NDOR

MAPA   UNL

OMAHA METROPOLITAN AREA

Intelligent Transportation Systems
Early Deployment Planning Study

Strategic Deployment Plan

Appendix B
ITS GOALS AND OBJECTIVES

Appendix C
APPLICABLE USER SERVICES
REPORT

Prepared by:

University of Nebraska- Lincoln
Meyer, Mohaddes Associates
Iowa State University
Nebraska Motor Carriers Association

December 15, 1995

APPENDIX B

ITS GOALS AND OBJECTIVES

Table of Contents

List of Tables

1.   ITS GOALS AND OBJECTIVES

ITS goals and objectives for the Omaha metropolitan area were defined to provide a basis for the identification and evaluation of ITS projects. The ITS goals and objectives defined were the goals and objectives in the planning documents of jurisdictions in the Omaha metropolitan area that were found to be consistent with the goals of the national ITS program plan.

The goals of ITS goals were originally provided in Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and have been refined in the strategic plans of the U.S. Department of Transportation and ITS America.   The national ITS program goals and objectives (1) are as follows:

- Improve the safety of the Nation's surface transportation system;
- Increase the operational efficiency and capacity of the surface transportation system;
- Reduce energy and environmental costs associated with traffic congestion;
- Enhance present and future productivity;
- Enhance the personal mobility and the convenience and comfort of the surface transportation system; and
- Create an environment in which the development and deployment of ITS can flourish.

The planning documents reviewed to define the ITS goals and objectives were the following:

- NDOR Long Range Transportation Plan
- MAPA Long Range Transportation Plan
- Omaha Master Plan
- Sarpy County Comprehensive Plan
- Council Bluffs Comprehensive Plan
- Bellevue Comprehensive Plan
- Ralston Plan
- Papillion Plan
- Elkhorn Comprehensive Plan

The statement of ITS goals and objectives derived from these planning documents was organized into the following six areas accordingly to the national ITS goals and is presented in Tables 1 through 6:

1. Safety (Table 1)
2. Operational Efficiency and Capacity (Table 2)
3. Energy and Environmental Costs (Table 3)
4. Productivity (Table 4)
5. Mobility and Convenience (Table 5)
6. Development and Deployment of ITS (Table 6)

Table 1. Safety Goals and Objectives.

Source	Goals and Objectives Statements
National ITS Program Plan	• Improve the safety of the nation's surface transportation system. • Reduce the number and severity of fatalities and injuries. • Reduce the severity of collisions.
NDOR Long Range Transportation Plan	• Reduce accidents at railroad grade crossings through installation of warning devices or grade separations. • Eliminate all geometric deficiencies on state highway system. • Upgrade the priority commercial system to the 1988 needs study criteria. • Complete the expressway system identified in the needs study. • Provide lighting at those rural highway intersections where established criteria dictates. • Develop a Safety Management System which addresses legal and judicial issues related to offenders of traffic laws. • Develop an organized educational program for all users of transportation systems. • Study the issue of the movement of hazardous material and develop policies for public protection.
MAPA Long Range Transportation Plan	Not available
Omaha Master Plan	Not available
Sarpy County Comprehensive Plan	Not available
Council Bluffs Comprehensive Plan	• Provide a transportation system throughout the City of Council Bluffs for the safe and efficient movement of people, goods, and services.
Bellevue Comprehensive Plan	• Provide a safe and efficient network of streets in Bellevue, with the size, spacing and alignment to accommodate both existing and anticipated traffic volumes.
Ralston Plan	• Provide for the safe movement of all residents of Ralston.
Papillion Plan	• Provide for the safe and convenient movement of all residents of Papillion.
Elkhorn Comprehensive Plan	• The main streets in and around the Elkhom area must be planned for a fast, safe, and uninterrupted traffic flow.

Table 2. Operational Efficiency and Capacity Goals and Objectives.

Source	Goals and Objectives Statements

National ITS Program Plan	• Increase the operation efficiency and capacity of the surface transportation system.
	    • Reduce disruptions due to incidents.
	    • Improve the level of service and convenience.
	    • Increase roadway capacity.

NDOR Long Rage Transportation Plan	• Develop incident management programs where needed. • Assess the need for local public transportation and develop a program to meet that need. • Develop and implement funding guidelines within the restrictions of funding providers, in coordination with transportation interests and the legislature, for funding of transportation modes. • Develop a strategy for the preservation of rail service or rail corridors. • Implement, as feasible, the intercity bus plan. • Develop a program to encourage ride sharing by commuters. • Maximize the use of telecommunications to reduce or eliminate communications-type travel, such as meetings, training, or observation. • Instill the practice of intermodal coordination and consideration by all transportation interests when planning and developing intermodal system enhancements.
MAPA Long Range Transportation Plan	• Develop a transportation system that provides adequate mobility for the efficient movement of people and goods within and through the MAPA region. • Provide efficient use of existing transportation facilities through the use of improved transportation management programs. • Protect and enhance the efficiency and productivity of our intermodal metropolitan transportation system and establish a stronger link between land development and the provision of transportation facilities.
Omaha Master Plan	• Provide public services efficiently and equitably. • Throughout the city and its jurisdiction, Omaha will continue to require adequate streets which promote transportation efficiency, reduce congestion, and limit access points. • The City will promote street systems, such as "dense street networks," that will offer flexibility, provide for better traffic flow, and reduce street right-of-way and paving costs. • Overall transportation planning for the city should include planning for an improved mass transit system and alternative modes of transportation.
Sarpy County Comprehensive Plan	• Develop and support an efficient road system to serve the county's future circulation and access needs. Development policies: • Develop specific incentives for encouraging or expanding the use of public transportation.
Council Bluffs Comprehensive Plan	• Provide a transportation system through out the City of Council Bluffs for the safe and efficient movement of people, goods, and services. Policies: - Coordinate transportation planning and improvements with the planning and development of other elements of the community, including other transportation modes, public utilities, community facilities, and commercial and industrial areas.
Bellevue Comprehensive Plan	• Provide a safe and efficient network of streets in Bellevue, with the size, spacing and alignment to accommodate both existing and anticipated traffic volumes.

Table 2. Operational Efficiency and Capacity Goals and Objectives (continued)

Source	Goals and Objectives Statements
Ralston Plan	• Assure that the transportation system is adequate to meet demands placed upon it. Policies and Actions: • Ralston should institute a program to improve the operation and efficiency of the overall street network.
Papillion Plan	• Provide a transportation system that meets the demands placed upon it. • Provide for the safe and convenient movement of all residents of Papillion. • Provide mobility for all with alternative transportation opportunities.
Elkhom Comprehensive Plan	• The main streets in and around the Elkhom area must be planned for a fast, safe, and uninterrupted traffic flow.

Table 3. Energy and Environmental Costs Goals and Objectives.

Source	Goals and Objectives Statements
National ITS Program Plan	• Reduce energy and environmental cost associated with traffic congestion.
NDOR Long Range Transportation Plan	- Promote programs to increase the availability of alternate fuels and vehicles designed to use them. • Improve fuel efficient driver practices through education.
MAPA Long Range Transportation Plan	• Protect and enhance the environmental quality of the region.
Omaha Master Plan	• Future development shall provide for bikes, pedestrians, and mass transit. When the activity center concepts becomes reality, the City will explore the feasibility of constructing a fixed transit (e.g., monorail or light rail) system that connects the major centers.
Sarpy County Comprehensive Plan	Not applicable
Council Bluffs Comprehensive Plan	Not applicable
Bellevue Comprehensive Plan	Not applicable
Ralston Plan	Not applicable
Papillion Plan	Not applicable
Elkhom Comprehensive Plan	Not applicable

Table 4. Productivity Goals and Objectives.

Source	Goals and Objectives Statements
National ITS Program Plan	• Enhance present and future productivity. • Reduce costs incurred by fleet operators and others, • Reduce travel time. • Improve transportation systems planning and management.
NDOR Long Range Transportation Plan	• Eliminate government required duplication of motor carrier record keeping and filing. • Utilize electronic technology for more efficient movement of motor carriers. • Develop an effective and equitable funded process to allow a maximum of uninterrupted flow of commercial vehicles. • Resolve transportation issues through increased coordination between agencies.
MAPA Long Range Transportation Plan	• Protect and enhance the efficiency and productivity of our inter-modal metropolitan transportation system and establish a stronger link between land development and the provision of transportation facilities.
Omaha Master Plan	Not applicable
Sarpy County Comprehensive Plan	Not applicable
Council Bluffs Comprehensive Plan	Not applicable
Bellevue Comprehensive Plan	Not applicable
Ralston Plan	Not applicable
Papillion Plan	Not applicable
Elkhom Comprehensive Plan	Not applicable

Table 5. Mobility and Convenience Goals and Objectives.

Source	Goals and Objectives Statements
National ITS Program Plan	• Enhance the personal mobility and the convenience and comfort of the surface transportation system. • Provide access to pre-trip and en-route information. • Improve the security of travel. • Reduce stressed involved in travel.
NDOR Long Range Transportation Plan	• Provide suitable attraction and directional signing of tourism, historical, and recreational facilities. • Assess the need for local public transportation and develop a program to meet that need. • Develop and implement funding guidelines within the restrictions of funding providers, in coordination with transportation interests and the legislature, for funding of transportation modes. • Develop a strategy for the preservation of rail service or rail corridors. • Implement, as feasible, the intercity bus plan. • Develop a program to encourage ride sharing by commuters. • Maximize the use of telecommunications to reduce or eliminate communications-type travel, such as meetings, training, or observation. • Instill the practice of intermodal coordination and consideration by all transportation interests when planning and developing intermodal system enhancements.
MAPA Long Range Transportation Plan	• Develop a transportation system that provides adequate mobility for the efficient movement of people and goods within and through the MAPA region. • Build and maintain an intermodal metropolitan transportation system that supports economic vitality and promotes economic development. • Provide access to all transportation modes for the elderly and handicapped under the Americans with Disabilities Act.
MAPA Long Range Transportation Plan	Principles: • The transit portion of the Long-Range Transportation Plan should be two fold. It should provide service to the transit dependent rider but also should make efforts to offer a viable alternative to the non-captive choice rider. • The transit system will maintain a strong focus on servicing the various activity centers and/or central business districts (CBDs) in the MAPA area with a fixed route structure. Express routes and service from suburban areas to CBDs and activity centers within the metropolitan area will also be in service to supplement the main route structure of the transit system. • Paratransit transit modes, public and private, should also be developed to help provide for specialized transportation needs in the urban area for which existing and future transit functions do not adequately provide service. • The express transit system should be provided by freeway and arterial express bus routes and utilize park and ride lots and other incentives. The development of high occupancy vehicle lanes (HOV) should be investigated in the construction and design of new highway segments to better facilitate the movement of people through the transit system. • All forms of transit and transit-related facilities will provide access to the elderly and handicapped in the metro area. All new buses, other rolling stock, and transit facilities will be outfitted with equipment designed for use by those patrons with physical disabilities. All will be done in accordance with ADA standards. • Other modes of transportation (e.g., car pooling, subscription bus service, taxis, demand actuated-shared-ride service, etc.) would also be developed to help provide for the specialized needs in the urban area.

Table 5. Mobility and Convenience Goals and Objectives (continued)

Source	Goals and Objectives Statements
MAPA Long Range Transportation Plan (continued)	• Efforts should be made to provide points of interaction among the various modes of transportation and to provide for efficient transfer of people and goods among these modes. This concept has broad implications and has a wide scope of possibilities. Such efforts may be as simple as adding bike racks to transit buses or as extensive as developing a barge-train-truck multimodal transfer center. • Transportation standards should be utilized to promote efficient and inter-jurisdictional connectivity and provide for an unencumbered movement of people and goods across the transportation mode spectrum.
Omaha Master Plan	• Reduce traffic congestion and costs by shifting from a "sparse hierarchy" to a "dense network" street system. • Future development shall provide for bikes, pedestrians, and mass transit. When the activity center concept becomes reality, the City will explore the feasibility of constructing a fixed transit (e.g., monorail or light rail) system that connects the major centers. • Overall transportation planning for the city should include planning for an improved mass transit system and alternative modes of transportation.
Sarpy County Comprehensive Plan	Not applicable
Council Bluffs Comprehensive Plan	Not applicable
Bellevue Comprehensive Plan	Not applicable
Ralston Plan	• Assure that the transportation system is adequate to meet demands placed upon it. • Accommodate needs of all people in the community by providing mobility for all. Policies and Actions: • Ralston should examine the feasibility of a shuttle service to transit stops at the periphery of the city. If a demand for such a service emerges, Ralston should institute a demand responsive shuttle to MAT stops at the edge of the community. • If shuttle service is instituted, Ralston should work with Metro Area Transit to provide bus stops at peripheral locations. These stops may include lighted and heated shelters, information kiosks, and a telephone.
Papillion Plan	• Provide mobility for all with alternative transportation opportunities.
Elkhorn Comprehensive Plan	Not applicable

Table 6. Development and Deployment of ITS Goals and Objectives.

