., James, Product Liability, 34 *Texas L. Rev.* 44, 192 (1955); Franklin, When Worlds Collide, 18 *Stan. L. Rev.* 974 (1966).

defendant breached its implied warranty by selling a defective product. Employing a contract liability theory carries with its own drawbacks. Although the requirement is slowly being abandoned,[52] some states still require plaintiffs to show "privity of contract," that is, a contractual relationship between plaintiff and defendant. Even when the privity requirement is relaxed, courts could still limit plaintiffs' actions against remote suppliers of component parts.[53]

How well would the liability-based-on-negligence fault system satisfy the purposes of an accident compensation scheme? To the extent that injured plaintiffs lost their lawsuits, the fault system would not provide compensation for accident losses. (As indicated above, it is difficult to predict what portion of plaintiffs will or will not recover.) The fault system would provide incentives toward accident cost avoidance: The costs of defending lawsuits and the cost of lawsuits lost should induce the dual mode system operator and product manufacturers to curb activities which contributed to their legal liability. Balanced against this accident deterrence effect, however, is the possibility that dual mode product manufacturers might absolutely refuse to participate in the system rather than risk being held liable for all costs of an accident. Holding the system operator or product manufacturers liable for those accidents for which he is proven to be "at fault" should satisfy social needs to punish wrongdoers. But, to the extent that the operator or manufacturer escapes liability due to difficulties of proof in cases in which one or another is believed to be "at fault," the fault system would frustrate this social need. (If the system operator were to escape liability on too many occasions, a legisla-

52. While some jurisdictions continue to require privity of contract (i.e., a contractual relationship) between plaintiff and defendant, it will be assumed here that no showing of privity will be necessary. This assumption is not unwarranted. See, e.g., *Greenman v. Yuba Power Products*, 59 Cal. 2d 57 (1963); *Goldberg v. Kollsman Instrument Corp.*, 12 N. Y. 2d 432 (1963); Kessler, Products Liability, 76 *Yale L. J.* 887 (1967).

53. The issue of how far back along the production chain should liability for breach of warranty extend was decided in the circumstance of an airline crash in *Goldberg v. Kollsman Instrument Corp., supra* note 48. Plaintiff, whose daughter was killed when an American Airlines aircraft in which she was a passenger crashed, brought suit against the airline, Lockheed, the manufacturer of the aircraft, and Kollsman, the manufacturer of the aircraft's allegedly defective altimeter. The action against the latter two defendants was based on breach of an implied warranty of merchantability and fitness. The court below dismissed plaintiff's action against these defendants. On appeal, the New York Court of Appeals, Desmond, Ch. J., traced the demise of the privity requirement and dispensed with it as to the defendant Lockheed only: dismissal of plaintiff's action against Lockheed was reversed, but dismissal of Kollsman as a defendant was affirmed.
See also, *Hall v. E. I. DuPont De Nemours & Co., Inc.*, 40 U.S.L.W. 2787 (U.S.D.C. E.N.Y., May 30, 1972), extending liability for a defective product to an entire industry.

tive judgement could be made to "sock it to him" for all his wrongs "once and for all" by closing the system, or by imposing a system of enterprise liability (discussed below) on its operation.)

2. Enterprise liability as an accident cost allocator

Dual mode bus and pallet system operations could be held liable for accident costs in all cases through application of enterprise or strict liability, parallel legislative and judgemade legal theories which have grown alongside the traditional liability-based-on-negligence fault system. These doctrines recognize that many beneficial activities will inevitably cause accidents, and that the costs of these accidents may prove catastrophic to individual victims who cannot protect themselves against them. Rather than leave these costs where they lay, or where the fault system redistributes them, enterprise liability requires the activities themselves to bear their accident costs.[54] Placing the burden of these costs on the enterprise is thought to provide incentives to reduce accident cost-producing activities. The enterprise is generally prohibited from bringing lawsuits to pass on accident costs to related activities which otherwise might be liable for them. Accident costs which cannot be eliminated are distributed by the enterprise in the form of higher prices so that all users share these costs equally.[55] The statutory scheme found in most states for compensating victims of work-related accidents, workmen's compensation, is an example of enterprise liability. "The basic philosophy of such legislation is that loss from these [job related] accidents is a cost of the enterprises that entail them, and should be borne by the enterprises or their beneficiaries."[56] Strict liability for defective products, mentioned earlier,[57] is a case law doctrine which results in holding manufacturing activities liable for their accident costs.[58] And a similar result is obtained in non-manufacturing areas through the theory of strict liability for ultra-hazardous or "abnormally dangerous"[59] activities: "One who carries on an abnormally dangerous activity is subject to liability for harm to the

