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RESEARCH PROBLEMS IN TRANSPORTATION COMMUNICATIONS

modes
1 highway transportation
2 public transit

subject area
54 operations and traffic control

OPERATION AND MAINTENANCE OF TRANSPORTATION FACILITIES

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INTRODUCTION

Transportation and communications perform similar functions in the services segments of our business and social environments. Whereas transportation is the movement of people and goods from one location to another, communications is the movement of information from one location to another. Communications also plays an important role in support of all transportation modes and such activities as operations, safety, and maintenance.

The Communications Committee is concerned with identifying how transportation needs may be served through the state-of-the-art to determine its transportation applicability.

For the past several years, the Committee has focused on the transfer of information between a communications center and devices along the right of way, between a communications center and moving vehicles, and among moving vehicles either directly or through relay stations along the right-of-way. Particular emphasis has been placed on vehicle and motorist communications, traffic flow surveillance and control, automatic vehicle monitoring and automatic vehicle guidance.

The Committee formulated a dozen research problem statements. These were reviewed and discussed at two committee meetings. It was decided that some proposed research was of narrow scope and could be incorporated in statements of broader scope. Other statements of low priority were eliminated to give greater emphasis to the remaining eight research statements. These were then prioritized into three categories: highest, second highest, third highest. No distinction was made within categories.

RESEARCH PROBLEM STATEMENTS

PROBLEM NO. 1

1. TITLE: Regulatory Procedures for Setting Aside Frequencies for Public Radio Communication Service

2. PROBLEM: Current regulatory procedures related to radio frequency band allocations allow for responses to Notices of Inquiries. However, in some cases, the time allowed is insufficient to permit proper planning and development of related new services.

   In the case of personal radio services, there is a need to structure any new system in ways that will promote safe and effective highway usage by the public, rather than simply allowing it to evolve. Such programs cannot be made the responsibility of manufacturers competing to sell their particular solutions.

   Instead, research and development programs are necessary, as well as careful planning for implementation. These tasks should be undertaken by agencies with demonstrated public interest concern in achieving systems that offer operational effectiveness and equipment compatibility. Such efforts will lead to encouragement of competition among suppliers and eventual public acceptance.

   Inasmuch as current procedures do not provide conditions suitable for such activities, study is needed to determine how they should be modified to permit more effective system development.

3. OBJECTIVE: The objective of this study is to determine the proper regulatory environment that will allow interested parties sufficient time for system development of public radio communication services.

4. KEY WORDS: Frequency allocation, structure, regulatory guidelines.

5. RELATED WORK: Precedent has been provided in the marine community, where large vessels, small vessels, government and business users are served within the same structure.

6. URGENCY/PRIORITY - HIGHEST PRIORITY LEVEL
   As the FCC is moving already toward creation of an additional personal radio service, it is imperative that procedures be modified quickly to allow time for system design and development.

7. COST: $15,000

8. IMPLEMENTATION: Development of modified procedures can best be determined by establishing a panel representing all interested groups, such as the many highway user communities, regulatory agencies, and private industry. The panel should explore all relevant issues, document the views of user communities and others, and make recommendations regarding the procedures.

9. EFFECTIVENESS: Changed procedures would permit the development of system concepts and the prescription of system characteristics assuring effectiveness and compatibility to those participating in its use.

PROBLEM NO. 2

1. TITLE: Standardization of Communications for Traffic Control

2. PROBLEM: Traffic control systems utilizing central and/or hierarchical control are being installed throughout the country. Each of these systems is, to a great extent, being configured with its own communications subsystem, dissimilar in make-up and operation (in both hardware and software) from every other communication subsystem. This wide range of specialty subsystems results in a wide range of specialty communications equipment and a high operations and maintenance cost for the users.

3. OBJECTIVE:

   1. Define the functional requirements of a traffic control communications subsystem delineating the basic features and the special features which require communications.

