Chesapeake Highway Advisories

Routing Traffic

CHART

Business Plan

October 1, 1996

**(prepared for the
Maryland General Assembly
J.C.R. page 77)**

**Maryland Department of Transportation
Maryland State Highway Administration**

CHESAPEAKE HIGHWAY ADVISORIES
ROUTING TRAFFIC

CHART
BUSINESS PLAN

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1.0 Introduction

The Chesapeake Highway Advisories Routing Traffic (CHART) Business Plan is a six-year program for the implementation of Intelligent Transportation Systems (ITS) by the Maryland State Highway Administration (SHA) in partnership with the Maryland Transportation Authority (MdTA) and the Maryland State Police (MSP). As part of the Maryland Department of Transportation's (MDOT) six year Consolidated Transportation Program, SHA will utilize this Business Plan to deploy priority elements of the CHART system. The Plan also addresses specific issues defined by the Maryland General Assembly during the 1996 session (J.C.R. page 77). These issues concern the purpose, scope, cost, funding, and benefits of the CHART program.

1.1 Organization of the Business Plan

The Business Plan is organized into four major sections. The first section is introductory in nature and provides background information on ITS and the CHART program in Maryland. It includes the CHART mission, goals and objectives, as well as overview discussions of coverage area, operations, facilities and regional coordination.

Section 2 provides a brief description of the planning process, sources of funding, relationships with the private sector, coordination with other agencies and an overview of evaluation efforts.

Section 3 provides the program elements of the Business Plan. It reflects a series of interrelated operations, capital investment and system maintenance projects that SHA is planning to undertake to achieve the CHART vision. Each program is presented in sufficient detail to identify its objectives and projected cost by year. Elements of the Current Year (FY 1997), Budget Year (FY 1998), Planning Years (FY 1999 - 2002) and the total six year program are presented.

Section 4 presents a glimpse of CHART's long-term future, looking beyond the six year program to "what's on the horizon" and providing insight as to the general objectives of CHART as SHA moves into the next century.

1.2 Intelligent Transportation Systems (ITS) Overview

ITS is a set of tools and practices that apply advanced technologies to monitoring, communications, information processing and intervention strategies aimed at improving the real-time operation and efficiency of the transportation system. The intent of any ITS deployment is to improve the system's efficiency and effectiveness for both providers and consumers of transportation services. The concept of ITS is focussed on managing the existing system better. By monitoring what is occurring on the system, making adjustments when needed, responding to unexpected traffic patterns or incidents, and providing real-time information, operating agencies can help travelers adjust their use of the system based on current conditions.

Throughout the United States, Europe and Japan, major cities and regions are embarking upon programs using ITS strategies and technologies. The U.S. Department of Transportation (US DOT) has initiated a program called Operation Timesaver, which is focussed on deploying an Intelligent Transportation Infrastructure (ITI) in 75 of the largest metropolitan areas in the country within the next 10 years. Although no new funding has yet been provided, the goal is to apply available federal funding toward this purpose.

Many of the transportation components in the ITI are included in the CHART program which ensures consistency with national efforts. The basic ITI infrastructure includes:

traffic signal control and highway-rail crossing protection
freeway traffic management
incident and emergency management services
traveler information
transit management
electronic fare and toll collection

CHART embraces the first four components, while other agencies within MDOT, especially the MdTA and the Mass Transit Administration (MTA), work cooperatively to deploy the remaining components. The national goal is to have the core infrastructure in place by the year 2005.

As shown in Figure 1, there are many ITS deployment programs underway in the United States, and even more being contemplated or in the planning stage. CHART is recognized as being deployed in a prudent, step-by-step method relying on the