Source	Goals and Objectives Statements
National ITS Program Plan	• Create an environment in which the development and deployment if ITS can flourish.
NDOR Long Range Transportation Plan	• Resolve transportation issues through increased coordination between agencies. • Develop incident management programs where needed. • Develop an effective and equitably funded process to allow a maximum of uninterrupted flow of commercial vehicles. • Expedite implementation of successful research and share findings.
MAPA Long Range Transportation Plan	Not applicable
Omaha Master Plan	Not applicable
Sarpy County Comprehensive Plan	Not applicable
Council Bluffs Comprehensive Plan	Not applicable
Bellevue Comprehensive Plan	Not applicable
Ralston Plan	Not applicable
Papillion Plan	Not applicable
Elkhorn Comprehensive Plan	Not applicable

2. REFERENCES

1. ***National ITS Program, Intelligent Transportation Systems.*** Volumes I and II. First Edition. ITS America, Washington, DC, March 1995.

APPENDIX C

APPLICABLE USER SERVICES REPORT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 Background

The Intelligent Transportation System (ITS) planning process is based on the concept of a "user services" approach to the deployment of ITS technologies. The premise of this approach is that the provision of a set of services to users of the transportation system is the reason for the deployment of ITS technologies. The "user services" approach is intended to place the emphasis of discussions about ITS on the development and deployment of useful ITS products and services for a range of defined users to meet specified needs. The "user services" concept is a major component of *the National ITS Program Plan* (I) and has formed the basis of the "user requirement" employed in the development of the National System Architecture.

The "users" include travelers using all modes of transportation, transportation management center operators, transit operators, metropolitan planning organizations (MPOs), commercial vehicle owners and operators, state and local governments, and many others who would benefit from deployment of ITS. So far, 29 user services have been defined and developed through the national program planning process.   The 29 user services are listed in Table 1, which shows them grouped into the "bundles" defined in the *National ITS Program Plan* (I)   These groupings organize the user services around common technical functions; however, they can be bundled in a variety of configurations for deployment to fit user needs and to achieve local transportation goals and objectives.

1.2 Objective and Scope

The objective of the Omaha Metropolitan Area ITS Early Deployment Planning (EDP) Study is to develop a strategic plan for the deployment of ITS technologies in the Omaha metropolitan area. The plan will define ITS projects for implementation, assess funding and implementation options, and recommend project priorities and implementation schedules. However, before alternative ITS technologies and projects can be identified and evaluated, the ITS user services that are applicable to the ITS goals and objectives of the Omaha metropolitan area must be determined.   Therefore, the objective of this phase of the EDP study is to determine which of the 29 user services are applicable to the Omaha metropolitan area.

The scope of the EDP study, as stated in the work plan, is limited to the areas of pre-trip planning and traveler information, traffic management, freight and fleet management, public transportation, and emergency vehicle management. These areas represent five of the six user service areas that were defined by the Federal Highway Administration (FHWA) at the time the study work plan was prepared in March, 1994. Since then, FHWA has revised the definition of user service areas to the user service bundles shown in Table 1. Therefore, in terms of user service bundles the scope of the EDP is limited to the first six bundles, which are highlighted in Table 1. Only the seventh bundle, Advanced Vehicle Safety Systems, is outside the scope

of the EDP study. It was excluded, because the technologies required for implementing the user services are in development and not ready for early deployment.

Table 1. User Service Bundles.[a]

Bundle	User Service
I. Travel and Transportation Management	1. En-RouteDriver Information 2. Route Guidance 3. Travel Services Information 4. Traffic. Control 5. Incident Management 6. Emissions Testing and Mitigation
2. Travel Demand Management	1. Demand Management and Operations 2. Pre-Trip Information 3. Ride Matching and Reservation
3. Public Transportation Operations	1. Public Transportation Management 2, En-Route Transit Information 3. Personalized Public Transit 4. Public Security
4. Electronic Payment	1. Electronic Payment Services
5. Commercial Vehicle Operations	1. Commercial Vehicle Electronic Clearance 2. Automated Roadside Safety Inspection 3. On-Board Safety Monitoring 4. Commercial Vehicle Administration Processes 5. Hazardous Material Incident Response 6. Freight Mobility
6. Emergency Management	1. Emergency. Notification and Personal Security 2. Emergency Vehicle Management
7. Advanced Vehicle Safety Systems	1. Longitudinal Collision Avoidance 2. Lateral Collision Avoidance 3. Intersection Collision Avoidance 4. Vision Enhancement for Crash Avoidance 5. Safety Readiness 6. Pre-Crash Restraint Deployment 7. Automated Highway System

[a] Shaded area includes user services that are within the scope of the EDP study.

1.3 Methodology

The applicable user services are the user services within the scope of the EDP study that:

> 1. support the ITS goals and objectives of the Omaha metropolitan area, and

> 2. address the transportation needs and opportunities of the Omaha metropolitan area.

A preliminary statement of ITS goals and objectives for the *Omaha metropolitan area (2)* was formulated from analysis of transportation goals and objectives contained in comprehensive plans of jurisdictions in the area and presented to the ITS Subcommittee on April 5, 1995. Transportation needs and opportunities in the Omaha metropolitan area were identified in the analysis of existing conditions and documented in the *EDP study Inventory Report* (3), April 28, 1995. In addition, the identification of the applicable user services utilized input from user focus groups, surveys, and interviews. This input further articulated the ITS goals and objectives and the transportation needs and opportunities. The descriptions of the user services were compared with the statement of ITS goals and objectives and the definition of transportation needs and opportunities to determine the applicable user services.

1.4 Contents of Report

The applicable user services and the methods used to determine them are documented in this report. The description of the user services and their relationship to the ITS goals and objectives are presented in Sections 2 and 3, respectively. The determination of the applicable user services in each of user service bundles within the scope of the study is described in the following sections:

- Travel and Transportation Management and Travel Demand Management in Section 4,
- Public Transportation Operations and Electronic Payment in Section 5,
- Commercial Vehicle Operations in Section 6, and
- Emergency Management in Section 7.

A summary of the applicable user services is presented in Section 8.

2.   USER SERVICES

The user services in each of the six bundles within the scope of the EDP study are described in this section. In addition, the functional areas of technologies that support the users services are defined.   The user service descriptions and functional area definitions are taken from the *National ITS Program Plan (1).*

2.1 User Service Descriptions

2.1.1 Travel and Transportation Management

The six user services in this bundle are designed to use advanced systems and technologies to improve the efficiency and operation of the existing surface transportation infrastructure and to help travelers become safer and better-informed.   These services are anticipated to enhance mobility and productivity, increase efficiency, and reduce the energy and environmental impacts of surface transportation.

Bundle	User Services
1. Travel and Transportation Management	1. En-Route Driver Information 2. Route Guidance 3. Traveler Services Information 4. Traffic Control 5. Incident Management 6. Emissions Testing and Mitigation

2.1.1.1   En-Route Driver Information

The En-Route Driver Information service provides advisories to convey information about traffic conditions, incidents, construction, transit schedules, and other mode choice options to drivers of personal, commercial, and public transit vehicles.   This service also includes in-vehicle signing, which provides the same types of information found on highway signs today but displays it directly in the vehicle.   Full deployment of in-vehicle signing would also include customized information, such as warnings of hazardous road conditions (e.g., fog, ice) or the safe speed for a specific type of vehicle (e.g., autos, buses, large trucks).

2.1.1.2   Route Guidance

The Route Guidance service provides travelers with a suggested route to reach a specified destination, along with simple instructions on upcoming turns and other maneuvers.   When fully deployed, route guidance systems will provide travelers of all modes with directions to their destinations based on real-time information about the transportation system, including traffic conditions, road closures, and the status and schedule of transit systems.

2.1.1.3 Traveler Services Information

The Traveler Services Information service provides a business directory, or "yellow pages, "of information on travel-related services and facilities; for example, the location, operating hours, and availability of food, loading, parking, auto repair, hospital, and police facilities. Traveler services information would be accessible in the home, office, and selected public locations to help plan trips, and it would also be available en-route.

2.1.1.4 Traffic Control

The Traffic Control service provides for the integration and adaptive control of the freeway and surface street systems to improve the flow of traffic. It can also give preference to transit and other high-occupancy vehicles to reduce congestion and increase the movement of people and goods. This service gathers data from the transportation system, fuses it into usable information, and uses it to determine the optimum assignment of right-of-way to vehicles and pedestrians. The real-time traffic information collected by the Traffic Control service is also disseminated for use by many other user services.

2.1.1.5 Incident Management

The Incident Management service uses advanced sensors, data processing, and communications to improve the incident management and response capabilities of transportation and public safety officials, the towing and recovery industry, and others involved in incident response. This service helps these groups to quickly and accurately identify incidents and implement a response which minimizes traffic congestion and the effects of incidents on the environment and the movement of people and goods.

2.1.1.6 Emissions Testing and Mitigation

The Emissions Testing and Mitigation service uses advanced vehicle emissions testing systems to identify environmental "hot spots" and implement strategies to reroute traffic around sensitive air quality areas, or control access to such areas. Other technologies provide identification of vehicles that are emitting levels of pollutants that exceed state, local or regional standards, and provides information to drivers or fleet operators to enable them to take corrective action. The service also provides transportation planning and operating agencies with information that can be used to facilitate implementation and evaluation of various pollution control strategies.

2.1.2 Travel Demand Management

The goal of travel demand management (TDM) is to reduce vehicle demands and congestion on the roadway by: (1) developing and encouraging modes other than the single-occupancy vehicle, (2) altering the timing and/or location of trips, and/or (3) eliminating trips altogether. Because of the growing problem of congestion and air pollution, many areas in the U.S. have already implemented TDM programs or will need to do so under the 1990 Clean Air Act. Besides addressing environmental goals, TDM programs allow employers to better accommodate the needs and lifestyles of employees, improving their productivity and mobility choices.

Bundle	User Services

2. Travel Demand Management	1. Demand Management and Operations
	    • HOV Facility Operation and Control
	    • Congestion/Roadway Pricing
	    • Parking Management and Control
	    - Mode Change Support
	    • Telecommuting
	2. Pre-Trip Travel Information
	3. Ride Matching and Reservation

The TDM bundle includes three user services. Together these user services provide: (1) the alternatives, arrangements, and incentives that create the choices and opportunities for people to select modes other than single-occupancy vehicles and (2) the information on the choices and opportunities in a convenient and timely fashion in order to help affect a change in travel behavior. TDM is most effective when these two functions are integrated in the deployment of user services.

2.1.2.1   Demand Management and Operations

The Demand Management and Operations service uses advanced technologies to support policies and regulations designed to mitigate the environmental and social impacts of traffic congestion. This service generates and communicates management and control strategies that support the implementation of programs to reduce the number of individuals who choose to drive alone; increase the use of high occupancy vehicles and transit; and provide a variety of mobility options for those who wish to travel in a more efficient manner, such as during non-peak periods.   The service also allows employers to better accommodate the needs and lifestyles of employees by encouraging alternative work arrangements such as variable work hours, compressed work weeks, and telecommuting .

2.1.2.2   Pre-Trip Travel Information

The Pre-Trip Travel Information service allows travelers to access a complete range of real-time intermodal transportation information at home, work, and other major sites where trips originate. Information on TDM operations and ride matching and reservations are conveyed through these systems to enable travelers to plan their trips.   Based on this information, the traveler can select the best departure time, route, and modes of travel, or perhaps decide not to make the trip at all.

2.1.2.3   Ride Matching and Reservation

The Ride Matching and Reservation service provides real-time rider matching inforrnation and reservations to travelers in their homes, offices or other locations, and assists transportation providers with vehicle assignments and scheduling. The user service provides one of the basic tools for altering the travel behavior of individuals who drive alone during congested periods. This service expands the market for ridesharing as an alternative to single-occupancy automobile travel, and provides enhanced alternatives for special population groups, such as the elderly or the handicapped.

2.1.3 Public Transportation Operations

Advanced Public Transportation Systems are presented as an alternative to single-occupancy driving. The expectation is that by using advanced technology, transit providers could respond to the primary concerns voiced by transit users.   Transit would achieve enhanced reliability, efficiency, and greater assurance of passenger safety.   Therefore, the user services in this bundle respond directly to the ITS program goals of :

- operational efficiency and capacity,
- enhancing present and future productivity of transportation systems, and
- enhancing the personal mobility, convenience, and comfort of the surface transportation system.

They also help to create an environment in which the development and deployment of ITS can flourish, thus helping to reduce energy and environmental costs associated with traffic congestion and improve the safety of the nation's surface transportation system.

Bundle	User Services
3. Public Transportation Operations	1. Public Transportation Management 2. En-Route Transit Information 3. Personalized Public Transit 4. Public Security

2.1.3.1   Public Transportation Management

The Public Transportation Management service provides computer analysis of real-time vehicle and facility status to improve transit operations and maintenance.   The computer analysis identifies deviations from schedules and provides potential solutions to dispatchers and drivers. Integrating this capability with traffic control services can help maintain transportation schedules and assure transfer connections in inter-modal transportation.   Information regarding passenger loading, bus running times, and mileage accumulated, improves service and facilitates administrative reporting. Transit personnel management is enhanced by automatically recording and verifying tasks performed by transit personnel.