   2. Determine if a standardized modular format can be used to communicate the features referred to above. Address the modulation, baud rate, method, timing, word length, input, output, vehicle detectors, etc.

   3. Develop a functional specification which will provide a basis for standardization of the communications subsystems.

4. KEY WORDS: Communication specification, traffic control modem.

5. RELATED WORK: Most of the traffic control systems now in operation were custom designed for a specific site. Standardization would enable manufacturers and system designers to be more flexible in their choice of interconnects and achieve a more cost effective and maintainable system.

6. Urgency/Priority: Highest priority level

   With more emphasis on reduced system and maintenance costs, it is very desirable to establish standards that could reduce the number of noncompatible components now being produced. Off-the-shelf subsystems interchangeable with different communication systems would reduce inventories and possible down times of traffic control links.

7. COST: Approximately $190,000 to conduct this research.

8. USER COMMUNITY: AASHTO, APTA, FHWA

9. IMPLEMENTATION: Manufacturers and specifiers of communication systems would welcome standardization. It would simplify choices to those deemed successful and cost effective, and reduce design time.

10. EFFECTIVENESS: Standardization could reduce costs, improve system operation, allow easy system expansion, reduce parts inventories, and reduce training time of maintenance personnel due to uniform specifications.

PROBLEM NO. 3

1. TITLE: Standardizing Elements of Land Mobile Public Safety Communications.

2. PROBLEM: In mobile communications for public safety services, control signals transmitted via wire line or radio link are used to control the operation of optimally located remote radio base stations. In more elaborate systems, control signals are used additionally as a means of selectively communicating with a particular mobile unit or a particular group of mobile units and conveying stations. In some highly developed land mobile communications systems, particularly for law enforcement and fire services in large metropolitan areas, digital communications are used for the above purposes. They are also used for data transfer and for providing mobile units with direct access to computer data files.

Further application of digital signalling to public safety communications has been stimulated by the U.S. Department of Justice/law Enforcement Assistance Administration (LEAA) through its Project 16 for the development of the concept of Digitally Addressed Trunked Communications Systems (DATCS). The DATCS concept makes possible the sharing, by all public safety services, of a common system of radio communications while at the same time maintaining the necessary operational perogatives and privacies of individual user agencies. The careful implementation of this concept will improve the cost-effectiveness and spectral efficiency of public safety radio communications in metropolitan areas; but more important, it may make if economically feasible to extend the benefits of good quality public safety communications to rural areas.

To permit growth of initial DATCS to accommodate increased communications demands in the initial coverage areas and to permit expansion of areas of coverage to suburban and rural areas, it is necessary that problems of communications compatibility be considered.

In the absence of nationally established standards, trunked systems development by different vendors will result in noncompatible systems. It can be expected that the current digital command channel languages developed by different vendors format is specified for DATCS for public safety communications, the utility of the concept cannot be realized.

For Emergency Medical Services (EMS) communications, the FCC has provided 24 UHF frequencies which are allocated as a block for use by each licensee. In the absence of a standard control language, new EMS communication systems have been installed and new systems are being put into service which use unique control signals and equipment in each locality. The control signals and equipment used generally are proprietary to the vendor chosen for the basic communications equipment. Typically the signals and associated equipment are closely tailored to the control needs of the initial installation - to minimize the competitive bid. No provision is made for increase in control capacity to accommodate installation of additional transmitter/receivers or to expand geographic coverage by use of mobile relays. A standard digital control language and message format for DATCS could also be used to increase the demands and to permit the geographic expansion of communications coverage while insuring communications compatibility for operational and medical direction of ambulances for EMS.

3. OBJECTIVE:

This research is expected to develop a U.S. national standard digital control language and message format for application to DATCS and for other public safety land mobile radio communications systems.

This development will permit the extension of the benefits of the DATCS concept of consolidation of public safety communications by compatible geographic expansion of communication coverage. It may make it economically feasible to fulfill the recognized national need to extend the benefits of quality radio communications for public safety to rural areas which are now underserved.