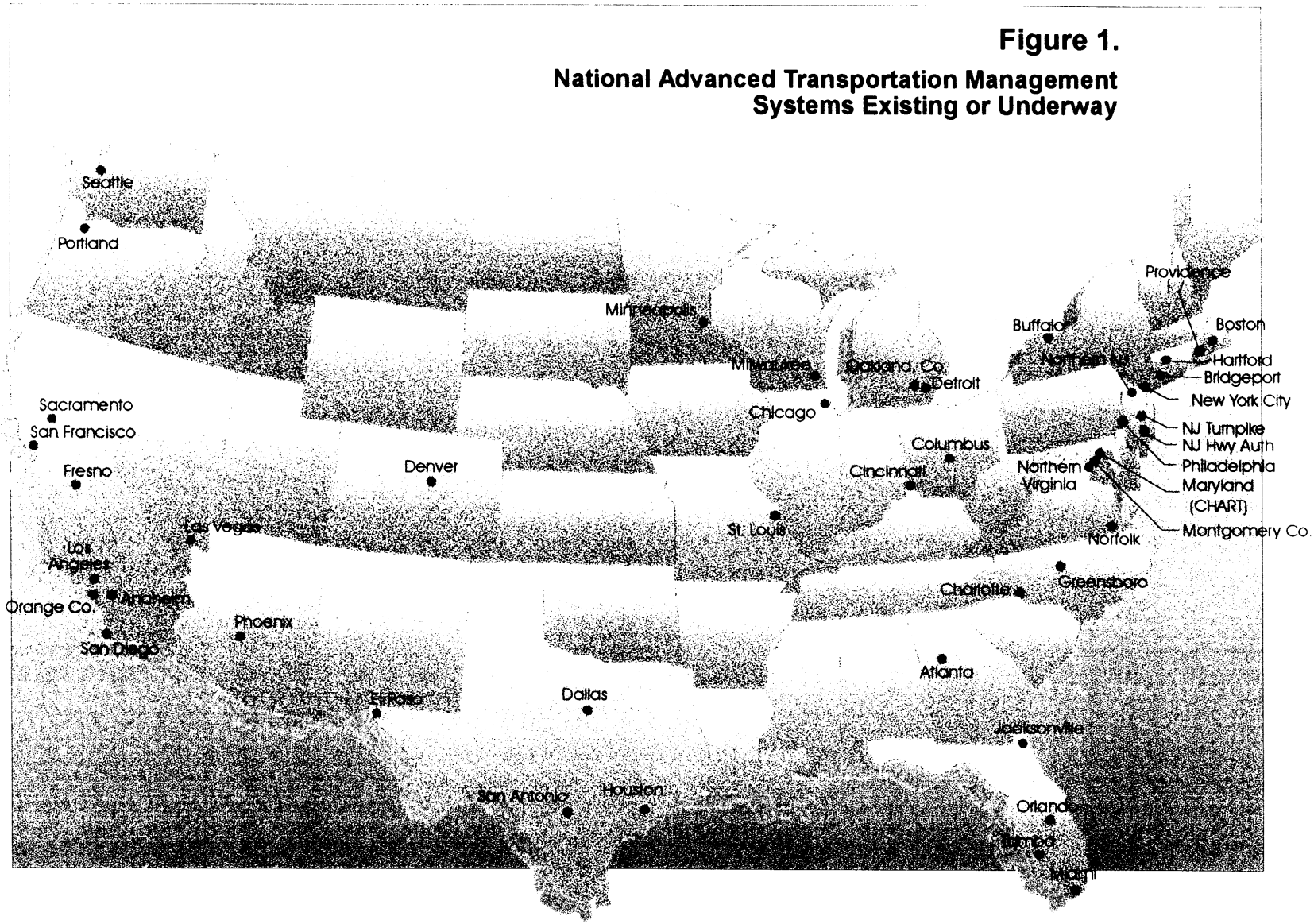


Figure 1.

National Advanced Transportation Management Systems Existing or Underway

assessment of needs and application of proven technology that meets those needs. CHART is not experimental. It is a program that is geared to meeting Maryland's unique transportation needs now and in the foreseeable future.

CHART is unique to other ITS deployments nationally in that:

- It is the first and only statewide program (others are focussed on regions or metropolitan areas).
- It consists of a Statewide Operations Center (SOC) facility that is interconnected to several satellite/regional facilities.
- The SOC combines four separate functions previously performed out of separate locations – freeway traffic management, traffic signal management, emergency management and maintenance communications.
- It serves a primary coverage area comprised of two major urban centers (Baltimore and Washington, DC) as well as two other urban areas (Annapolis and Frederick).
- It is the first program to integrate the efforts of a state highway agency, state toll authority and state police.

Nationally, the traveling public is beginning to notice the difference ITS can make. In addition to the National ITS Architecture, which defines major interfaces and specifies where standards are required, several operational tests and studies have been completed.

According to the US DOT's ITS Joint Program Office, an evaluation of benefits for several large metropolitan area ITS deployments has shown that:

- In Seattle, an advanced freeway management system reduced travel time for cars, trucks and buses.
- In Minneapolis/St. Paul, the GuideStar program has been instrumental in providing 35 percent shorter rush hour commute times, a 25 percent reduction in accidents,

a decrease in emergency response time by 20 minutes and an increase of freeway capacity by 22 percent.

- In Atlanta, the multi-modal traveler information program was put to the test with the arrival of the Olympics in the summer of 1996. The system was very effective given the enormous demand well in excess of typical demand expectations in that metropolitan area.