2.1.3.2   En-Route Transit Information

The En-Route Transit Information service provides travelers with real-time transit and high-occupancy vehicle information, allowing them to select travel alternatives while they are en-route. There are three major functions: (1) receiving information, (2) processing information, and (3) distributing information.   This capability integrates information from different transit modes and presents it to travelers to help them with en-route decisions. The En-Route Transit Information services gives travelers access to travel-related information at fixed locations. Visual displays and audio messages provide notification of arrival of transit vehicles, and interactive video is available at kiosks. Similar information is available via personal portable devices.   Information regarding all private and public service providers is available and continuously updated.

2.1.3.3   Personalized Public Transit

The Personalized Public Transit service provides flexibly-routed transit vehicles to offer more convenient customer service. It enables an individual rider to request a trip by specifying trip origin, destination, time, and date.   The rider may request special equipment or handling requirements. The service also has the capability of notifying the requester that the transit vehicle's arrival is imminent.   Vehicle schedules are optimized via networking, and vehicle assignments provide the best match between the rider needs and available vehicles.   Both public and privately-licensed vehicles can be included in the vehicle pool, and vehicle assignments are made in real-time, accommodating immediate trip requests when sufficient capacity is available. Data collection permits real-time schedule adjustment, off-line analysis and planning, and off-line filing of fares paid by agencies.

2.1.3.4   Public Travel Security

The Public Travel Security service provides an environment of safety in public transportation. Trip security encompasses all physical areas related to public travel, including: bus stops, park and ride lots, transit vehicles, transfer points, and kiosk locations.   These locations are monitored by video and audio equipment. All secure areas have traveler activated alarms, and all public transit vehicles are equipped with silently activated alarms which can be activated by the driver. Sensory technology alerts operators and police of potential incidents. Ride matching includes the capability for participants to be identified.   Riders use electronic payment to eliminate the need to carry cash and reduce cash handling by drivers. Equipment is monitored to assist in responding to terrorist incidents.

2.1.4 Electronic Payment

The Electronic Payment user service bundle allows travelers to pay for transportation services by electronic means. Four functions can be provided: electronic toll collection, electronic fare collection, electronic parking payment, and electronic payment services integration.

Bundle	User Services
4. Electronic Payment	**1. Electronic Payment Services**

Where tolls are collected, vehicle operators are permitted to pay tolls without stopping their vehicles. Pricing structures can be implemented for locally determined needs, and customers receive confirmation of each transaction.   With electronic fare collection, travelers are able to use a compatible fare medium for all applicable forms of surface transportation. Electronic fare collection permits variable and flexible fare structures and permits identification of invalid payment media.   It also permits systems to verify the eligibility of riders. Drivers are able to park without the use of cash.   Electronic payment services for various transportation modes, as well as for parking, can be combined and implemented in such a way that multiple agencies are able to use the same system across political boundaries.   The use of the electronic payment service also has the capability to implement pricing for the purpose of influencing mode selection.

2.1.5 Commercial Vehicle Operations

Commercial Vehicle Operations (CVO) encompass a broad range of diverse operators and operating environments. The interstate motor carrier industry, which includes approximately 275,000 businesses operating trucks, 4,000 for-hire passenger carriers, and 6.6 million commercial drivers, is a complex mix of businesses that transport goods and passengers for profit or as part of another business function. A similar number of intrastate carriers may also benefit from ITS/CVO technologies.

The user services in this bundle are concerned primarily with freight movement and focus on two specific areas: (1) improvement of private-sector fleet management and freight mobility and (2) streamlining government/regulatory functions. The primary "users" of the developed technology application are the motor carrier industry and state highway and motor carrier regulatory authorities.

Bundle	User Services
5. Commercial Vehicle Operations	**1. Commercial Vehicle Electronic Clearance** **2. Automated Roadside Safety Inspection** **3. On-Board Safety Monitoring** **4. Commercial Vehicle Administration Processes** **5. Hazardous Material Incident Response** **6. Freight Mobility**

2.1.5.1   Commercial Vehicle Electronic Clearance

The Commercial Vehicle Electronic Clearance service allows enforcement personnel to electronically check safety, credential, and size and weight data for transponder-equipped vehicles before they reach an inspection site, selecting only illegally or potentially unsafe vehicles for an inspection.   Safe and legal carriers are able to travel without stopping for compliance checks at weigh stations, ports-of-entry, and other inspection sites.

2.1.5.2   Automated Roadside Safety Inspection

The Automated Roadside Safety Inspection service uses safety data provided by the Commercial Vehicle Electronic Clearance service, combined with state-of-the-art technology, to allow for more selective and rapid inspections.   Through the use of sensors and diagnostics, inspectors are able to check vehicle systems and driver requirements and, ultimately, driver alertness and fitness for duty.

2.1.5.3   On-Board Safety Monitoring

The On-Board Safety Monitoring service non-intrusively monitors the driver, vehicle, and cargo and notifies the driver, carrier, and possibly enforcement personnel, if an unsafe situation arises during operation of the vehicle.   Such an unsafe situation might involve driver fatigue, vehicle braking system failure, or cargo shifting.

2.1.5.4   Commercial Vehicle Administration Processes

The Commercial Vehicle Administration Processes service allows motor carriers to obtain credentials and to collect and report fuel and mileage tax information electronically.   Through automation, this service significantly reduces in the administrative workload required of carriers and regulatory agencies, and simplifies compliance operations.

2.1.5.5   Hazardous Material Incident Response

The Hazardous Material Incident Response system provides emergency personnel at the scene of a hazardous material incident immediate information on the types and quantities of hazardous materials present in order to facilitate a quick and appropriate response.

2.1.5.6   Freight Mobility

The Freight Mobility service provides information links between drivers, dispatchers, and inter-modal transportation providers, enabling carriers to take advantage of real-time traffic information, as well as vehicle and load location information, to increase productivity.

2.1.6 Emergency Management

The Emergency Management user service bundle contains user services that relate directly to the detection, notification, and response to emergency and non-emergency incidents, which take place on or adjacent to the roadway. The focus of this bundle is to improve the timeliness and appropriateness of the response of police, fire, and rescue operations, as well as roadside service providers.

Bundle	User Services

6. Emergency Management	1. **Emergency Notification and Personal Security**
	    -Driver and Personal Security
	    -Automated Collision Notification
	2. **Emergency Vehicle Management**
	    -Emergency Vehicle Fleet Management
	    -Route Guidance
	    -Signal Priority

2.1.6.1   Emergency Notification and Personal Security

The Emergency Notification and Personal Security user service focuses on: (1) reducing the time from occurrence of an emergency or non-emergency incident until the notification of the appropriate response personnel and (2) providing an accurate estimate of the location of the vehicle in need of assistance. This user service is divided into two subservices:

- *Driver and Personal Security* subservice, which provides the ability to manually initiate the notification of emergency and non-emergency incidents, such as mechanical breakdowns, fire, non-injury accidents, or injury accidents where a person on the scene is able to manually initiate the notification.

- *Automated Collision Notification* subservice,which provides automatic notification of automobile crashes. This subservice has the goal of reducing the response time for medical assistance in incidents where serious injury has occurred to the vehicle occupants, rendering them unable to initiate manual incident notification.

2.1.6.2   Emergency Vehicle Management

The Emergency Vehicle Management user service is oriented towards reducing the time from the receipt of notification of an incident to the arrival of the emergency vehicles on the scene. This user service is divided into three subservices:

- *Emergency Vehicle Fleet Management* subservice, which provides improved display of emergency vehicle location and automation support to dispatchers to help them dispatch the vehicle that can most quickly reach the incident site. It includes improving communications between response vehicles and the dispatch center.

- *Route Guidance* subservice, which assists the dispatcher and emergency vehicle driver in determining the minimum-time route to reach the incident scene, and if required, from the incident scene to a suitable hospital. It also provides in-vehicle route guidance for directing the emergency vehicle driver to the destination. This subservice provides capabilities needed by emergency response vehicles that are not provided by systems developed for private or commercial vehicles under the Route Guidance user service in the Travel and Transportation Management user service bundle.

- *Signal Priority* subservice, which provides the capability to preempt traffic signals on an emergency vehicle's route so that emergency vehicle is nearly always presented with a green signal. It includes the capability to warn drivers of affected vehicles that an emergency vehicle is approaching.

Both the Emergency Notification and Personal Security and the Emergency Vehicle Management user services address the need for timely, appropriate responses to emergency and non-emergency situations. The primary "users" of the Emergency Notification and Personal Security user service are the vehicle drivers and passengers who may benefit from more timely responses in the event of an incident. The "users" of the Emergency Vehicle Management user service are service providers, including law enforcement agencies, emergency medical services (EMS), and fire services. Additional users of the Emergency Vehicle Management user service include rescue services, extrication services, hazardous materials clean up services, and other such secondary responders, as required by various incidents.

2.2   Functional Areas

There is a wide range of technologies capable of supporting the deployment each of the 29 user services. Based on an analysis of these technologies, the *National ITS Program Plan (4)* has grouped the technologies into 17 functional areas. Each functional area is comprised of one or more separate technologies which can be used interchangeably in system deployment to provide a user service. For example, two-way mobile communications could be provided by either digital cellular telephones or two-way satellite communications. The 17 functional areas are defined in Table 2.

The user service bundles provide logical groupings and combinations of the user services. By analyzing a user service's relationship to other user services, a system may be conceived over a period of years in a comprehensive manner. This approach makes it possible to optimize the use of funds and resources, resulting in a more achievable and affordable system deployment.

Table 2. Functional Areas of User Service Technologies.

Function	Definition
Traffic Surveillance	Surveillance technologies that collect information about the status of the traffic stream. Possible technologies include loop detectors, infrared sensors, radar and microwave sensors, machine vision, aerial surveillance, closed circuit television, acoustic, in-pavement magnetic, and vehicle probes.
Surveillance	Surveillance technologies that collect a variety of information about specific vehicles. These technologies include weigh-in-motion devices, vehicle identification, vehicle classification, and vehicle location.
Inter-Agency Coordination	Technologies that connect travel-related facilities to other agencies such as police, emergency services providers, weather forecasters and observers, Traffic Management Centers (TMCs), transit operators, etc.
I-Way Mobile Communications	Any communication technology that transmits information to potentially mobile reception sites but cannot receive information back from those sites. Possible technologies providing this function include highway advisory radio, FM subcarrier, spread spectrum, commercial broadcasts, and infrared or microwave beacons.
I-Way Mobile Communications	Any communication technology that transmits information to potentially mobile reception sites and allows receipt of information from those same sites. Possible technologies include cellular telephones, 2-way radio, spread spectrum, microwave, infrared, and 2-way satellite.
stationary Communications	Any communication technology that connects stationary sites. Technologies include fiber optics, microwave, radio, land lines.
Individual Traveler Interface	Devices that provide information flow to a specific traveler. Technologies meeting this function include touch screens, keypads, graphics displays and computer voices at kiosks, keypads, computer voice and on-board display systems in vehicles, personal communications devices carried with the traveler, audiotex from any phone, and TV in the office or home.
Payment Systems	Technologies that enable electronic fund transfer between the traveler and the service provider. The technology areas include Automated Vehicle Identification (AVI), smart cards, and electronic funds management systems. This function overlaps with the Electronic Payment user service.
Variable Message Displays	Technologies that allow centrally controlled messages to be displayed or announced audibly to multiple users at a common location, such as a roadside display or display board in a transit terminal. These technologies would typically be applied to provide information on highway conditions, traffic restrictions, and transit status.
Signalized Traffic Control	Technologies that allow for real-time control of traffic flow. Possible technologies include optimized traffic signals, ramp metering, reversible lane designation, and ramp/lane closures.
Restrictions Traffic Control	Operational techniques that restrict the use of roadways according to regional goals. Techniques include HOV restrictions, parking restrictions, and road use (congestion) pricing.

Table 2. Functional Areas of User Service Technologies. (continued)

Function	Definition
Navigation	Technologies that determine vehicle position in real time. Technologies that provide this function include GPS, LORAN, dead reckoning, localized beacons, map database matching, and cellular/radio triangulation.
Database Processing	Technologies that manipulate and configure or format transportation-related data for sharing on various platforms. General purpose data base software currently exists and is currently being adapted to transportation needs, such as data fusion, maps, and travel services.
Traffic Prediction Data Processing	Data processing relating to prediction of future traffic situations. Algorithms under development include areas such as real-time traffic prediction, and traffic assignment.
Traffic Control Data Processing	Data Processing related to the real-time control of traffic. Algorithms under development include optimal control and incident detection, and the interaction of route selection and traffic control.
Routing Data Processing	Data processing related to routing of vehicles including the generation of step-by-step driving instructions to a specified destination. Algorithms under development include the scheduling of drivers, vehicles, and cargo; route selection; commercial vehicle scheduling; route guidance; and multimodal dispatching.
In-Vehicle Sensors/Devices	Technologies providing a range of sensing functions to be located within vehicles. Functions addressed by these technologies include monitoring of vehicle performance and driver performance; determination of vehicle position relative to the roadway, other vehicles, and obstacles; improvement of vision in adverse conditions; and on-board security monitoring.