54. See, James, General Products—Should Manufacturers Be Liable Without Negligence? 24 *Tenn. L. Rev.* 923 (1957).

55. For refutation of these policy justifications, see, Plant, Strict Liability of Manufacturers for Injuries Caused By Defects in Products—An Opposing View, 24 *Tenn. L. Rev.* 938 (1957).

56. Harper and James, *op. cit. supra* note 31, at 731.

57. See text at note 45.

58. See Prosser, *supra* note 45.

59. This change in terminology is recommended by the drafters of the second Restatement of Torts. Restatement (second), Torts, Tentative Draft No. 10 at 56 (Reporter's note to § 520) (April 1964).

person, land or chattels of another resulting from the activity, although he has exercised the utmost care to prevent such harm."[60]

If the rationale underlying enterprise and strict liability and the result they produce appear to make these theories desirable methods for allocating dual mode bus or pallet system accident costs, they could be implemented directly, by legislation, or gradually, as accident victims press the courts to extend strict liability to the sale of dual mode transportation services. (It would seem unfortunate for dual mode system operators if courts branded their systems "ultrahazardous activities" to justify imposing strict liability. In its early days, aviation was included within the category of ultrahazardous activities.[61]) If the latter case-by-case approach were followed, however, it could be some time until courts were persuaded to hold the system operator strictly liable for accidents without proof of negligent acts. And, under strict liability, the system operator could still attempt to redistribute this liability by initiating his own breach-of-warranty actions against dual mode equipment makers whose products appeared to have caused the accident.

Enterprise liability appears to satisfy the requirements of an accident compensation scheme better than the fault system. First, it would provide compensation to all dual mode bus or pallet accident victims. Individuals should be more willing to become dual mode bus or pallet passengers because they would not face the risk of unreimbursed accident costs. Enterprise liability would impose accident costs on the system operator who would be in the best position to change equipment, conditions, and procedures to avoid future accidents. Requiring the system operator to pay accident costs should not deter his operation of the system.[62] The system operator could self-insure or purchase insurance to cover the cost of unavoidable accidents, and distribute these costs to all users in the form of increased fares.[63] Further, making the system operator bear accident costs should satisfy the need to punish the wrongdoer because,

60. Restatement (second), Torts, Tentative Draft No. 10 at 52 (§ 519(i)) (1964).

61. See, Note, Tort Liability in Aircraft Accidents, 4 *Vand. L. Rev.* 857, 861 (1951), and cases there cited.

62. If the system operator did act to curtail dual mode activities, his judgment implicit in such actions should induce critical re-thinking of the viability of the system.

63. The system operator may wish to arrange for Federal reimbursement of accident costs which exceed a certain minimum level during the system's first years of operation. Such an arrangement would assure that an especially costly accident in the early days of dual mode service did not bankrupt the system. A few years' operation should provide the system operator with sufficient data to calculate the amount of insurance necessary, and to adjust rates accordingly. See generally, Morris, Enterprise Liability and the Actuarial Process—The Insignificance of Foresight, 70 *Yale L.J.* 554 (1961).

as between accident victims and the system operator, the latter more likely would be the cause of accidents.

Placing accident costs on the system operator through strict liability would produce results which, on balance, make it somewhat less satisfactory than legislated enterprise liability as an accident cost allocator. While permitting the system operator to sue his suppliers could induce them to produce better products, it could also intimidate them from participating in the system.[64] With enterprise liability, on the other hand, such lawsuits could probably be barred by the enabling statute; the system operator would then be limited to economic pressures against suppliers to obtain accident-free products. The system operators' search for better (i.e., accident-cost-reducing) products under enterprise liability should induce new manufacturers to enter dual mode markets; the risk of bearing redistributed accident costs under strict liability could serve to eliminate them.