- In San Antonio, traffic managers have measured a 20% decrease in the time to respond to incidents, and have seen an overall decrease in overall accident rate.

The CHART system has already provided substantial benefits in Maryland -- most notably a reduction of one third to one half the time required to detect, respond to and clear incidents that create sudden and unexpected bottlenecks on the highways. The benefits have been most conspicuous on the Capital and Baltimore Beltways where six to eight hour delays due to a major tractor trailer accident were not uncommon, but now are rare.

3.3 ITS Applications in Maryland

In Maryland, highway travel (measured in vehicle miles traveled) increased 60% between 1980 and 1995, and could increase an additional 40% by the year 2010. Approximately 70% of all traffic in Maryland travels on the State Highway system, even though this system comprises less than 20% of the total road system in the state. Maryland sits astride major Interstate corridors such as I-95 and I-70, that serve transportation consumers far beyond the borders of the State. While the State has implemented an extensive grid of freeways and expressways in the Baltimore-Washington Corridor, Maryland's high degree of urbanization in conjunction with these major interstate and international travel/freight corridors combine to produce a high degree of traffic congestion.

Heavy volumes of traffic, stop-and-go commuter peaks, and lack of comprehensive information regarding current, real-time conditions on available alternatives contribute to and compound the effects of unexpected incidents, such as traffic accidents. Accidents contribute to about 60% of all delays due to congestion. With the growth in traffic out-pacing any realistic hope of expanding capacity at the same rate as the growth in travel, it is imperative to find ways to improve efficiency in our present system. One of the key

tools to improve operational efficiency is to focus on the implementation of ITS through the CHART program. While ITS alone cannot eliminate daily traffic congestion, it can have a dramatic effect on dealing with those unexpected incidents that cause more than half of all delays.

MDOT is unique in that it embodies transit, aviation, toll roads, ports, motor vehicle and highway operating agencies that work together to provide the framework for a seamless transportation system. The CHART program has been developed in the context of other ITS programs underway at MDOT to ensure that a proper level of coordination of efforts occurs.

CHART activities are also coordinated with local and regional planning and operating agencies. The most active have been local law enforcement agencies, the Montgomery County Department of Public Works and Transportation, the Baltimore Metropolitan Council and the Metropolitan Washington Council of Governments. Coordination with other localities such as Baltimore City, Prince George's and Anne Arundel Counties occur on an event specific basis, such as the Preakness, Andrews Air Force Base Air Shows, and Annapolis/Naval Academy events. Additionally, during the warm weather season, CHART activities extend to beach-bound recreational traffic, while during the cold weather season, special emphasis is given to traffic conditions in the mountains of western Maryland.

Coordination with the Virginia Department of Transportation (VDOT) on Capital Beltway incident response and traffic management is now routine. This has spread to similar relationships with the Pennsylvania Department of Transportation (Penn DOT) and Delaware Department of Transportation (Del DOT).

SHA is also an active member of the I-95 Corridor Coalition, which is formulating strategies and deploying systems for ITS applications along the corridor between Maine and Virginia. This has also ensured that the ITS applications in Maryland are consistent with the needs of a larger travel market. As part of this effort, a new Coalition-deployed Information Exchange Network (IEN) will relay relevant travel and traffic information as well as coordinate transportation agency activities from Norfolk, Virginia to Portland, Maine.

1.4 CHART Mission

It is CHART's mission to improve efficiency and safety on Maryland's major highways through the application of ITS technology and interagency teamwork. The CHART program relies on communication, coordination, and cooperation among agencies and disciplines, both within Maryland and with neighboring states, to foster the teamwork necessary to achieve our goal. This is consistent with SHA's overall mission which is to provide Maryland with an effective and efficient highway system.

1.5 CHART Overview

CHART is comprised of the following major components:

(1) *Traffic and Roadway Monitoring:* Remote sensors, commercial traffic reporters, field units, and individual travelers all combine to provide the information necessary to assess real-time traffic flow. CHART traffic monitoring tools include:

Traffic speed detectors (currently at 108 locations) deployed along 155 centerline miles of the heaviest traveled freeways. These detectors provide the average speed of traffic flow along a segment of roadway. This information is used for early detection of traffic congestion and incidents.

Existing in-pavement loop detection traffic counting devices which are being retrofitted to provide speed information.

Video verification is provided by Closed Circuit Television (CCTV) cameras (currently at 21 locations) which provide visual information on traffic congestion, incidents and roadway conditions during inclement weather.