The relationships among the functional areas and the user service bundles are shown in Table 3. If a user service technology function supports full implementation of a user service, the intersection of the user service column and technology function row is marked. Note that, depending upon a particular application, one technology function could successfully deploy multiple user services.

For example, the Traffic Surveillance function is shown in Table 3 as one of 11 functions supporting the En-Route Driver Information user service in user service bundle 1, Travel and Transportation Management. In addition, the Traffic Surveillance function also supports the user services of Route Guidance, Traffic Control, and Incident Management in user service bundle 1.

Table 3. Relationships Among Functional Areas and User Services.

1. Travel and Transportation Management

Function	User Service					
	En-Route Driver Information	Route Guidance	Traveler Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation
Traffic Surveillance	■	■		■	■	
Vehicle Surveillance						■
Inter-Agency Coordination	■			■	■	■
1-Way Mobile Communications	■	■			■	■
2-Way Mobile Communications	■	■	■		■	
Stationary Communications	■	■		■	■	■
Individual Traveler Interface	■	■	■			■
Payment Systems						
Variable Message Displays	■			■	■	■
Signalized Traffic Control				■	■	■
Restrictions Traffic Control					■	
Navigation	■	■	■		■	
Data Base Processing	■	■	■	■	■	■
Traffic Prediction Data Processing	■	■		■	■	
Traffic Control Data Processing				■	■	
Routing Data Processing	■	■				
In-Vehicle Sensors/Devices						■

Table 3. Relationships Among Functional Areas and User Services. (continued)

2. Travel Demand Management

Fuction	User Service		
	Travel Demand Management	**Pre-Trip Travel Information**	**Ride Matching & Reservation**
Traffic Surveillance	■	■	
Vehicle Surveillance	■		■
Inter-Agency Coordination		■	■
1-Way Mobile Communications	■		■
2-Way Mobile Communications		■	■
Stationary Communications	■	■	■
Individual Traveler Interface	■	■	■
Payment Systems	■		■
Variable Message Displays	■	■	■
Signalized Traffic Control	■		
Restrictions Traffic Control	■	■	
Navigation	■	■	■
Data Base Processing	■	■	■
Traffic Prediction Data Processing		■	
Traffic Control Data Processing			
Routing Data Processing		■	■
In-Vehicle Sensors/Devices			

Table 3. Relationships Among Functional Areas and User Services. (continued)

3. Public Transportation Operations

Function	User Service			
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security
Traffic Surveillance	■	■		■
Vehicle Surveillance	■	■	■	■
Inter-Agency Coordination	■	■	■	■
1-Way Mobile Communications	■	■		■
2-Way Mobile Communications	■	■	■	■
Stationary Communications	■	■	■	■
Individual Traveler Interface	■	■	■	■
Payment Systems	■		■	
Variable Message Displays	■	■	■	
Signalized Traffic Control	■			
Restrictions Traffic Control				
Navigation	■	■	■	■
Data Base Processing	■	■	■	■
Traffic Prediction Data Processing	■	■	■	
Traffic Control Data Processing				
Routing Data Processing	■		■	
In-Vehicle Sensors/Devices	■			■

Table 3. Relationships Among Functional Areas and User Services. (continued)

4. Electronic Payment

Function	User Service
	Electronic Payment Services
Traffic Surveillance	
Vehicle Surveillance	■
nter-Agency Coordination	■
I-Way Mobile Communications	■
I-Way Mobile Communications	■
itationary Communications	■
ndividual Traveler Interface	■
Payment Systems	■
Variable Message Displays	■
Signalized Traffic Control	
Restrictions Traffic Control	
Navigation	
Data Base Processing	■
Traffic Prediction Data Processing	
Traffic Control Data Processing	
Routing Data Processing	
In-vehicle Sensors/Devices	

Table 3. Relationships Among Functional Areas and User Services. (continued)

5. Commercial Vehicle Operations

Function	User Service					
	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility
Traffic Surveillance						
Vehicle Surveillance	■			■	■	■
Inter-Agency Coordination						
1-Way Mobile Communications	■			■	■	■
2-Way Mobile Communications	■	■	■	■	■	■
Stationary Communications	■	■		■		■
Individual Traveler Interface	■		■	■		■
Payment Systems				■		
Variable Message Displays	■			■		
Signalized Traffic Control						
Restrictions Traffic Control						
Navigation					■	■
Data Base Processing	■	■		■	■	■
Traffic Prediction Data Processing						
Traffic Control Data Processing						
Routing Data Processing						■
In-Vehicle Sensors/Devices		■	■		■	

Table 3. Relationships Among Functional Areas and User Services. (continued)

6. Emergency Management

Function	User Service	
	Emergency Notification & Personal Security	Emergency Vehicle Management
Traffic Surveillance		■
Vehicle Surveillance	■	■
Inter-Agency Coordination		■
1-Way Mobile Communications	■	■
2-Way Mobile Communications	■	■
Stationary Communications		■
Individual Traveler Interface	■	
Payment Systems		
Variable Message Displays		■
Signalized Traffic Control		■
Restrictions Traffic Control		
Navigation	■	■
Data Base Processing	■	■
Traffic Prediction Data Processing		■
Traffic Control Data Processing		
Routing Data Processing	■	■
In-Vehicle Sensors/Devices	■	

3. MAPPING OF USER SERVICES TO ITS GOALS AND OBJECTIVES

The user services were developed to address the ITS goals and objectives. The ITS goals were originally provided in Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and have been refined in the strategic plans of the U.S. Department of Transportation and ITS America. *The national ITS program goals and objectives (4)* are as follows:

- Improve the safety of the Nation's surface transportation system;
- Increase the operational efficiency and capacity of the surface transportation system;
- Reduce energy and environmental costs associated with traffic congestion;
- Enhance present and future productivity;
- Enhance the personal mobility and the convenience and comfort of the surface transportation system; and
- Create an environment in which the development and deployment of ITS can flourish.

Using the national ITS goals and objectives as a frame of reference, a statement of ITS goals and objectives for the Omaha metropolitan area *(2)* was developed from an analysis of the transportation goals and objectives in comprehensive plans of the jurisdictions in the area in an earlier study task and reported to the ITS Subcommittee on April 5, 1995. The statement was organized in accordance with the following six areas derived from the national ITS goals and objectives:

1. Safety
2. Operational Efficiency and Capacity
3. Energy and Environmental Costs
4. Productivity
5. Mobility and Convenience
6. Development and Deployment of ITS

The specific goals and objectives for the National ITS Program and the Omaha Metropolitan Area ITS Program, within each of these six areas, are listed in the table in Appendix C-l. The table also shows the user services that support each of the national and local ITS goals and objectives.

The numbers of national and local ITS goals and objectives supported by each user service are shown in Table 4. As these numbers indicate, all of the user services in the six user service bundles within the scope of this study support several of the national and local ITS goals and objectives.   Therefore, all 22 of the user services could be considered to be applicable from the standpoint of supporting ITS goals and objectives. However, based on the number of local ITS goals and objectives supported, the following are the most applicable user services:

- En-Route Driver Information
- Traveler Services Information

- Traffic Control
- Incident Management
- Demand Management and Operations
- Pre-Trip Travel Information
- Public Transportation Management
- En-Route Transit Information
- Personalized Public Transit
- Electronic Payment Services
- Freight Mobility

Table 4. Number of ITS Goals and Objectives Supported by User Services.

Bundle	User Service	Number of ITS Goals and Objectives Supported'		
		National	Omaha	Total
Travel and Transportation Management	1. En-Route Driver Information	13	11	24
	2. Route Guidance	13	9	22
	3. Traveler Services Information	6	11	17
	4. Traffic Control	13	21	34
	5. Incident Management	11	12	23
	6. Emissions Testing and Mitigation	2	5	7
Travel Demand Management	1. Demand Management and Operations	9	25	34
	2. Pre-Trip Travel Information	11	16	27
	3. Ride Matching and Reservation	9	8	17
Public Transportation Operations	1. Public Transportation Management	13	25	38
	2. En-Route Transit Information	8	10	18
	3. Personalized Public Transit	7	16	23
	4. Public Travel Security	5	9	14
Electronic Payment	1. Electronic Payment Services	10	12	22
Commercial Vehicle Operations	1. Commercial Vehicle Electronic Clearance	10	6	16
	2. Automated Roadside Safety Inspection	5	7	12
	3. On-Board Safety Monitoring	2	5	7
	4. Commercial Vehicle Administration Processes	2	8	10
	5. Hazardous Material Incident Response	3	7	10
	6. Freight Mobility	10	19	29
Emergency Management	1. Emergency Notification and Personal Security	4	7	11
	2. Emergency Vehicle Management	3	8	11

4.   TRAVEL AND TRANSPORTATION MANAGEMENT AND TRAVEL DEMAND MANAGEMENT

The applicability of the user services in the Travel and Transportation Management and Travel Demand Management user service bundles was evaluated with respect to the needs associated with their deployment in the Omaha metropolitan area. The identification of the needs related to these user services was based on a review of the following:

- *EDP Study Inventory Report (3),* which provides information on the needs and opportunities for the deployment of ITS technologies in the Omaha metropolitan area. The report includes an assessment of the existing traffic operations, an inventory of corridor characteristics, and the viewpoints of several public agencies and private concerns pertinent to the deployment of ITS technologies.

- *National ITS Program (1),* which provides information on the general needs associated with user services bundles.

- *Core ITS Infrastructure Elements for Metropolitan Area ATMS/ATIS Deployment (4),* which provides an outline of the general infrastructure needs associated with the deployment of transportation management and traveler information systems illustrated in Figure 1.

- Functional areas of user service technologies for the Travel and Transportation Management and Travel Demand Management user service bundles, which are described in Section 2 of this report.

- Relationship between the ITS goals and objectives for the Omaha metropolitan area and the user services in the Travel and Transportation Management and Travel Demand Management user service bundles, which is presented in Section 3 of this report.

Based on a review of this information, the study team developed lists of preliminary needs for the Travel and Transportation Management and Travel Demand Management user service bundles, which are shown in Tables 5 and 6, respectively. Some of the needs are associated with both user service bundles are therefore listed in both tables. In addition, a deployment schedule for each need is also shown in the tables. The deployment schedule has the following deployment categories:

- In Progress
- Short Range (0 to 2 Years)
- Medium Range (2 to 5 Years)
- Long Range (more than 5 Years)
- Not Applicable

Transit Management Systems

Freeway Management Systems

Incident Management Program

Traffic Signal Control Systems

Traveler Information Center

Electronic Toll Collection Systems

Electronic Fare Payments Systems Smart Card

CUSTOMER

Source: FHWA

/j94-045/gra/finalrpt/f4_its
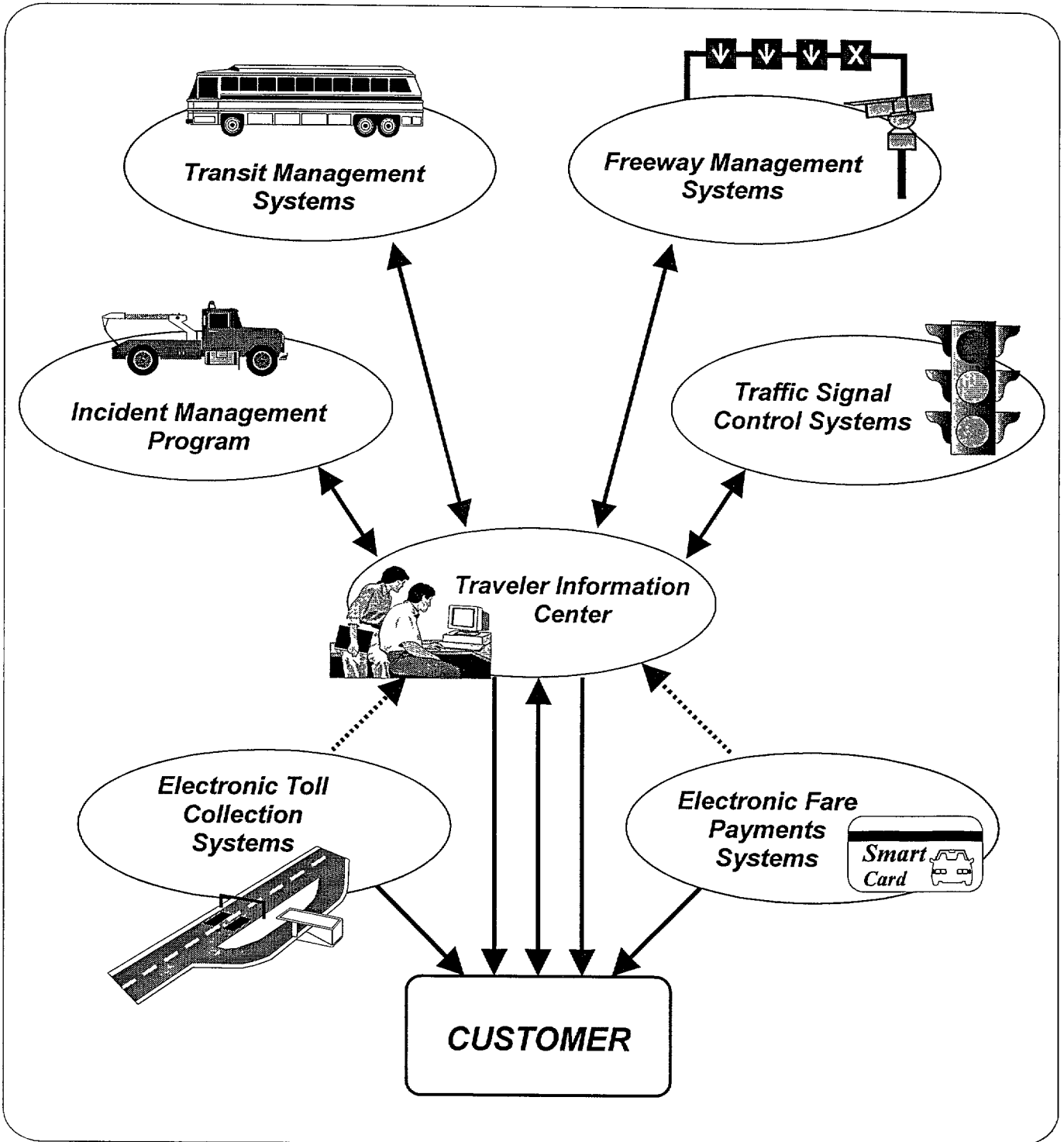
Metropolitan Area ITS Core Infrastructure for ATMS/ATIS Deployment

Figure 1

Table 5. Travel and Transportation Management Needs Assessment.