4. KEY WORDS: APCO (Associated Public-Safety Communications Officers, Inc.)
Digital Communications
Common System of Communications
Spectrum Management in the Land Mobile Service
Federal Communications Commission (FCC) Docket No. 18262

5. RELATED WORK: Radio Technical Commission for Marine Services, Special Committee No. 71 study on "VHF Automated Radiotelephone Systems" addressed the use of mobile communication uses. Committee papers include letters and memoranda citing the need and applicability of a standard digital language for land mobile communications.

"900 MHz Trunked Communications System Functional Requirements Development," prepared by the Associated Public-Safety Communications Officers, Inc. under Grant No. 78 SS AX 0021 from the Law Enforcement Assistance Administration, explains the DATCS concept of operation and requirements for digital signalling but provides that the digital addressing concept is at the discretion of the system designer.

Application of Mobile Digital Communications in Law Enforcement - An Introductory Planning Guide," by R.L. Sohn, et.al., California Institute of Technology, May 1975 (NTIS Report N75-26200) provides background communications including improvement in spectrum utilization, increased reliability and speed of communications, preservation of communications security/privacy, access to computer data files by mobile units, and comparative survey of available system configurations, and reports on codes - different variants of the USA Standard Code for Information Interchange (USASCII) - used by various Vendors.

"Communications System Handbook for State Highway Departments," Appendix C. Reference Material by Computer Sciences Corporation, January 1972, (Chapter 2, Data Communications)- Explains the various systems of control signals and their evolution and intended application. Discusses various digital codes, modulation techniques, error control techniques, and other digital communications systems design parameters including the interfacing with telemetry of analog signals.

"Emergency Medical Services Communications Design Manual," prepared by Systech Corporation under DOT/NHTSA Contract DOT-HS-9-02306- Section on "Control Languages" explains the problems arising from the lack of a standard control language, develops the control requirements for the "ten-channel common-system approach" employing DTMF signals and makes an unfavorable comparison of digital control techniques with DTMF, based on the present high cost and complexity of nonstandard proprietary digital systems.

NHTSA Contract DTNH22-80-R-05144, which the Oklahoma Department of Public Safety initiated June 11, 1980, "EMS/PTS Trunked Communications System Development" examines the statewide communications requirements for public safety and public service communications for the State of Oklahoma and the potential for meeting these requirements using the DATCS concept. NHTSA's contribution funds the inclusion in this concept of the communications requirements for emergency medical services and police traffic safety services which are federally fundable under the Highway Safety Act of 1966. This contracted study is being augmented under separate contract/cooperative agreement between the Oklahoma Department of Public Safety and the Department of Commerce/National Telecommunications and Information Administration to conduct a cost-benefit study of the statewide application of DATCS for consolidated public safety and public service communications.

National Telecommunications and Information Administration (NTIA) Interagency Committee Report on Rural Communications, December 15, 1977 contains material explaining the needs and societal impact of improved telecommunications in rural areas.

6. URGENCY/PRIORITY: Highest Priority Level

There are immediate high priority needs for the results of this proposed research.

For emergency medical services alone between ten and twenty million dollars of Federal funding and at least an equal amount of local matching funds are being applied to the procurement and operation of radio communications systems which would benefit by the availability and retrofit of a standard communications control system. As EMS communications system coverage is expanded geographically, the requirement for standardization of the communications control function becomes increasingly urgent, as evidenced by increasing instances of incompatibility and interference in EMS communications in adjacent communications service areas.

The application of DATCS technology to public safety communications is a perishable opportunity which depends critically upon the availability of spectrum offered under FCC Docket No. 19262. The public safety and special emergency service sectors of the land mobile communications community are virtually in competition with private enterprise and common carrier interests for access to these spectrum resources. Unless a showing can be made for a coherent, slow-growth, spectrum efficient, cost beneficial application of this spectrum for public safety and special emergencies, the opportunity for related societal benefits can be lost in favor of commercial exploitation of the spectrum. Standardization of the digital control language and message format are critical elements of the DATCS concept.