3. An aside on procedural problems incident to fault and strict liability accident compensations systems

Both liability-based-on-negligence and strict liability require persons injured in accidents to initiate lawsuits to recover their accident costs.[65] Procedures governing these legal actions could be modified to reduce administrative costs and time delays. For example, all accident victims could be required to join together to litigate defendants' liability instead of subjecting each defendant to multiple lawsuits.[66] Once liability were established, victims' recoveries could be as broad as permitted under present law—pain and suffering, lost earnings, lost earning capacity, medical expenses, property damage, and incidental expenses.[67] Or, legislation could limit recovery to a percentage of each of these expenses, or could deny recovery altogether for certain expenses.[68] Alternatively, a judicial arbitrator or damages adjuster agreed to by the parties could fix

64. See discussion on page 20, *supra*.

65. If a system of enterprise liability for dual mode operations were established by legislation, the statute should include an administrative mechanism for making payments to accident victims. See generally, Note, Workmen's Compensation, 56 *Mich. L. Rev.* 827 (1958).

66. Fed. Rules Civ. Pro. rule 20, 28 U.S.C.A., now authorizes Federal trial courts to permit voluntary joinder of several plaintiffs' actions arising out of a common occurrence.

67. See generally, Harper and James, *op. cit. supra* note 31, at 1299-1360.

68. Massachusetts has taken the lead in limiting personal injury recoveries in automobile accidents. No person may bring suit for pain and suffering unless his medical expenses exceed $500, or unless he suffers specific types of injuries. Mass. Gen. Laws c.231, § 6D. Recovery for lost wages is limited to 75% of the victim's average wage. Mass. Gen. Laws c. 90, § 34A.

each victim's loss according to a predetermined compensation formula. Standards from workmen's compensation statutes could be used to supply the basis for computation of dual mode accident victims' recovery.[69]

4. Social insurance accident compensation plans

Social insurance—direct payments to accident victims from general tax revenues—constitutes the last and least satisfactory method for allocating the accident costs of dual mode bus or pallet operations. The prime advantages of this scheme would be that it would compensate accident victims, and would certainly not discourage either the system operator, dual mode product manufacturers, or individual passengers from selling or purchasing dual mode transportation services. Social insurance would not, however, provide direct economic incentives to reduce accident costs, because neither the system operator nor product manufacturers would be liable to pay for them. Only if these costs skyrocketed to a politically unacceptable level would the system operator receive exhortations to reduce accident-causing activities from anxious politicians, concerned about high expenditures or the number of constituents injured by dual mode operations. In addition, social insurance would not punish the moral wrongdoer behind each accident. Unless dual mode accident costs were or were expected to be so high that the other schemes described above could not accommodate them, and/or unless dual mode bus or pallet transportation appeared so socially desirable that all society should bear its accident costs, social insurance is an unsatisfactory method of accident compensation.

*B. Accident compensation schemes for privately-owned dual mode systems*

1. Accident cost allocation under the fault system

A system for optimal allocations of costs resulting from accidents on the automated portion of a private vehicle dual mode system is more difficult to develop than one for allocation of dual mode bus or pallet

69. Massachusetts requires employers' insurers to furnish eligible injured employees "adequate and reasonable" medical and hospital services, Mass. Gen. Laws c.152, § 30, death benefits to dependents, § 31, burial expenses, § 33, payments for total and partial incapacity to the employee §§ 34, 34A, 35, and to dependents, § 35A, and lump-sum payments for certain injuries, § 36. Limitations of injured workers' recovery to only those benefits provided by a workmen's compensation statute have been found constitutional. *New York Central R.R. v. White*, 243 U.S. 188 (1917) (New York's Workmen's compensation statute). See generally, Note, Workmen's Compensation, 35 *Chi.-Kent L. Rev.* 164 (1956).

system accident costs. This difficulty arises because of the increased number of active participants in private-vehicle systems. The increased complexity which these participants add to the liability determination necessary under the existing case-law fault system makes that system a poor choice for accident cost allocator for this dual mode system. The fault system, it will be recalled, requires an injured accident victim to bring suit against persons who may be liable to him, and to prove liability by showing the duty of care owed, a breach of that duty, causation, and damages.