Need	Deployment Schedule[a]				
	In Progress	Short Range (0-2 years)	Medium Range (2-5 years)	Long Range (5+ years)	Not Applicable
1. Computerized signal systems for each jurisdiction as appropriate: • Basic computerized system	5	1	1		
• Real-time traffic-adaptive system			2	5	
• Ability to communicate with TMC		1	2	4	
2. Area-wide Traffic Management and Information Center			5	2	
3. Information kiosks at top 50 activity centers		3		4	
4. Traveler information via TV	3	1	1	3	
5. Traveler information via radio	3	1	2	1	
6. Incident management program: • Incident response		7			
• Cellular service	2	4	1		
7. Areawide surveillance system • Freeways			4	3	
• Arterials			4	3	
• Integration			2	5	
8. Ground access improvements at major activity centers	1	1		4	1
9. Interagency communications system for incident management		6	1		
10. "Yellow Pages" traveler information service • Interactive		2	2	3	
• CD ROMs		2	3	2	
11. Ramp metering			3		3
12. Media ATIS services • CATV		3	2	1	1
• Computer BBS/Internet		3	2	1	1
13. Vehicle emissions monitoring • In-vehicle			1	3	3
• Roadside			2	2	3
• LIDAR			1	2	4
14. Pollution control strategies			1	5	1
15. Interagency transportation management center		2	2	3	
16. Signal priority/preemption • Emergency services	4		1	1	1
• Transit services			1	2	4

[a]   Number of focus group members indicating each deployment schedule category.

Table 5. Travel and Transportation Management Needs Assessment. (continued)

Need	Deployment Schedule[a]				
	In Progress	Short Range (0-2 years)	Medium Range (2-5 years)	Long Range (5+ years)	Not Applicable
17. Areawide communications master plan		3	1	3	
18. Traveler information dissemination: • CMS		2	2	3	
• Portable CMS		2	4	1	
• Radio	2	2	2	1	
19. Special events management plans	1	4	2		
20. Arterial signal system improvements	3	1	3		
21. Public-private partnerships in ATIS			5	1	1
22. Transit preference treatments			1	3	3
23. Intermodal coordination		3	1	2	1
24. Education programs: - Transportation safety	2	3	2		
• Incident management		5	2		
• Fuel-efficient driver practices			5	1	1
• Emission-related processes			1	5	1
25. Alternative fuels	1		2	2	2
26. Alternative vehicles	1			4	2
27. Improved signage to tourist/recreational sites	1	3			3
28. Improved on-board vehicle system monitoring			2	3	2
29. Improved vehicle control capability			1	3	3
30. Increased highway capacity	4	2		1	
31. Improved HAZMAT incident response	3	2	1	1	
32. Improve transit schedule adherence	2	4			1
33. Improved availability of communications devices	2	4			1
34. Areawide signing and striping data base	1	2		1	3
35. Weather detection system	1	1			1
36. Work zone and road closure information			1		

[a]   Number of focus group members indicating each deployment schedule category.

Table 6. Travel Demand Management Needs Assessment.

Need	Deployment Schedule[a]				
	In Progress	Short Range (O-2 years)	Medium Range (2-5 years)	Long Range (5 + years).	Not Applicable
1. Information kiosks at top 50 activity centers		3		4	
2. Areawide surveillance system: Freeways			4	3	
• Arterials			4	3	
• Integration			2	5	
3. Media ATIS Services: CATV		3	2	1	1
• Computer BBS/Internet		3	2	1	1
4. Interagency coordination among transit operators	2	2	2	1	
5. HOV facilities			1	5	1
6. Automatic vehicle identification (AVI)			1	6	
7. Signal priority/preemption for transit services			1	2	4
8. TDM Policy: Telecommuting		4	1	1	1
• Ridesharing		4	1	1	1
. Variable work hours	3	1		2	1
• Congestion pricing			3	1	3
• Parking Management		2	1	1	3
• Reversible lanes	3	1	1		2
9. Special events management plans	1	4	2		
10. Public-private partnerships in ATIS			5	1	1
11. Transit preferential treatments			1	3	3
12. Intermodal coordination		3	1	2	1
13. Land use/transportation planning process policy	5	2			
14. Fixed transit connecting major activity centers	4		1		2
15. Improved signage to tourists/recreational sites	1	3			3
16. Increased average vehicle occupancy		3	2	1	1
17. Improved transit schedule adherence	2	4			1
18. Improved availability of communications devices	2	4			1
19. Work zone and road closure information			1		

[a]   Number of focus group members indicating each deployment schedule category.

A Traffic Management Focus Group was organized to assist the study team with the needs assessment. The focus group was composed of the following individuals who are responsible for traffic control systems on the priority corridors (3) in the Omaha metropolitan area:

- Ron Dooley, Traffic Control Engineer, Traffic Engineering Division, NDOR
- Ken Gottula, Division Engineer, Traffic Engineering Division, NDOR
- Glenn Hansen, Traffic Signal Systems Engineer, City of Omaha
- John Jacobsen, District Engineer, District 2, NDOR
- Charles Krajicek, City Traffic Engineer, City of Omaha
- Blake Redfield, Traffic Supervisor, City of Council Bluffs
- Greg Reeder, City Engineer, City of Council Bluffs

The lists of needs, including the deployment schedule, were discussed with the members of the Traffic Management Focus Group on May 18, 1995. The members were then asked to assess the relative importance of the needs with respect to the deployment schedule,

The results of focus group's needs assessment are shown in Tables 5 and 6. The number of members who indicated each deployment schedule category is shown for each need. Agreement among the members was unanimous, or nearly unanimous, with respect to the short-term needs for incident management, interagency communications during incident management, and incident management education programs. General agreement was also found with respect to the medium- to long-range needs for areawide freeway and arterial street surveillance systems and for an areawide traffic management and information center. The needs associated with traveler information systems were viewed by the members as applicable, but the deployment schedule indicated by the members ranged from short- to long-term. The needs associated with HOV facilities and AVI were viewed by the members as being long-term. The needs related to emissions testing and monitoring were most often viewed as being long-term or not applicable.

The results of the needs assessment by the Traffic Management Focus Group indicate that, except for Emissions Testing and Mitigation, all of the user services in the Travel and Transportation Management and Travel Demand Management user service bundles are applicable to the Omaha metropolitan area. The most applicable users services are:

- Short-Term:
    - Incident Management
    - Ride Matching and Reservation
    - Traffic Control (Basic)
- Medium-Term:
    - En-Route Driver Information
    - Traveler Information Services
    - Pre-Trip Travel Information
    - Traffic Control (Adaptive)
- Long-Term
    - Route Guidance
    - Traffic Control (Smart)
    - Demand Management and Operations

5.   PUBLIC TRANSPORTATION OPERATIONS AND ELECTRONIC PAYMENT

5.1   Perspectives on User Services

Perspectives on the needs for user services in the area of passenger transportation vary considerably among various segments of residents in the Omaha metropolitan area. Hence, in an effort to secure a range of opinions the study team sought opinions from:

- service providers,
- business representatives and employers,
- current transit users and nonusers, and

To review transportation needs from the perspective of service providers, the study team visited with representatives of the Metro Area Transit (MAT) and its citizen advisory board. Members also met with the operator of the largest taxi fleets in the Omaha metropolitan area. To begin to understand the perspective of the business community, the study team met with members of the Omaha Chamber of Commerce transportation committee, a representative of the Council Bluffs Chamber of Commerce, and the manager of the Mall of the Bluffs. In addition, the team conducted a survey of the 100 largest employers in the metropolitan area. The airport represents both a trip generator and an employer. The team visited with a representative of the airport authority. The perspective of transit users was provided by several members of the MAT citizen advisory board. In addition, the study team conducted an intercept survey of bus riders at two transfer points in Omaha. Non-transit users who work downtown were also interviewed in an intercept survey.

Most residents would agree that the metropolitan area is primarily oriented to the automobile. Personal preference toward the single-occupant automobile is reinforced by the scattered development pattern in the metropolitan area and by the relative convenience of automobile travel. New firms are locating on the periphery of the metropolitan area where it is not economically feasible to extend bus routes. Where the bus does operate, MAT services ceases in early evening. Hence, bus travel is not possible for the minimum wage workers on round-the-clock shifts. Taxi service is expanding and increasing in efficiency, but the fares which must be charged to cover operations cost price out a sizable proportion of the population that would otherwise be transit dependent. New homes are being constructed in areas where population density is insufficient to support conventional fixed-route transit. New tourist attractions are developing in Council Bluffs outside the boundaries of the current transit route system. Although some workers complain about the cost of parking in downtown Omaha, there still is adequate parking for an average of $1.75 to $2.50 a day, and a large number of firms offer free parking. Besides, the size of the metropolitan area still allows for relatively short 20- to 30- minute commutes by car.

Nevertheless, the various groups did indicate areas of need that might be addressed by ITS user services.

5.1.1 Service Providers

The service providers were most interested in improving the efficiency and effectiveness of their operations. The concept of tracking vehicles is of interest to MAT, which could then increase schedule adherence and affect more timely transfers. For paratransit and taxi services, the interest is in reducing the time spent in dispatching and increasing the opportunity to insert trips. These needs can be addressed through the user services associated with transportation systems management. The potential technologies would be automated vehicle location (AVL) and dynamic scheduling. An add-on to the AVL tracking program would be a silent alarm that would allow the drivers to have access to emergency help.

Data generated from a tracking or a computer scheduling program could also help with maintenance scheduling and operational adjustments. The taxi company is interested in developing some type of shared-ride service that could operate on the fringes of the metropolitan area. Such a concept could be explored using computer scheduling. Vehicle tracking would make transfers to fixed-route vehicles efficient and reliable.

5.1.2 Business Representatives

Input from a group from the Transportation Council of the Omaha Chamber of Commerce as well representatives of the Council Bluffs Chamber of Commerce, the Mall of the Bluffs, and Eppley Airfield, underscore the need for increased communications regarding alternative transportation modes. The expectation is that information sources could be coupled with real-time information reporting congestion levels. Both commuters and tourists could benefit from new sources of information. Some business people suggest videotext (computer on-line) information that could be reviewed at home and be used to generate dynamic car pools. There was more interest in information kiosks which could provide static information as well as real-time information to out-of-town visitors as well as to occasional users of transit. With increasing levels of tourists to casinos and sports facilities in Council Bluffs and to the stadium and zoo in Omaha, there is considerable interest in informational kiosks that could supply bus route information as well as information on local businesses in a type of electronic yellow pages. By having more information about where to find attractions and shopping opportunities, visitors would be able to more easily find their way around the city.

Similar information kiosks could assist the increasing number of patrons using the airport. Ridership has gone up 25 % since lower cost airlines joined the mix of air companies serving Omaha, and many of these new riders are unfamiliar with the attractions in the area or with potential transit services. These needs can be addressed through the user services associated with en-route transit information.

5.1.3 Transit Users

Transit users included in the MAT citizen advisory board indicate the need for expanded service and increased schedules to serve the far-flung city. They also indicate the problems associated with interjurisdictional service contracts and negative perceptions which choice

riders might hold of the existing bus service.   A number of their concerns are outside the purview of this ITS study.   Several issues, however, can potentially be addressed by ITS technology. These concerns include:

1. routing and scheduling;
2. difficulties in timing of transfers;
3. the need for some type of feeder system that would serve travelers beyond existing MAT routes;
4. safety concerns, as some passengers are wary of other passengers;
5. congestion on Dodge Street, which continues all day and slows buses as well as automobiles;
6. buses need to move quickly than cars along key corridors in order to offer an incentive to ride;
7. bus signage, a particular concern for the disabled;
8. need for increased education about bus options; and
9. travelers don't want to be reminded of costs, and some do not have correct change.