7. COST: It is estimated that the objectives of this research could be met at a cost not in excess of $300,000.00 over a total project period of three years.

8. IMPLEMENTATION:

The findings of this research could be implemented as follows:

Prepare an interface design specification (IDS) detailing standard digital coding, message formats, and control protocols for DATCS as described in the current version of the Functional Requirements Statement for Oklahoma Public Safety Land Mobile Communications.

Prepare computer program performance specifications (CPPS) for all DATCS communications control elements.

Test and validate the IDS and CPPS by means of simulation modeling.

Based on the validated IDS and CPPS procure prototype DATCS communications control elements for testing.

Based on prototype testing, finalize the IDS and CPPS and specify tests for product qualification of control elements for DATCS.

Publish implementing standards as Federal Specifications, and/or applicable FCC Rules, and as Industry Standards.

9. EFFECTIVENESS:

The developments of this research can be expected to have beneficial societal impacts based on the following considerations:

The economies of competitive procurement for land mobile communications control equipment would be realized.

Design uncertainties which are presently retarding the use of trunked radio communications systems would be resolved.

The potential for mass-production of microprocessors tailored for land mobile communications control would be created.

Better spectrum utilization would be fostered by the encouragement of communications system sharing.

Communications system compatibility and interoperability of mobile units would be facilitated for mobile services which cover large areas.

By facilitating the DATCS concept, this development would make it economically feasible to provide good quality public safety communications in rural areas where it is not now affordable. At the

same time it would provide communications linkages between urban and rural public safety services who share the same DATCS.

PROBLEM NO. 4

1. TITLE: Automatic Vehicle Monitoring Communications Improvements

2. PROBLEM: Automatic vehicle monitoring (AVM) promises improved productivity of existing resources for transit systems, police, emergency medical services, trucking, taxis, and so on. Demonstration systems have been sponsored by various government agencies to determine the operational characteristics of various technologies. Although widely different technologies may be used to determine the location of a given vehicle, most systems require some means of communicating that location and possibly other information to a central site. The larger the fleet and the more information to be sent (e.g., passenger counts, engine data) and the more rapid the update, (e.g., for central site position smoothing) the more bandwidth is required.

   The usual communications method uses two-way radio communications, with a polling message addressing a given vehicle which then replies. The need to preserve digital data integrity in the radio frequency bands normally available for this type of communications requires some form or type of coding, further increasing bandwidth needs. Systems of different types have been found to require a separate voice channel to handle each 200 vehicles. As there is already a scarcity of spectrum available in the larger urban areas which would require support of large fleets (e.g., 2000 vehicles), successful future AVM applications may depend upon the ability to substantially increase the information density of existing communications channels.

3. OBJECTIVE:

   Using realistic user needs, determine if state-of-the-art communications methods can provide substantial improvement in AVM data communications.

4. KEY WORDS:
   Automatic Vehicle Monitoring
   Automatic Vehicle Location
   Automatic Vehicle Identification
   Signpost
   LORAN
   Trilateration
   Dead Reckoning
   Data Communications

5. RELATED WORK:

   Operational systems have been or are being installed in Chicago, Los Angeles, New York, Cincinnatti, St. Louis, Dallas, Huntington Beach, California, and Monroe County, New York in the United States.

6. URGENCY/PRIORITY: Second Highest Priority Level

   Improved productivity of established vehicle fleets is of high priority. Previous cost-benefit studies have shown AVM to have great potential for improving productivity. Improved communications can assure that the most suitable AVM technique can be installed where needed, rather than restricting applications to certain areas or to certain AVM techniques.