Of these elements, plaintiffs should probably find it easiest to prove their damages resulting from the accident. Choosing defendants from among the many actors involved in the operation of a privately owned vehicle on the dual mode guideway would be quite difficult. Potential defendants might include the guideway operator, the vehicle manufacturer, the manufacturers of specific vehicle components, a supplier to the component maker, the mechanic who last serviced the vehicle, the most recent vehicle inspector, the vehicle in front, the vehicle behind, etc. The decision to sue a particular defendant should be based on that defendant's actions which proximately caused the accident. Given the complexity of the system and the shambles accident-damaged vehicles and guideway may be in after an accident, it would be very difficult to identify either a defective product or a specific negligent act.[70] Even if a defendant's product were found to have been defective, or a defendant were found to have acted negligently, plaintiff must still prove that the defect (or negligent act) actually caused the accident.[71] Plaintiffs would not be able to use the *res ipsa loquitur* doctrine to create a presumption of negligence because no single defendant would have sufficient control to justify the doctrine's application.[72]

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70. Similar problems arise in determining the cause of commercial airline crashes. See, e.g., Note, Domestic Aircraft Tort Litigation: A Proposal for Absolute Liability of the Carriers, 23 *Stan. L. Rev.* 569, 571 (1971); see generally, Hardman, Aircraft Passenger Accident Law: A Reappraisal, 1961 *Ins. L.J.* 688.

71. If the accident were caused by a defective product, say, the vehicle or a vehicle component, plaintiff could employ the doctrine of strict products liability to hold the manufacturer liable for damages. If, however, the accident were caused by a defendant's action, perhaps the guideway operator's act or another vehicle owner's act, plaintiff would also have to prove that the act violated the standard of care to which that particular actor must adhere. The novelty of dual mode private vehicle operations might result in case-by-case development of either a higher standard of care (equivalent to that owed by a passenger common carrier), or a lower standard (equivalent to that owed a guest occupant of an automobile).

72. See, Note, *Res Ipsa Loquitur* As Applied to Multiple Defendants, 43 *Ky. L.J.* 535 (1955).

The net effect of the fault system's post-accident legal obstacles to injured plaintiffs' accident cost recovery most likely would be to block plaintiffs' attempts at cost redistribution. How well does this succeed as an accident compensation system? Plaintiffs' failure to win lawsuits would leave losses where they fell after the accident, on the dual mode vehicle owners involved.[73] Vehicle owners would have to insure against these losses. Occasionally, perhaps almost randomly depending on jurors' vicissitudes, one or more accident victims would succeed in pinning liability on a particular defendant, with disastrous consequences for that defendant. The bill for all costs of a major dual mode accident could bankrupt all but very wealthy defendants, and could exceed the limits of most vehicle owners' liability insurance policies. The risk of bearing this liability, no matter how remote, may deter individuals from using the dual mode system and manufacturers from building dual mode vehicles, components, and guideways. The allocation of accident costs to injured owner-victims or to an occasional damned defendant would create no effective incentives toward future accident deterrence. Individual vehicle owners have neither sufficient bargaining power to compel manufacturers to build better dual mode vehicles,[74] nor adequate expertise to discover on their own, defects in vehicle design, construction or maintenance. The burden of accident costs could not produce better driving habits in vehicle operators because operators would have no control over vehicle movement during routine automated operation. (Even if emergency devices were provided in the vehicle, chances are that an accident would occur before a human operator could accomplish even reflexive movements.) If the risk of liability did not deter manufacturers from the dual mode market altogether, they might well find it cheaper to invest in lawyers' services after an accident than to take elaborate precautions beforehand to reduce the chance of accidents. Finally, leaving accident costs where they lay would not serve to punish wrongdoers.

2. Enterprise liability and private vehicle dual mode systems

Enterprise liability—the legislative decision to hold an activity liable

73. The guideway operator would incur accident costs to the extent the guideway is damaged in an accident. If he sought to redistribute these costs through fault or breach-of-contract litigation, he would face the same problems as other injured parties. The risk of liability for these costs should provide some incentives to accident cost reduction through better guideway design, improved maintenance, etc.