MAT could be assisted in responding to issues associated with routing and scheduling and in assuring on-time transfers by installing an automatic vehicle location (AVL) system. This would also assure reliable transfers that are necessary to insure an effective feeder system. A silent alarm, linked to an AVL system, would help with the safety issue by pin-pointing a location for emergency vehicles.

Concern about congestion and the need to move buses through the congestion could be addressed by signal prioritization. Signage and information about bus service would be the focus for ATIS (Advanced Transportation Information Systems), both pre-trip and en-route. Smart cards would answer the problems related to fare payment.

An intercept survey of bus patrons provided additional information about interests and needs of transit users.   A group of 33 bus riders were interviewed at bus transfer points (Crossroads Shopping Center and 16th Street) on two weekdays in June. Their responses are as follows:

1. Of these riders, 75 percent use MAT daily, 9 percent use it weekly, and 16 percent use it occasionally.

2. Most (55 percent) use the bus to get to work, but 18 percent use it for shopping, 11 percent for getting to school, 9 percent for recreational purposes, and 7 percent for other purposes.

3. Not surprisingly, 85 percent of the riders interviewed at these locations were waiting to transfer to another bus.

4. Although 60 percent of the riders interviewed do not have an automobile available for the trip, 40 percent have an automobile available and still elect to ride the bus. None of those interviewed had used the park and ride lots.

5. When asked how they would find out information about which bus to take to an unfamiliar location, 49 percent said that they would call MAT, 34 percent said they would look at printed schedules, 9 percent would read information at bus stops, 6 percent would ask bus drivers, and 2 percent would ask a friend or acquaintance.

6. Only 20 percent of the riders interviewed use passes.

7. When asked "What is the most important issue for commuters in the Omaha metro area?" these respondents commented: limited bus service for late shifts, long walks to bus stops, frequency of service, need for on-time service, need for more service on week ends and midday, and transfer problems.

8. When asked specifically about issues for transit users, they provided similar responses. Several also noted unfriendly bus drivers, infrequent service in midday, the length of the routes, and not having change available for fares.

ITS cannot respond to all these issues, but it can help in adjusting routes and schedules, timing transfers, and in fare payment systems.

5.1.4 Non-Transit Users

Two clusters of workers were interviewed downtown. One set of young workers were on break outside a firm on 16th Street, and the others were middle aged workers outside Union Pacific headquarters. They were asked how they travel to work. They all drive their own automobiles. When asked about issues confronting travelers, they noted congestion and the cost of parking downtown. Their estimates on the cost of parking downtown range from $1.75 to $2.50 a day. Several of the younger workers said they park a long distance from their work site to save on parking costs. Of all the workers interviewed, only one said that he car-pools and that was with his wife who gets free parking at her place of work. Although all these workers could have taken the bus, none do. One worker said that there is no route connecting his place of work with his home in eastern Council Bluffs. The others prefer the convenience of having a personal automobile available, especially for the trip home. The young people cited their negative perceptions regarding the image of bus travel.

Parking problems downtown are outside the realm of ITS, but the discussion of parking does bring to mind the need to review changes to passenger transportation systems in the context of relatively low cost or free parking near business sites. Although residents complain about parking problems downtown, there still is parking available and no strong consistent disincentive to driving alone.

5.2 Applicable User Services

Perceptions of passenger transportation needs and priorities vary considerably among these various groups of respondents. A number of the issues raised would be part of an overall assessment of transportation needs in the metropolitan area, but are outside the realm of the user services included in ITS. Those needs that can be addressed through the ITS user services bundles include:

- the need for en-route information on travel options and trip planning,
- the need for reduced travel time as an incentive to using transit,
- the need for increased transit service reliability and efficiency,
- the need for efficient and timely transfers between and within modes,
- the need for increased safety and security on transit vehicles, and
- the need for convenient fare payment mechanisms.

These needs relate to the following user services:

- Public Transportation Management
- En-route Transit Information
- Public Travel Security
- Electronic Payment Services

The feeder transit concept discussed as a way of addressing the needs of travelers in the less densely populated areas is related to the Personalized Public Transit user service.

6. COMMERCIAL VEHICLE OPERATIONS

The evaluation of the applicability of the user services in the Commercial Vehicle Operations (CVO) user service bundle with respect to the needs of CVO in the Omaha metropolitan area was based on the following sources of information:

- results of a survey of motor carriers conducted by the Nebraska Motor Carriers Association to obtain information on CVO for the inventory of existing conditions reported in the *EDP study Inventory Report* (3) and

- meetings with the CVO Focus Group.

The results of the survey of motor carriers indicated that several motor carriers are using ITS technologies, such as vehicle tracking, vehicle performance monitoring, and computer-aided dispatching. However, the motor carriers do not generally recognize these technologies as ITS technologies. Also, it was discovered that the focus of ITS in the area of CVO has been on intercity and interstate CVO. No information on ITS applications relative to intracity CVO was found by the study team. Therefore, the study team decided to organize a focus group composed of representatives of motor carriers in the Omaha metropolitan area for the purpose of identifying the needs of CVO within the metropolitan area that might be addressed by ITS user services.

The following individuals were members of the focus group:

- Jim Caputa, Roberts Dairy
- Kevin Schmidt, Lyman-Richey Corporation
- Ed Trout, Cornhusker Motor Line
- Jerry Noel, Wheeler Transport
- Jim Fowler, Willen Company
- David Carrington, Warren Distribution
- Dick Pierson, BEE Line
- Roy Ryscamp, United Parcel Service

Two focus group meetings were held on April 6 and 20, 1995. The purpose of the meetings was to: (1) inform the focus group about the EDP study and ITS user services pertinent to motor carrier operations and (2) solicit input on the needs of CVO in the Omaha metropolitan area relative to ITS user services. The needs of CVO related to intercity and interstate travel were outside the scope of the discussion.

6.1   Needs

The needs expressed by the CVO Focus Group were the following:

- Participation by motor carriers in ITS must be voluntarily.

- Radio station dedicated to traffic information would be useful.

- Traffic and route guidance information provided by work zone signing and commercial radio lack timeliness and credibility.

- Reliable information is already available to truckers via CB channel 19; this is what truckers listen to and believe regarding traffic and roadway conditions.

- Route guidance information on alternate routes during street closures is inadequate and often does not consider the requirements of trucks (e.g., turning radii, grades, erc.).

- Response agencies need a coordinated plan of action to respond to incidents on the roadways. Also, the agencies need education on the proper response methods, especially regarding hazardous materials.   Drivers observe mistakes during the removal of hazardous materials, but no one seems to listen to them.

- Traffic signals need to be coordinated better on West Maple Road.

- There should be one number to call for traffic and roadway information and, like "911," it should be the same number in all cities.

- The basic non-ITS system of roadway signing would be adequate if it were done properly (i.e., signing that provided accurate and timely information); but, it is seldom done properly. Therefore, why should we believe that the highway people can do any better with more sophisticated systems like ITS?

a Changeable message signs should be used only at uncongested locations. They are no good where there is congestion, because truck drivers cannot take their eyes off the road long enough to read them. Radio would be much better.

In summarizing the discussion, Charles Bacon, President of the Nebraska Motor Carriers Association and member of the study team, thought that two major points were being expressed: (1) better coordination is needed among the various transportation agencies and (2) the traffic and roadway information provided must be more accurate and more timely.

6.2 Applicable User Services

A comparison of the needs expressed by the CVO Focus Group with the descriptions of the user services indicated that the following user services in the CVO user service bundle were applicable to the needs of CVO in the Omaha metropolitan area:

- Hazardous Material Incident Management
- Freight Mobility

In addition, the following user services in the Travel and Transportation Management user service bundle also address some of the needs of CVO in the Omaha metropolitan area:

- En-Route Driver Information
- Route Guidance
- Traffic Control
- Incident Management

7. EMERGENCY MANAGEMENT

As a result of the findings of the analysis of incident management reported in the *EDP study Inventory Report* (3), a focus group was formed to more clearly define the needs and opportunities for ITS user services in the Emergency Management user service bundle. Members of the focus group were:

- Bob Bosiljevac, Omaha Fire Department
- Marvin Lech, District 2, NDOR
- Dennis McCann, Omaha 911
- Jack Mielke, FHWA
- Paul Mullen, MAPA
- Jim Parish, Nebraska State Patrol
- Bob Rockwell-, Omaha Police Department
- Erik Swanson, Douglas County Emergency Management Agency

The group held four meetings on April 19, April 28, May 3, and June 7, 1995. The purpose of these meetings was to: (1) discuss the relationship between the EDP study and the establishment of an incident management program in the Omaha metropolitan area, (2) examine the potential benefits of incident management, and (3) evaluate the applicability of ITS user services. The primary objective of the focus group was to establish an incident management program. A secondary objective of the focus group was to determine the applicability of ITS user services. Consequently, the focus group meetings included discussions of non-ITS incident management measures as well as ITS user services.

7.1 Potential Benefits

One of the first topics of discussion was the potential benefits of incident management. Although the members of the focus group believed in the importance of incident management, it was necessary for them to justify to their supervisors that they should continue to participate in the activities of the focus group. The analysis of the potential benefits of freeway incident management presented in the *Inventory Report (3)* indicated that the annual delay cost savings to road users would be about $1.5 million per year. Using the same incident data, the focus group estimated that freeway incident management could also provide an annual accident cost reduction of approximately $1 million per year. In addition, using on a 2-month sample of incident response reports from the computer files of the Omaha emergency telephone 911 system, the focus group estimated a potential savings in police response unit time of 1,000 hours per year. Based on these estimated benefits, the members were able to justify their continued membership in the focus group to their supervisors.

7.2 Incident Management Options

The focus group evaluated the 45 freeway incident management options that were presented in the *FHWA Incident Management Workshop (5)*, which was presented in Omaha in April, 1993. A summary of the focus group discussions relative to the evaluation of the 45 freeway incident management options is presented in Appendix C-2. The results of the evaluation were used to establish priorities for the development of an incident management program and to provide a basis for the determination applicable ITS user services. The options were sorted into the following implementation categories:

- Options that should be implemented immediately.
- Options that should be implemented in the future.
- Options that have already been implemented.
- Options that are not applicable.

Nine of the 45 options were determined to have already been implemented in the Omaha metropolitan area Therefore, these options were excluded from further consideration. The nine options classified as having already been implemented are the following:

- Command Post
- Equipment and Materials List
- Hazardous Materials Manual
- Improved Media Ties
- Inflatable Air Bag Systems
- Ordinances Governing Travel on Shoulder
- Ties with Transit/Taxi Companies
- Tow Truck/Removal Crane Contracts
- Variable Lane Closure

Eleven of the 45 options were determined to be not applicable in the Omaha metropolitan area. Therefore, these options were also excluded from further consideration. The 11 options classified as being not applicable are the following:

- Aircraft Patrol
- Citizen's Band (CB) Radio Monitoring
- Externally Linked Route Guidance (ELRG) Systems
- Flashing Lights Policy
- Highway Advisory Radio
- Identification Arm Bands
- Incident Phone Lines
- Motorist Aid Call Boxes/Telephones
- Peak Period Motorcycle Patrols
- Radio Data Systems (RDS)
- Volunteer Watch

Fourteen of the 45 options were determined to be options that should be implemented immediately. These options are:

- Administrative Traffic Management Teams (i. e. , Incident Management Team)
- Alternative Route Planning
- Cellular Telephone (i. e. , incident reporting procedure brochure for cellular telephone users)
- Closely Spaced Reference Markers
- Dedicated Freeway/Service Patrols
- Emergency Vehicle Access
- Identification of Fire Hydrant Locations
- Improved Interagency Radio Communication
- Personnel Resource List
- Policy Requiring Fast Vehicle Removal
- Public Education Programs
- Push Bumpers
- Total Station Surveying Equipment
- Variable Message Signs

The remaining 11 options were classified as options that should be implemented in the future. These options are:

- Accident Investigation Sites
- Central Information Processing and Control Site
- Electronic Loop Detection
- Equipment Storage Sites
- Incident Response Manual
- Incident Response Team (i.e., interdisciplinary team trained in handling large incidents)
- Personnel Training Programs
- Properly Defined Parking for Response Vehicles
- Properly Defined Traffic Control Techniques
- Responsive Traffic Control Systems
- Video and Closed Circuit TV

After the options were classified, the focus group prioritized the options that were classified as those that should be implemented. The prioritization of these options is shown in Table 7. Emergency Vehicle Access, Dedicated Freeway/Service Patrols, Closely Spaced Reference Markers, and Personnel Resource List were determined to be the four highest priority options among those that should be implemented immediately. Incident Response Manual, Equipment Storage Sites, Central Information Processing and Control Site, and Incident Response Team for Major Incidents were determined to be the four highest priority options among those that should be implemented in the future.

Table 7. Prioritization of Implementable Incident Management Options.