7. COST: $65,000.

8. USER COMMUNITY:

   The organizations which should receive this Research Problem Statement should include present and potential users and suppliers of AVM systems and designers and suppliers of communications systems. Included are: FHWA, UMTA, AAA, NHTSA, ATA, IACP, APCO, APTA, Post Office Department, AASHTO, FRA, International Taxicab Association, and State motor vehicle bureaus.

9. IMPLEMENTATION:

   The findings of the proposed research should be implemented through extensive dissemination in transportation publications.

10. EFFECTIVENESS:

    The dissemination of the results of this research will enable potential AVM users or suppliers to choose a data communications method that will meet their requirements for capacity, reliability and coverage.

PROBLEM NO. 5

1. TITLE: Land Transportation Applications of Automatic Vehicle Monitoring

2. PROBLEM: The substantial capital investment and resources needed to operate and maintain large vehicle fleets is causing the owners and operators of these fleets to investigate ways to optimize the use of their resources. In recent years, the application of data processing technology has enabled these groups to develop more effective plans and schedules for the use of their resources. More recent interest in the dynamic and real time allocation of these resources has been expressed.

   It appears that electronics technology, through advancements in communications and large scale integration, affords a cost effective opportunity for public agencies and private firms to accomplish this dynamic resource allocation. A major requirement of such dynamic resource allocation is to frequently monitor the location and status of vehicles in productive use. Using this information, a fleet operator can respond more readily to continually changing requirements. Typical of such operators are transit properties, police departments, the Post Office, trucking companies (including garbage trucks, message services and parcel pickup and delivery services), taxi and limousine companies, and mining firms.

   The security of private motorists whose vehicles are suitably equipped might also be enhanced through the automatic or manual activation of a radio alarm that would pinpoint their location in the event of an accident or other incident.

3. OBJECTIVE:

The purpose of this research is to identify those fleet operations which might benefit from the application of dynamic resource allocation, determine their information needs, and estimate the potential benefit.

4. KEY WORDS:

Automatic Vehicle Identification
Automatic Vehicle Location
Automatic Vehicle Monitoring (AVM)
Accident Location
LORAN
Trilateration
Signpost

5. RELATED WORK:

Several AVM projects have been operational for a few years. These installations are in Dallas, St. Louis, and Chicago. Two new installations will shortly become operational--namely, in Los Angeles, California and Monroe County, New York. To guide organizations currently investigating AVM, a detailed and quantitative assessment is needed of the various ways in which AVM would benefit the movement and safety of people and goods.

6. URGENCY/PRIORITY: Second Highest Priority Level

The growing awareness of the need for dynamic resource allocation in land transportation coupled with the apparent availability and maturity of electronics technology indicates that information needs to be gathered, assessed, and made available to potential users.

7. COST: $65,000.

8. USER COMMUNITY:

The organizations which should receive this Research Problem Statement should represent potential users and suppliers of AVM. These include: FHWA, UMTA, APTA, AAA, NHTSA, ATA, IACOP, Post Office Department, AASHTO, FRA, International Taxicab Association, and State motor vehicle bureaus.

9. IMPLEMENTATION

The findings of the proposed research should be implemented through extensive dissemination in transportation association publications.

10. EFFECTIVENESS:

The availability of the information contained in the publications resulting from this research should enable various users to judge whether AVM is suitable and promises justifiable benefits in terms of improved productivity, more effective use of resources, and increased security and safety for people and goods.

PROBLEM NO. 6

1. TITLE: Investigation of Communications Mode and Media

2. PROBLEM: Communication costs for area wide traffic control systems, route guidance, motorist information, and transit systems are a large part of the capital investment and operating cost. In some applications, the communication costs have caused implemented systems to be canceled; other applications have not been cost effective.

In addition, the transmission of traffic control data between field installations and central control is subject to many forms of interference. The mode of and the media for transmission vary in susceptability to this interference. It would appear that cost beneficial reduction in interference is possible by careful selection of either or both the mode and media of transmission.