74. Owners' lack of bargaining power *vis-a-vis* large manufacturers is demonstrated by automobile purchasers' inability to compel auto makers to build safer cars, or to eliminate unwanted annual model changes.

for its accident costs—would also be more difficult to apply to private vehicle dual mode systems than to bus or pallet systems because of the increased number of activities involved: vehicle ownership, guideway operation, vehicle manufacture, all of which could be under separate control. The question is, which activity should be held liable.[75] Since no candidate for liability stands out, it is necessary to estimate how well accident compensation goals would be satisfied when different dual mode activities are held liable.

If each vehicle owner were held liable for his own accident costs, the result for accident cost distribution would be similar to that obtained in the fault system when plaintiffs lose their cases. While victims could insure themselves to cover their accident costs,[76] this solution would pro-

75. The problem is akin to that raised by railroad grade crossing accidents, or auto-pedestrian accidents: See, Blum and Kalven, Public Law Perspectives on a Private Law Problem—Auto Compensation Plans, 31 *U. Chi. L. Rev.* 641, 699 (1964).

76. Vehicle owners could be made liable for their own accident costs by requiring them to participate in a compulsory insurance scheme comparable to "no-fault" automobile insurance. See, e.g., Mass. St. 1970, c. 670, found constitutional in *Pinnick v. Cleary*, ___ Mass. ___ (1971 Adv. Sh. 1129). A no-fault insurance accident compensation scheme for private vehicle dual mode systems could pose administrative problems. Vehicle owners may be required to purchase two types of insurance — one covering automated operation on the guideway and a second covering non-automated operations. If there were a single no-fault system covering all vehicles, whether equipped for dual mode operations or not, rates would have to be adjusted so that neither dual mode vehicles owners nor non-dual mode vehicle owners subsidized each others' insurance premiums. With single insurance coverage, rates for frequent users of the automated portion of the system should be relatively lower than rates set for infrequent users because of dual mode automation's predicted increases in safety. Each privately-owned dual mode vehicle could be equipped with meters to register miles traveled in each mode, or the guideway computer could keep track of each vehicle's operations in the automated mode. Rates would then be based on total miles driven, and miles driven in each mode. Such a rate determination process could become extremely burdensome to administer, however. And, if monitoring patrons' usage resulted in detailed computerized records of trip origins, destinations and times of travel, the fear of unauthorized disclosures of trip details could induce potential users to shun automated operations. If owners of dual mode equipped vehicles were required to purchase two insurance policies, one covering automated operations and the other non-automated operations, when will one coverage begin and the other end? Unless clear and easily applied principles resolved this issue, both insurers could deny liability in close cases. One solution would require the automated operations insurer to assume liability as soon as the vehicle crossed an arbitrary entrance point, perhaps upon passing through an electronic beam at an entrance ramp. The electronic entrance registering device would record the vehicle's entry, and its record would be deemed conclusive evidence of the vehicle's entry into the system. Alternatively, no vehicle could be considered to have begun automated operations until the dual mode central computer noted and recorded its presence on the guideway. The computer's record would again be considered conclusive as to when coverage began. As with single insurance coverage, combined automated and non-automated insurance premiums for vehicles usually

vide little or no deterrence of future accidents because victims could not bargain effectively for improved vehicles or guideways.[77] This cost distribution might also deter individuals' use of the system for fear of incurring accident costs. In addition, the result produced by this allocation would not satisfy social needs to punish wrongdoers (except in rare instances in which an owner's error in maintenance or operation actually caused an accident).

A legislative decision to hold the guideway operator liable for accident costs would produce a more satisfactory result: victims would receive compensation for accident costs from a source well placed to deter future accidents. The guideway operator could self-insure or purchase insurance to provide funds for compensation of accident victims.[78] His control over the automated right-of-way would put him in a good position to reduce the possibility of future accidents.[79] He could, for example, improve accident-prone sections of the guideway. If he had the authority, the guideway operator could license or establish vehicle inspection and maintenance stations and permit only qualified vehicles to enter the guideway. If the experience of several accidents and near-accidents indicated that certain vehicles were accident-prone, the guideway operator could increase the rates charged those vehicles for guideway use. This increased toll should deter purchase of accident-prone vehicles and create economic pressure on these vehicles' manufacturers to improve their products. The guideway operator could be further empowered to set vehicle specifications and allow only complying vehicles on the guideway.