Options	Priority Ranking
Options That Should Be Implemented Immediately	
Emergency Vehicle Access	1
Dedicated Freeway/Service Patrols	2
Closely Spaced Reference Markers	3
Personnel Resource List	4
Administrative Traffic (Incident) Management Teams	5
Identification of Fire Hydrant Locations	5
Improved Interagency Radio Communication	7
Variable Message Signs	8
Cellular Telephone (Incident Reporting Procedure)	9
Total Station Surveying Equipment	10
Alternative Route q	11
Public Education Programs	12
Policy Requiring Fast Vehicle Removal	13
Push Bumpers	14
Options That Should Be Implemented In The Future	
Incident Response Manual	1
Equipment Storage Sites	2
Central Information Processing and Control Site	3
Incident Response Team (Major Incidents)	4
Personnel Training Programs	5
Properly Defined Traffic Control Techniques	5
Properly Defined Parking for Response Vehicles	7

Table 7. Prioritization of Implementable Incident Management Options (continued).

Options	Priority Ranking
Responsive Traffic Control Systems	7
Accident Investigation Sites	9
Video and Closed Circuit TV	10
Electronic Loop Detection	11

7.3 Applicable User Services

Ten of the 25 options listed in Table 7 involve some of the functional areas of ITS technologies shown in Table 3 as being associated with the user services of incident management and emergency vehicle management. These 10 options are:

- Alternative Route Planning
- Cellular Telephone
- Dedicated Freeway/Service Patrols
- Improved Interagency Radio Communications
- Total Station Surveying Equipment
- Variable Message Signs
- Central Information Processing and Control Site
- Electronic Loop Detection
- Responsive Traffic Control
- Video and Closed Circuit TV

Therefore, it is concluded that Incident Management and Emergency Vehicle Management are applicable user services in the Omaha metropolitan area.

8.   APPLICABLE USER SERVICES

Based on the evaluation of the 22 user services within the scope of this study, which are shown in Table 1, 16 of them were determined to be applicable in the Omaha metropolitan area.   The 16 applicable user services are shown in Table 8. These 16 user services were determined to be applicable user services based on the analysis ITS goals and objectives presented in Section 3 and the assessment of needs described in Sections 4, 5, 6, and 7.   It was determined that these 16 user services: (1) support the ITS goals and objectives in the Omaha metropolitan area and (2) address the transportation needs in the Omaha metropolitan area.   They will provide the basis for the development of deployment scenarios in the next phase of the EDP study.

Table 8. User Services Applicable in the Omaha Metropolitan Area.

Bundle	User Service
1. Travel and Transportation Management	1. En-Route Driver Information 2. Route Guidance 3. Travel Services Information 4. Traffic Control 5. Incident Management
2. Travel Demand Management	1. Demand Management and Operations 2. Pre-Trip Information 3. Ride Matching and Reservation
3. Public Transportation Operations	1. Public Transportation Management 2. En-Route Transit Information 3. Personalized Public Transit 4. Public Security
4. Electronic Payment	1. Electronic Payment Services
5. Commercial Vehicle Operations	5. Hazardous Material Incident Response 6. Freight Mobility
6. Emergency Management	2. Emergency Vehicle Management

REFERENCES

1. *National ITS Program Plan, Intelligent Transportation Systems.* Volumes I and II. First Edition. ITS America, Washington, D.C. March, 1995.

2. G.P. Scholz. *Analysis of Existing Goals Statements from Planning Documents of Organizations Relevant to the Omaha Metropolitan Area ITS Early Deployment Planning Study.* University of Nebraska-Lincoln, Lincoln, Nebraska. April 6, 1995.

3. *Inventory Report-Omaha Metropolitan Area ITS Planning Study.* University of Nebraska-Lincoln, Lincoln, Nebraska. April 28, 1995.

4. *Core ITS Infrastructure Elements* for *Metropolitan Area ATMS/ATIS Deployment.* Federal Highway Administration, U.S. Department of Transportation, Washington, D.C. March, 1995.

5. J. Koehne, F.L. Mannering, and M.E. Hallenbeck. *Framework for Developing Incident Management Systems.* Washington State Transportation Center, University of Washington, Seattle, Washington. August, 1991.

APPENDIX C-1
**Relationships Between User Services and
National and Local ITS Goals and Objectives**

1. Safety

Goals and Objectives	Travel and Transportation Management						Travel Demand Management		
	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
A. National ITS Program									
• Reduce frequency of accidents	■	■		■	■		■	■	
• Reduce severity of accidents	■	■		■	■				
B. Omaha Metropolitan Area ITS Program									
• Reduce accidents at railroad crossings				■	■		■		
• Eliminate geometric deficiencies on State highways	■						■		
• Complete expressways identified in NDOR Needs Study		■					■		
• Provide lighting at rural highway intersections				■					
• Develop safety management system to address legal issues to monitor offenders of traffic laws									
• Develop safety education program				■	■				
• Prepare HAZMAT policies and guidelines					■				

2. Operational Efficiency and Capacity

Goals and Objectives	Travel and Transportation Management						Travel Demand Management		
	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
A. National ITS Program									
• Increase capacity of transportation system	■	■	■	■	■		■	■	■
• Reduce congestion due to incidents	■	■		■	■			■	
• Improve transportation customer service	■	■		■				■	■
B. Omaha Metropolitan Area ITS Program									
• Develop incident management system	■	■		■	■			■	
• Assess public transportation needs and develop program			■	■		■	■		■
• Preserve rail service or rail corridors				■			■		
• Implement, as feasible, the intercity bus plan							■		
• Develop commuter ride-sharing program					■	■	■	■	■
• Promote telecommuting							■	■	
• Promote intermodal coordination/system enhancements			■	■			■	■	
• Improve transportation management programs	■	■	■	■	■		■	■	
• Protect and promote land use plan/transportation facilities relationships							■		
• Promote alternative modes of transportation							■	■	■

Travel and Transportation Management | **Travel Demand Management**

Goals and Objectives	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
3. Energy and Environmental Costs									
A. National ITS Program									
• Reduce harmful emissions per unit of travel	■	■	■	■	■	■	■	■	■
• Reduce energy consumption per unit of travel	■	■	■	■	■		■	■	■
• Reduce new right-of-way requirements	■	■	■	■	■		■	■	■
B. Omaha Metropolitan Area ITS Program									
• Promote alternative fuels and vehicles	■					■	■	■	■
• Improve fuel efficient driver practices through education			■		■	■	■		
• Include in future development, provisions for bicycles, pedestrians, and mass transit				■			■		
• Conduct study of the feasibility of fixed transit system connecting major activity centers				■			■		

Goals and Objectives	Travel and Transportation Management						Travel Demand Management		
	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
A. National ITS Program									
• Reduce costs incurred by fleet operators and others	■	■		■	■				
• Reduce travel time	■	■		■	■		■	■	■
• Improve transportation systems planning and management				■					
B. Omaha Metropolitan Area ITS Program									
• Apply electronic technology to improve motor carrier movement	■	■						■	
• Enhance record keeping and filing process with government									
• Develop process to improve traffic flow of commercial vehicles	■	■	■	■	■			■	
• Promote and develop interagency coordination process			■	■	■			■	
• Improve efficiency of intermodal transportation			■	■			■	■	
• Promote and protect land development/transportation facilities relationship							■		

48

Goals and Objectives	Travel and Transportation Management						Travel Demand Management		
	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
A. National ITS Program									
• Enhance traveler security			■						
• Reduce travel stress	■	■		■	■		■	■	■
• Improve accessibility to transportation	■	■					■	■	■
B. Omaha Metropolitan Area ITS Program									
• Enhance attraction of historical, recreational and tourism facilities via improved measures such as signing		■	■						
• Assess needs and develop a program for public transportation/paratransit							■		■
• Develop program to encourage ridesharing/telecommuting							■	■	■
• Develop strategy to preserve rail service and rail corridors				■			■		
• Adhere to and promote ADA guidelines in all transportation modes				■					■
• Assess need for HOV facilities							■		
• Include in future development provisions for bicycles and pedestrians				■			■		
• Conduct feasibility study of fixed transit system connecting major activity centers				■			■		
• Examine feasibility of MAT and shuttle connectivity when appropriate						■	■		
• Assess facility needs at bus shelters such as light, heat, kiosks, and phone		■						■	

5. Mobility and Convenience

6. Development and Deployment of ITS

Goals and Objectives	Travel and Transportation Management						Travel Demand Management		
	En-Route Driver Information	Route Guidance	Travel Services Information	Traffic Control	Incident Management	Emissions Testing and Mitigation	Travel Demand Management	Pre-Trip Travel Information	Ride Matching & Reservation
A. National ITS Program									
• Create an environment in which development and deployment of ITS can flourish	■	■	■	■	■	■	■	■	■
B. Omaha Metropolitan Area ITS Program									
• Resolve transportation issues through increased coordination among agencies			■	■	■			■	
• Develop incident management program	■	■		■	■			■	
• Develop effective process to provide efficient and uninterrupted traffic flow for commercial vehicles	■	■	■	■	■			■	
• Expedite implementation of successful research and share findings	■		■	■	■		■	■	■

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
1. Safety					
A. National ITS Program					
• Reduce frequency of accidents					
• Reduce severity of accidents	■			■	
B. Omaha Metropolitan Area ITS Program					
• Reduce accidents at railroad crossings					
• Eliminate geometric deficiencies on State highways					
• Complete expressways identified in NDOR Needs Study					
• Provide lighting at rural highway intersections					
• Develop safety management system to address legal issues to monitor offenders of traffic laws					
• Develop safety education program	■			■	
• Prepare HAZMAT policies and guidelines					

2. Operational Efficiency and Capacity

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
A. National ITS Program					
• Increase capacity of transportation system	■	■	■		■
• Reduce congestion due to incidents	■				■
• Improve transportation customer service	■	■	■	■	■
B. Omaha Metropolitan Area ITS Program					
• Develop incident management system	■				
• Assess public transportation needs and develop program	■		■	■	■
• Preserve rail service or rail corridors					
• Implement, as feasible, the intercity bus plan	■				
• Develop commuter ride-sharing program	■	■	■		
• Promote telecommuting					
• Promote intermodal coordination/system enhancements	■	■	■		■
• Improve transportation management programs	■		■	■	■
• Protect and promote land use plan/transportation facilities relationships	■		■		
• Promote alternative modes of transportation	■	■	■		■

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
3. Energy and Environmental Costs					
A. National ITS Program					
• Reduce harmful emissions per unit of travel	■	■	■		
• Reduce energy consumption per unit of travel	■	■			
• Reduce new right-of-way requirements	■				
B. Omaha Metropolitan Area ITS Program					
• Promote alternative fuels and vehicles					
• Improve fuel efficient driver practices through education					
• Include in future development, provisions for bicycles, pedestrians, and mass transit	■	■	■	■	
• Conduct study of the feasibility of fixed transit system connecting major activity centers					

4. Productivity

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
A. National ITS Program					
• Reduce costs incurred by fleet operators and others	■				■
• Reduce travel time	■	■	■	■	■
• Improve transportation systems planning and management	■				■
B. Omaha Metropolitan Area ITS Program					
• Apply electronic technology to improve motor carrier movement	■				■
• Enhance record keeping and filing process with government	■				■
• Develop process to improve traffic flow of commercial vehicles	■				
• Promote and develop interagency coordination process	■			■	■
• Improve efficiency of intermodal transportation	■	■	■		■
• Promote and protect land development/transportation facilities relationship	■		I		

5. Mobility and Convenience

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
A. National ITS Program					
• Enhance traveler security				■	■
- Reduce travel stress	■	■	■		■
- Improve accessibility to transportation	■	■	■		■
B. Omaha Metropolitan Area ITS Program					
- Enhance attraction of historical, recreational and tourism facilities via improved measures such as signing		■			
• Assess needs and develop a program for public transportation/paratransit	■		■		■
- Develop program to encourage ridesharing/telecommuting			□		
• Develop strategy to preserve rail service and rail corridors					
- Adhere to and promote ADA guidelines in all transportation modes	■	■	■		■
- Assess need for HOV facilities	-				
- Include in future development provisions for bicycles and pedestrians			■		
• Conduct feasibility study of fixed transit system connecting major activity centers	■	■			
• Examine feasibility of MAT and shuttle connectivity when appropriate	■	■	■		
• Assess facility needs at bus shelters such as light, heat, kiosks, and phone	■	■	■	■	■

Goals and Objectives	Public Transportation Operations				Electronic Payment
	Public Transportation Management	En-Route Transit Information	Personalized Transit Information	Public Travel Security	Electronic Payment Services
6. Development and Deployment of ITS					
A. National ITS Program					
- Create an environment in which development and deployment of ITS can flourish	■	■	■	■	■
B. Omaha Metropolitan Area ITS Program					
. Resolve transportation issues through increased coordination among agencies	■		□	■	■
. Develop incident management program	■				
. Develop effective process to provide efficient and uninterrupted traffic flow for commercial vehicles	■			✐	
- Expedite implementation of successful research and share findings	■			■	