3. OBJECTIVE:

1. Investigate the various media for transmission of data between field installations and central control points such as telephone cable, coaxial cable, (including use of cable TV channels), fiber optic cable, and define the susceptibility of each in relative terms to electromagnetic interference, co-channel interference, radio frequency interference, lighting, etc.

2. Investigate the various modes of transmitting data over the above media such as frequency division multiplex, time division multiplex and the various methods of modulation, etc., and define their susceptability to interference in relative terms.

3. Utilizing the information above, develop a means of determining for a given area of the United States, the best through worst modes and media to be used for transmission of data, the recommended protective devices to be added to enhance reliability, and the relative costs of each method of transmission.

4. Compare capabilities, capital, and operating costs.

4. KEY WORDS:

Telephone Cable
Coaxial Cable
Cable TV
Electromagnetic Cable Interference

5. RELATED WORK:

There have been various studies, defining communication needs and hardware for specific systems, but no one has synthesized the data nor conducted an in-depth study into the aspects related above.

6. URGENCY/PRIORITY: Second Highest Priority Level

The results of this work are needed now by transportation agencies to define the most cost effective and efficient means to communicate traffic control data. Communications technology is improving rapidly, and the benefits must be carefully considered in relationship to existing modes in order to select the best "fit" for each system.

7. COST:

Approximately $250,000 to conduct this research.

8. USER COMMUNITY:

AASHTO, APTA, FHWA

9. IMPLEMENTATION:

The results of this research could be immediately utilized by system planners and those considering modifying or expanding existing systems.

10. EFFECTIVENESS:

Communication costs have soared in recent years. The expectation is that they will continue to rise. If modern traffic control systems are to survive, communication costs must be carefully considered in the short and long run. The results of this research, (which should be periodically updated to keep it relevant) can provide a practical guide to system planners and managers.

PROBLEM NO. 7

1. TITLE: Procurement, Operations and Maintenance Experience with Land Transportation Applications of Automatic Vehicle Monitoring

2. PROBLEM:

A number of Automatic Vehicle Monitoring systems have been installed in the U.S., mainly for transit and police applications. The installations represented the incorporation of systems with new technologies into established organizations of various types. Although previous theoretical studies and prototype tests showed the feasibility and promise of the various techniques, actual implementation in most cases was more complicated than was foreseen. In general, the field environment is harsher, the logistics of installation and maintenance in a large system is more complicated, and the operational systems with which they must be integrated are more complex and have more exceptions than were anticipated.

The experience gained through the installation and operation of such systems would be invaluable to users who plan future installations. Although there have been evaluations of some of the systems, there has been no attempt at the documentation of procurement, operations and maintenance experience as suggested here.

3. OBJECTIVE:

Investigate the experiences of users who have implemented AVM systems, determining factors in the procurement, operations and maintenance of the system critical to a successful installation.

4. KEY WORDS:

Automatic Vehicle Monitoring
Automatic Vehicle Location
Automatic Vehicle Identification
Signpost
LORAN
Trilateration
Dead Reckoning
System Procurement
System Operation
System Maintenance

5. RELATED WORK:

Operational systems have been or are being installed in Chicago, Los Angeles, New York, Cincinnati, St. Louis, Dallas, Huntington Beach, California, and Monroe County, New York in the United States. Certain experience of Canadian systems in Toronto and Mississauga, Ontario may also be pertinent, although there also may be significant differences because of differing institutional constraints.

6. URGENCY/PRIORITY: Third Highest Priority Level

Improved productivity of established vehicle fleets is of high priority. Previous cost-benefit studies have shown AVM to have great potential for improving productivity. Based on the experience of previous AVM users, prospective users can select procurement, operational and maintenance procedures best suited to their application.