Placing liability on vehicle manufacturers should result in some combination of accident-cost-reducing vehicle improvements and higher vehicle prices to reflect the burden of unavoided accident costs; the precise mix would depend on manufacturers' monopoly power. Vehicle makers could decide to establish maintenance networks to extend their control over

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operated in the automatic mode should be lower than rates for vehicles only occasionally operating automatically.

77. See text at note 74, *supra*.

78. For a discussion of administrative issues in connection with victim compensation, see text at note 65, *supra*.

79. Instead of using his authority to reduce accident costs, the guideway operator could choose instead merely to increase all toll rates charged for use of the guideway to cover these costs. This result is especially likely if the guideway operator occupied a monopoly position, with little possibility that other guideway operators would arise to compete with him by lowering their rates to reflect their reduced accident costs. A monopolist guideway operator whose position was established by law, for example, could easily develop an entrenched bureaucracy unwilling to initiate accident-cost-reducing changes (except, of course, when pressed by politicians controlling the monopoly).

vehicle-related accident causes. This allocation of accident costs would not deter accidents resulting from defective guideways. While it would be in their interest to persuade the guideway operator to reduce his accident-causing activities, vehicle manufacturers would probably lack leverage to compel changes in guideway operations. Holding vehicle makers responsible for accident costs could also deter potential entrants from the vehicle market, or quickly bankrupt the maker of inferior (accident-prone) vehicles.

This discussion indicates that an enterprise liability system in which the guideway operator is held liable for all accident costs best satisfies dual mode private vehicle accident compensation requirements. Unlike the fault system, enterprise liability would provide reimbursement to all vehicle owners and drivers for accident costs. The guideway operator could distribute these costs to maximize economic pressures to reduce accidents and to minimize dislocations resulting from unavoidable accidents. This allocation of accident costs should discourage no one from participation in dual mode operations because no single individual—driver, owner, or manufacturer—would bear all costs of an accident. (If costs exceeded cash reserves or insurance, the guideway operator could be permitted to tap general tax revenues to pay all accident victims.) Finally, placing responsibility for accident costs on the guideway operator should tend to discourage the wrongdoing in most cases: the guideway operator could have, after all, avoided or pressed others to avoid the accident.

### *C. Accident compensation alternatives for rental vehicles dual mode systems*

The analysis developed for bus, pallet and private vehicle dual mode systems can also be applied to rental vehicle systems. The effectiveness of alternative accident compensation plans for this type of system will depend on the specific characteristics of the rental system: the identity of vehicle lessor(s) and the guideway operator (are they one and the same entity?), the rental time period, and lessor's control over the vehicle during the rental. Under the fault system, for example, if the vehicle lessor were also the guideway operator, and if only short-term rentals were allowed, it could be argued that the lessor-operator was in effect a passenger common carrier *vis-a-vis* vehicle lessees. Lessees injured in accidents while on the automated portion of the guideway could then use the special rules applicable to passenger carriers to facilitate their recovery.[80] The

80. Lessees could also employ breach-of-implied-warranty arguments to hold lessors liable for defects in the rental vehicle. See text at notes 50-53, *supra*.

risk of liability for accidents could result in substantive improvements in vehicles, guideway maintenance, and so on, or in higher rental or toll rates to cover accident costs. The pressure to avoid accident costs rather than merely redistribute them through increased tolls and rental charges would then depend on the extent of the lessor-guideway operator's monopoly power. If the lessor-guideway operator contracted with lessees to assume liability for all accidents, a result equivalent to strict liability of the lessor-operator would obtain.