Goals and Objectives	Commercial Vehicle Operations						Emergency Management	
	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Security	Emergency Vehicle Management
1. Safety								
A. National ITS Program								
• Reduce frequency of accidents	■							
• Reduce severity of accidents		■	■		■		■	■
B. Omaha Metropolitan Area ITS Program								
• Reduce accidents at railroad crossings		■			■			
• Eliminate geometric deficiencies on State highways						■		
• Complete expressways identified in NDOR Needs Study						■		
• Provide lighting at rural highway intersections								
• Develop safety management system to address legal issues to monitor offenders of traffic laws								
• Develop safety education program							■	
• Prepare HAZMAT policies and guidelines		■	■	■	■		■	■

| | Commercial Vehicle Operations | | | | | | Emergency Management | |
Goals and Objectives	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Security	Emergency Vehicle Management
2. Operational Efficiency and Capacity								
A. National ITS Program								
• Increase capacity of transportation system	■					♦		
- Reduce congestion due to incidents					■	■	□	■
• Improve transportation customer service						■		
B. Omaha Metropolitan Area ITS Program								
- Develop incident management system			■		■	■	■	■
- Assess public transportation needs and develop program								
• Preserve rail service or rail corridors								
- Implement, as feasible, the intercity bus plan								
- Develop commuter ride-sharing program								
- Promote telecommuting								
- Promote intermodal coordination/system enhancements				■		■		■
• Improve transportation management programs	■					■		■
• Protect and promote land use plan/transportation facilities relationships						■		
• Promote alternative modes of transportation								

3. Energy and Environmental Costs

Goals and Objectives	Commercial Vehicle Operations						Emergency Management	
	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Safety	Emergency Vehicle Management
A. National ITS Program								
• Reduce harmful emissions per unit of travel	□	■				■		
• Reduce energy consumption per unit of travel	□					■		
• Reduce new right-of-way requirements	□					■		
B. Omaha Metropolitan Area ITS Program								
• Promote alternative fuels and vehicles								
- Improve fuel efficient driver practices through education						■		
• Include in future developmenf provisions for bicycles, pedestrians, and masstransit								
- Conduct study of the feasibility of fixed transit system connecting major activity centers						■		

Goals and Objectives	Commercial Vehicle Operations						Emergency Management	
	Commercial Vehicle, Electronic. Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Security	Emergency Vehicle Management
4. Productivity								
A. National ITS Program								
- Reduce costs incurred by fleet operators and others	■	■		■		■		
- Reduce travel time	□	■				■		
- Improve transportation systems planning and management	■							
B. Omaha Metropolitan Area ITS Program								
- Apply electronic technology to improve motor carrier movement	■	□				■		
- Enhance record keeping and filing process with government	■	■		■				
- Develop process to improve traffic flow of commercial vehicles	■	■		■		■		
- Promote and develop interagency coordination process				■	□	■		■
- Improve efficiency of intermodal transportation						■		
- Promote and protect land development/transportation facilities relationship						■		

Goals and Objectives	Commercial Vehicle Operation						Emergency Management	
	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Security	Emergency Vehicle Management
5. Mobility and Convenience								
A. National ITS Program								
• Enhance traveler security							■	
• Reduce travel stress	■					□		
- Improve accessibility to transportation								
B. Omaha Metropolitan Area ITS Program								
• Enhance attraction of historical, recreational and tourism facilities via improved measures such as signing						□		
- Assess needs and develop a program for public transportation/paratansit								
• Develop program to encourage ridesharing/telecommuting								
• Develop strategy to preserve rail service and railcorridors								
• Adhere to and promote ADA guidelines in all transportation modes			■				■	
- Assess need for HOV facilities								
- Include in future development provisions for bicycles and pedestrians								
• Conduct feasibility study of fixed transit system connecting major activity centers						■		
• Examine feasibility of MAT and shuttle connectivity when appropriate								
• Assess facility needs at bus shelters such as light, heat, kiosks, and phone							■	

6. Development and Deployment of ITS

Goals and Objectives	Commercial Vehicle Operations						Emergency Management	
	Commercial Vehicle Electronic Clearance	Automated Roadside Safety Inspection	On-board Safety Monitoring	Commercial Vehicle Administrative Processes	Hazardous Material Incident Response	Freight Mobility	Emergency Notification & Personal Security	Emergency Vehicle Management
A. National ITS Porgram								
• Create an environment in which development and deployment of ITS can flourish	■	■	■	■	■	■	■	■
B. Omaha Metropolitan Area ITS Program								
• Resolve transportation issues through increased coordination among agencies				■	■	■		■
• Develop incident management program			■		■	■	■	■
• Develop effective process to provide efficient and uninterrupted traffic flow for commercial vehicles	■	■		■	■	■		
• Expedite implementation of successful research and share findings	■	■	■	■	■	■	■	■

APPENDIX C-2
Summary of Evaluation Discussions
of Incident Management Options
by the Emergency Management Focus Group

Accident Investigation Sites

Accident investigation sites would be beneficial. It would have been best if accident investigation sites would have been included in the design of the freeway. However, the planning necessary for the implementation of accident investigation sites could be done most effectively by an incident management team comprised of representatives of the response agencies (i.e., police, fire, rescue, and roads).

Administrative Traffic Management Teams

An incident management team is comprised of representatives of the response agencies (i.e., police, fire, rescue, and roads). An incident management team meets regularly to evaluate and improve the coordinated incident response of the agencies. It typically evolves from a task force which is usually set up to initiate an incident management system. In this evaluation, the term "incident management team" is used in place of the terms "administrative traffic management team" and "incident management task force. " Therefore, an incident management team should be formed to facilitate the implementation of an incident management system.

Aircraft Patrol

Aircraft patrol for the purpose of detecting freeway incidents is not needed in the Omaha metropolitan area.

Alternative Route Planning

Alternative route planning is definitely needed and would be very beneficial. It should be done as soon as possible.

Cellular Telephone

Cellular telephone users are already calling 911 to report freeway incidents. However, information on the correct procedure for reporting incidents should be disseminated to cellular telephone users. This could be done by preparing a brochure describing the procedure and asking the telephone companies to send it out to their customers with their monthly telephone bills. It is not necessary to establish a contract with cellular telephone

Citizen's Band (CB) Radio Monitoring

Citizen's band (CB) radio monitoring is not necessary, because cellular telephone users already provide an adequate level of freeway incident reporting by motorists.

Closely Spaced Milepost Markers

Something needs to done as soon as possible to help motorists report the locations of freeway incidents more accurately. Instead of milepost markers, street name signs may be more effective. A means of identifying interchange ramps and overpasses is also needed.

Command Post

Command posts are not needed for freeway incidents except in the case of major incidents involving hazardous materials. A procedure already exists for establishing command posts for hazardous materials incidents.

Dedicated Freeway/Service Patrols

Dedicated freeway/service patrols would be very beneficial. Their creation should be given early consideration in the process of establishing an freeway incident management system.

Electronic Loop Detection

Electronic loop detection would not be cost effective if used only for the purpose of incident detection. However, it would be a necessary component of a traffic-responsive freeway control and motorist information system that should be considered in the future.

Emergency Vehicle Access

This is definitely a problem that needs to be addressed as soon as possible, Individuals reporting incidents do not always adequately describe the incident locations so that the fire department can approach them on the proper side of the median. Therefore, the fire department needs more access points across the median along the freeway in order to reach incidents on the other side.

Equipment and Materials Resource List

Omaha 911 has an equipment and materials resource list. The list should be reviewed and updated as necessary and distributed to the response agencies.

Equipment Storage Sites

Equipment storage sites are not needed at the present time, but they may need to be considered in the future.

Externally Linked Route Guidance (ELRG) Systems

These systems are not practical at the present time, but they may be applicable in the future.

Flashing Lights Policy

Response agencies are reluctant not to use flashing lights because of liability and safety concerns. Therefore, a new flashing lights policy is not applicable in Omaha.

Hazardous Materials Manual

The response agencies already have a hazardous materials manual. A new manual is not needed.

Highway Advisory Radio

Highway advisory radio is not needed. The broadcast media is more effective. Therefore, the implementation of highway advisory radio would not be worthwhile.

Identification Arm Bands

Identification arm bands are not needed, because respondents wear uniforms.

Identification of Fire Hydrant Locations

Identification of fire hydrant locations along the freeway would be very beneficial. Access to fire hydrants located behind noise walls is a problem. The fire department and NDOR should study the problem and find ways to provide additional access to fire hydrants along the freeway.

Improved Interagency Radio Communication

Improved interagency radio communication is definitely needed. At the present time, the response agencies are not able to communicate with one another via two-radio. A system similar to the 800 mhz system installed in Sarpy County is needed in Omaha and Douglas County.

Improved Media Ties

An excellent relationship already exists with the media. Omaha 911 has a radio alert system which is used to inform the media of emergencies, and NDOR has a FAX system which is used to notify the media about road conditions.

Incident Phone Lines

Citizens currently report freeway incidents by calling 911, which is adequate. There is no need for an incident phone line.

Incident Response Manual

An incident response manual would be useful. It should be prepared in the future by an incident management team comprised of representatives of the response agencies *(i.e.,* police, fire, rescue, and roads).

Incident Response Teams

An incident response team is an interdisciplinary team trained in handling large or severe incidents. It should not be confused with an incident management team comprised of representatives of the response agencies *(i.e.,* police, fire, rescue, and roads). The incident management team is formed for the purpose of implementing a freeway incident management system. An incident management team should be formed to facilitate the implementation of an incident management system in the Omaha metropolitan area. The need for an incident response team would be determined by the incident management team in the future.

Inflatable Air Bags Systems

The Omaha Fire Department has Vetter Bags, which are only used for extraction purposes. None of the response agencies have inflatable air bag systems for righting overturned vehicles, but towing companies or other businesses (e.g., Williams Pipeline) may have these systems. If so, they should be added to the equipment and materials resource list maintained by Omaha 911.

Motorist Aid Call Boxes/Telephones

Motorist aid call boxes/telephones are expensive and are not needed because of the increasing number of cellular telephones being used by motorists. Thus, this technologies is becoming obsolete.

Ordinances Governing Travel on Shoulder

Existing ordinances governing travel on shoulders are adequate. New ordinances are not needed.

Peak Period Motorcycle Patrols

Peak period motorcycle patrols are not needed in the Omaha metropolitan area.

Personnel Resource List

Omaha 911 has a personnel resource list, which applies to working hours *(i.e.,* 8:00 am to 5:00 pm). But, a personnel list is also needed for after working hours, particularly when the incident occurs in a work zone and NDOR needs to be contacted.

Personnel Training Programs

Personnel training programs on the policies and procedures of the freeway incident management system would need to be developed in the future once the system is established.

Policy Requiring Fast Vehicle Removal

The current policy allows vehicles blocking a traffic lane, or considered to be a traffic hazard, to be pushed to the shoulder. Vehicles are allowed to stay on the shoulder for 12 hours, after which they can be towed. Revising the policy to reduce the time a vehicle is allowed to stay on the shoulder from 12 hours to 1 or 2 hours would be beneficial.

Properly Defined Parking for Response Vehicles

There are too many variables to consider. At this time, it is not practical to develop a set of parking guidelines. This may be something that an incident management team could consider in the future after a freeway incident management system has been established.

Properly Defined Traffic Control Techniques

There are too many variables to consider. At this time, it is not practical to develop a set of traffic control guidelines. This may be something that an incident management team could consider in the future after a freeway incident management system has been established.

Public Education Programs

Public education is needed to inform motorists about when they should move their vehicles from the roadway prior to the arrival of a police officer. However, a public education program should be developed by an incident management team, once it has been established.

Push Bumpers

Omaha police have push bumpers on some cars. But, they should be on all police cars, because they are very useful in removing stalled vehicles from traffic lanes.

Radio Data Systems (RDS)

These systems are still in the development stage. Therefore, they are not practical for implementation at this time. Also, they may not be needed in the future, because the dissemination of motorist information by the broadcast media and other traveler information systems may adequate.

Responsive Traffic Control Systems

Responsive traffic control systems would reduce the traffic demand upstream of an incident by controlling traffic at the upstream entrance ramps. Such a system would be beneficial. But in order to be most effective, such a system would need to be implemented as part of a traffic management/information center.

Ties with Transit/Taxi Companies

Ties with MAT and the taxi companies already exist. Incidents observed by their drivers are reported to Omaha 911. However, information on the correct procedure for reporting incidents should be given to the drivers.

Total Station Surveying Equipment

Total station surveying equipment would be very helpful to police in collecting accident investigation data and would reduce the time required to clear accidents. This incident management option should be implemented as soon as possible.

Tow Truck/Removal Crane Contracts

The City of Omaha already has a contract with a tow truck company. It does not have a contract with a crane company, but cranes are called by Omaha 911 when they are needed.

Variable Lane Closure

A policy allowing variable lane closure already exists.

Variable Message Signs

Variable message signs would be very helpful in providing motorist information. The deployment of variable message signs should be considered in conjunction with the planning of alternative routes. NDOR has portable variable message signs that could be deployed within 15 minutes during the work day and within 30 minutes during non-working hours.

Video and Closed Circuit TV

Video and closed circuit TV would reduce the time needed to detect freeway incidents. But it is very expensive and would need to be implemented as part of a traffic

management/information center in order to be cost effective. Video and closed circuit TV should be considered in the future.

Volunteer Watch

The effort and expense of establishing a volunteer watch program to detect freeway incidents would not be worthwhile, because incidents are already being reported voluntarily by motorists calling Omaha 911.