7. COST: $85,000.

8. USER COMMUNITY:

The organizations which should receive this Research Problem Statement should represent present and potential users and suppliers of AVM. These include: FHWA, UMTA, AAA, NHTSA, ATA, IACP, APCO, APTA, Post Office Department, AASHTO, FRA, International Taxicab Association, and State motor vehicle bureaus.

9. IMPLEMENTATION:

The findings of the proposed research should be implemented through extensive dissemination in transportation publications.

10. EFFECTIVENESS:

The disseminated results of this research can save money for potential AVM users by allowing them to avoid costly mistakes and by helping them to choose the most cost-effective implementation for their needs.

PROBLEM NO. 8

1. TITLE: Potential Health Hazards of Microwave Automatic Vehicle Identification

2. PROBLEM: The use of microwave technology appears to be a prime candidate in the design of present and future Automatic Vehicle Identification (AVI) systems. Such a system uses a microwave-sensitive transponder mounted on a target vehicle, thus line of sight devices are most applicable. As precise location of a vehicle (e.g., which road lane or toll lane) is usually a system requirement, the energy from interrogator to transponder and back to interrogator should be capable of being focused into a well-defined beam. However, as most systems are installed in outside environments, susceptible to dirt, snow and rain, visual optical systems generally are not useful. Microwave energy is not as adversely affected by the environment and it is capable of being focused in a precise manner. Hence, this technology is desirable for AVI systems. Recently, there has been concern about the possible health hazards of nonionizing radiation

with emphasis on the microwave band. The present exposure limitation recommended by the ANSI is $10mW/cm^2$ continuous power density, or $1mWh/cm^2$ energy density. The Government Accounting Office (GAO) has questioned the use of this guideline by OSHA in a report dated November 30, 1978. The GAO also recommended that the Environmental Protection Agency establish an environmental exposure standard to protect the public. There have been numerous articles published in the press and also in magazines. Symposia have been given which concentrated on nonionizing radiation health hazards. The general conclusions by those experts in the field indicate a much more stringent maximum exposure level be set by the government. Several government agencies are actively involved in the investigation of microwave hazards. AVI users and manufacturers of systems employing microwave technology could provide pertinent input to those concerned with such investigations. Details of operating system requirements such as placement of equipment, present power levels in use, and system recommendations will be of value to the investigators. It may be necessary to develop and implement a standard reporting procedure to insure that all proper information is being correctly forwarded to the authorities.

3. OBJECTIVE:

The purpose of this research is to insure that the needs of microwave AVI systems are taken into account by any standards organization or governmental agency that promulgates regulations or guidelines.

4. KEY WORDS:

Automatic Vehicle Identification
Nonionizing Radiation
Microwave Radiation Hazard
Electromagnetic Radiation Standards

5. RELATED WORK:

The Bureau of Radiological Health has studied the effects of nonionizing radiation in regard to interference with cardiac pacemakers. The U.S. House of Representatives Committee on Interstate and Foreign Commerce has received a report from the GAO on the subject of microwave radiation health hazards.

6. URGENCY/PRIORITY: Third Highest Priority Level

With the increased need of vehicle traffic control systems, automatic toll collection on highways, unattended toll parking lots and computerized vehicle fleet operations, the use of microwave AVI may become very common with thousands of AVI vehicles in use. If there are any potential hazards they should be determined as soon as possible so that design changes can be made.

7. COST: Not determined

8. USER COMMUNITY:

The organizations which should receive this research Problem Statement should represent appropriate government agencies, potential users and suppliers of AVI equipment. These include FHWA, UMTA, AAA, NHTSA, AASHTO, IBTTA, state motor vehicle bureaus, vehicle fleet operators.

9. IMPLEMENTATION:

The procedure for reporting AVI experience and system requirements should be disseminated to all potential AVI users and suppliers through trade associations and publications.

10. EFFECTIVENESS:

Proper resolution of this research problem could provide useful AVI mocrowave systems with no health hazards to anyone.