To change assumptions, suppose now that lessors and the guideway operator were independent of each other, or that long-term vehicle leases exempted lessors from vehicle maintenance and inspection. Plaintiff-lessees would now face both the difficult decision, which person to sue — vehicle lessor, guideway operator, maintenance man, lessor of another vehicle, etc., and the problems of proof of liability discussed earlier.[81] Plaintiffs' chances for recovery would decline correspondingly with these additional complexities. Applying the fault system to rental vehicle dual mode systems designed around these assumptions would therefore yield an unsatisfactory accident cost distribution in most cases. If injured lessees failed to recover their accident costs in lawsuits, they would be forced to bear their own accident costs. Even worse from the perspective of an individual lessee would be the possibility of being held liable for another renter's accident costs. This possibility could deter persons from renting dual mode vehicles, and would provide little effective deterrence of accident-producing activities. Lessees could be permitted to shift the burden of accident costs to vehicle lessors by purchasing accident liability insurance from lessors. But, if lessors were relatively small independent businessmen, the fear of being held liable for all costs of a single accident could altogether deter their participation in the vehicle rental business, instead of stirring them to avoid future accidents through purchase of better vehicles, improved maintenance, etc.

The analysis could continue, changing assumptions about the rental vehicle system and applying the different systems of accident compensation (fault, enterprise liability, social insurance) described earlier.

### *D. Summary*

This discussion of dual mode accident cost allocation suggests that goals of an accident compensation scheme could be satisfied for most dual mode systems when accident costs are distributed to the system operator (in bus or pallet systems), or to the guideway operator through

81. See text at notes 70-72, *supra*.

an enterprise liability plan. The system or guideway operator should have, through purchased insurance or self-insurance, adequate resources to compensate accident victims. His control over automated operations places him in a good position to reduce future accident costs by requiring safer vehicles, guideway and operating procedures. Assessing accident costs against the system or guideway operator should not discourage system utilization, because neither passengers, vehicle owners, vehicle lessees, or dual mode product manufacturers would face the crushing burden of accident costs. If fear of accident costs intimidated potential system or guideway operators from engaging in dual mode transportation activities, a social insurance plan could be employed to distribute society-wide accident costs exceeding a predetermined level.[82]

## VI. Social and Environmental Implications of Dual Mode Operations

Several issues concerning dual mode construction and operation still remain. While not necessarily "legal" questions, these issues could arise in legal contexts as individuals seek administrative and judicial relief from proposed construction or operation of dual mode facilities.

### *A. Who is dual mode for?*

A strong argument can be made by opponents of dual mode systems that dual mode transportation would primarily benefit the middle and upper economic classes, those who could afford to purchase dual mode services and who lived in suburban areas (where dual mode guideways are likely to be installed). Their reasoning would run as follows: dual mode transportation will likely be expensive transportation. The complex electronic hardware with which private dual mode vehicles would be equipped would probably result in vehicles costing at least as much as expensive conventional automobiles. The high cost of this equipment would also be reflected in rental fees for dual mode rental vehicles and in higher fares on dual mode bus and pallet systems. Dual mode opponents would therefore conclude that poor persons would not have effective access to a self-supporting system of dual mode transportation.

Increased utilization of dual mode systems could result in lower per person costs, thus bringing dual mode costs to within the economic reach

82. A mixed compensation system such as this would require, of course, a collective decision that dual mode transportation should continue despite its anticipated accident costs.

of the poor. In addition, the Federla government could subsidize capital and operating expenses, much as it now subsidizes the capital costs of state-of-the-art mass transportation investments.[83] (Proposals to underwrite operating expenses, however, would require departure from current transportation aid policies. Operating subsidies for dual mode bus and pallet systems, for example, would have to overcome the requirement that public transportation recover at least its operating costs;[84] subsidies for the purchase or rental and operation of dual mode vehicles would conflict with current notions about private automobile ownership requiring each individual to bear his auto's capital and maintenance expenses.) Operating costs for dual mode bus systems could be lower than for comparable manned bus systems because of the absence of drivers during automated operations.

Challengers of dual mode transportation might also contend that dual mode transportation would provide best service to urban low density and suburban residents of metropolitan areas. The purpose of the automated portion of any dual mode system would be to provide fast line-haul transportation between points in heavily trafficked corridors. In most metropolitan areas such transportation corridors link suburban residential areas with the core city. The addition of dual mode transportation service in these corridors would speed commuters' work trips to the central cities, but would provide slight service improvements to the poor and central city dwellers.

On the other hand, dual mode proponents could respond that dual mode guideways need not be used in this limited manner, but could also be used to provide circumferential transportation around city cores. Even if built exclusively to connect suburbs and core cities, such guideways would also serve to establish new linkages between densely populated inner city neighborhoods and suburban jobs and recreation facilities. Dual mode bus systems, and dual mode pallet and auto systems coupled with adequate parking facilities, could also reduce traffic volumes in central city areas.

### B. *Environmental impacts*

Proposed installations of any new transportation systems would be required to satisfy, at a minimum, the environmental protection require-

83. 49 U.S.C.A. § 1602.

84. See generally, U. S. Department of Transportation, *Feasibility of Federal Assistance for Urban Mass Transportation Operating Costs* 3 (1971).

ments set forth in the National Environmental Policy Act of 1969.[85] Because of the potential for environmental disruption incident to the construction of major transportation facilities, such facilities may be made subject to special legislation imposing tighter environmental controls.[86] In the case of dual mode systems, these restrictions could, for example, prohibit construction of at-grade automated guideways on rights-of-way not already devoted to transportation uses.[87] Such a limitation could lead to extensive tunneling, causing increased capital costs. Guideways built at or above grade could become a visual blight subject to further environmental challenge. On the other hand, dual mode systems' greater vehicle capacity per lane, when compared with conventional freeways, could make such systems relatively more attractive than conventional highways.

Depending on guideway network layouts, dual mode systems could have significant effect on the distribution of residential population in metropolitan areas having access to the system.[88] Because dual mode vehicles operating in the automated mode would move much faster than conventional automobiles and buses, it would be possible for users of this system to commute from suburbs to central city places of employment in less time than non-dual mode users. In addition to being able to get to work in a shorter time than they could have by conventional means, suburban users would be able to travel farther from home to work in the same time. System users accustomed to work trip of any given duration could then elect to live farther from their in-town jobs and, thanks to the dual mode system, still travel from home to work in the same amount of time. This relocation phenomenon induced by improved transportation could lead to further extension of low-density suburban residential land uses into what is now rural countryside. Housing in the inner suburbs,

85. 42 U.S.C.A. §§ 4331-4335.

86. See, e.g., Airport and Airways Development Act of 1970, 49 U.S.C.A. §§ 1716(c)(4), 1716(e), setting special environmental quality restrictions on certain airport improvements.

87. Location of dual mode guideways on existing highway rights-of-way could further adversely impact those who could not afford to purchase dual mode services. While use of highway rights-of-way would reduce the quantity of new land devoted to transportation, closing lanes of highways would also reduce the capacity of the automobile transportation system left to non-users of dual mode systems. Non-automated lanes could become as congested as today's urban freeways at rush hour if too few persons elected to use dual mode transportation. Even if no highway lanes were actually taken, locating automated guideways anywhere in highway rights-of-way could create distracting conditions for non-dual mode drivers.

88. See generally Liepmann, *The Journey to Work—Its Significance for Industrial and Community Life* 48 (1944).

vacated by dual mode users heading to more distant residential areas, would soon "trickle down" to less affluent inner city dwellers seeking escape from urban ills. These trends could produce a multi-ringed "doughnut city," its central core filled and abandoned each workday and surrounded by broad rings of increasingly affluent suburban residential areas.

## VII. Conclusion

Rational well-integrated solutions to the types of issues raised in this essay are essential to public acceptance of any major technological innovation. In the case of dual mode transportation systems, planners should be prepared to supply proposals for administration of a proposed system and a description of the administrator's authority necessary for efficient and responsible operation. Planners should also have ready a method for allocation of accident costs on the system, or a rationale explaining why none is needed. Planners should further have available recommendations for modification of local communities' land use regulations to assist them in anticipating and channeling trends in land use patterns spurred by dual mode installation. And, to avoid the accusation that dual mode transportation would be separate and unequal transportation, planners should devise a comprehensive dual mode financing and fare policy.