A #77 cellular call-in system by which individual motorists can report disabled vehicles and accidents. This service, coordinated through the MSP and MdTA Traffic Management and Police Services, receives more than 10,000 calls annually.

Reports from field units including State and local police as well as SHA's own units, and information from commercial radio traffic spotters who operate from aerial as well as ground units.

Pavement weather sensors installed and operating at 40 locations statewide. These sensors are placed at locations that are the first sites to freeze during winter conditions. They provide pavement temperature, moisture, and degree of chemical treatment during winter operations.

(2) *Incident Management:* Once the traffic and roadway monitoring system has identified a problem, an immediate response is initiated to clear the incident and re-open lanes as quickly as possible, while protecting the safety of victims, travelers and emergency personnel. CHART operates a nationally recognized incident management program which depends heavily on the cooperation and teamwork developed among the SHA, the MSP and the MdTA. The tools used for incident management include:

Emergency Traffic Patrols (ETP) used to provide emergency motorist assistance and to relocate disabled vehicles out of travel lanes.

Emergency Response Units (ERU) used to set up overall traffic control at accident locations.

Freeway Incident Traffic Management (FITM) Trailers, pre-stocked with traffic control tools such as detour signs, cones, and trailblazers used to quickly set up pre-planned detour routes when incidents require full roadway closure.

A "Clear the Road" policy which provides for the rapid removal of vehicles from the traveled lanes rather than waiting for a private tow service or time consuming off-loading of disabled trucks which are blocking traffic.

An Information Exchange Network (IEN) Clearinghouse, provided by the I-95 Corridor Coalition, which through a workstation at the SOC shares incident and traveler information to member agencies along the Corridor.

A variety of other tools are used to facilitate incident management. These include portable arrow boards, portable variable message signs, and portable travelers advisory radio transmitters for traffic management; front end loaders, tow rigs and push bumpers to move vehicles; and training exercises to maintain a high competency level for teams working under hazardous conditions.

(3) *Traveler Information:* CHART provides real-time information concerning travel conditions on the main roads in the primary coverage area. Traveler information focuses on planned or accidental traffic disruptions, such as accidents, chemical spills, snow, ice, floods, major special events, seasonal recreational peaks, and roadway construction. CHART uses several ways to disseminate traveler information, including:

Variable Message Signs (VMS), which are programmable message boards (permanent and portable) capable of displaying real-time traffic information to motorists. There are currently 35 permanent and nearly 100 portable units.

Travelers Advisory Radio (TAR) stations which are low power radio stations that provide information on traffic conditions and special events. There are currently 29 permanent stations as well as several portable units.

Commercial radio and television broadcasts - by providing accurate and timely information to commercial broadcasters, CHART reaches a wide audience of listeners and viewers.

Travelers Advisory Telephone (TAT) is currently used for summer beach traffic, and is in the planning phase for possible broader application.

(4) *Systems Integration & Communications:* The communications network is the "glue" that connects CHART's functional components together. As a whole, these components collect, process and disseminate real-time information concerning the transportation system. The success of CHART relies on accurate and timely information and therefore requires a sophisticated information system and communications network that is continually functioning and highly accurate.

Like the CHART program, the communications network has grown from a grass-roots effort, pieced together from different areas within SHA. And as the CHART program grows so will the underlying communications network. As is common practice in the private sector, such a network should be designed and built cost-effectively, but with an eye to other potential users. MDOT recognizes that the State may be able to capitalize on a rare opportunity: the beginnings of a statewide network for all agencies. To this end, MDOT has and will continue to work with the Department of Budget and Management's Office of Information Technology (DBM OIT) in developing the best network solution for MDOT as well as the State.

In addition to working with other agencies to share technology resources, MDOT has also worked with the private sector in pursuing mutually beneficial resource sharing opportunities. In cooperation with the Department of General Services Telecommunications Office (now under the DBM OIT), MDOT has pursued and succeeded in opportunities to obtain bandwidth capacity in exchange for right-of-way access. To date, the State has obtained approximately 75 miles of fiber optics in a shared resource initiative. The remainder of CHART3 communications network is leased.

(5) *Traffic Management:* The CHART system strives to manage freeway and arterial traffic flows with the goal of greater efficiency and safety. When freeways and other primary routes are unexpectedly congested, some traffic will shift to surface arterials. Arterial signal systems are being installed statewide to provide remote and adaptive traffic signal control and coordinated signal timing. Traffic signal technicians and CHART system operators can better balance demand and capacity by adjusting traffic signal timing remotely.

1.6 Key Partners in CHART

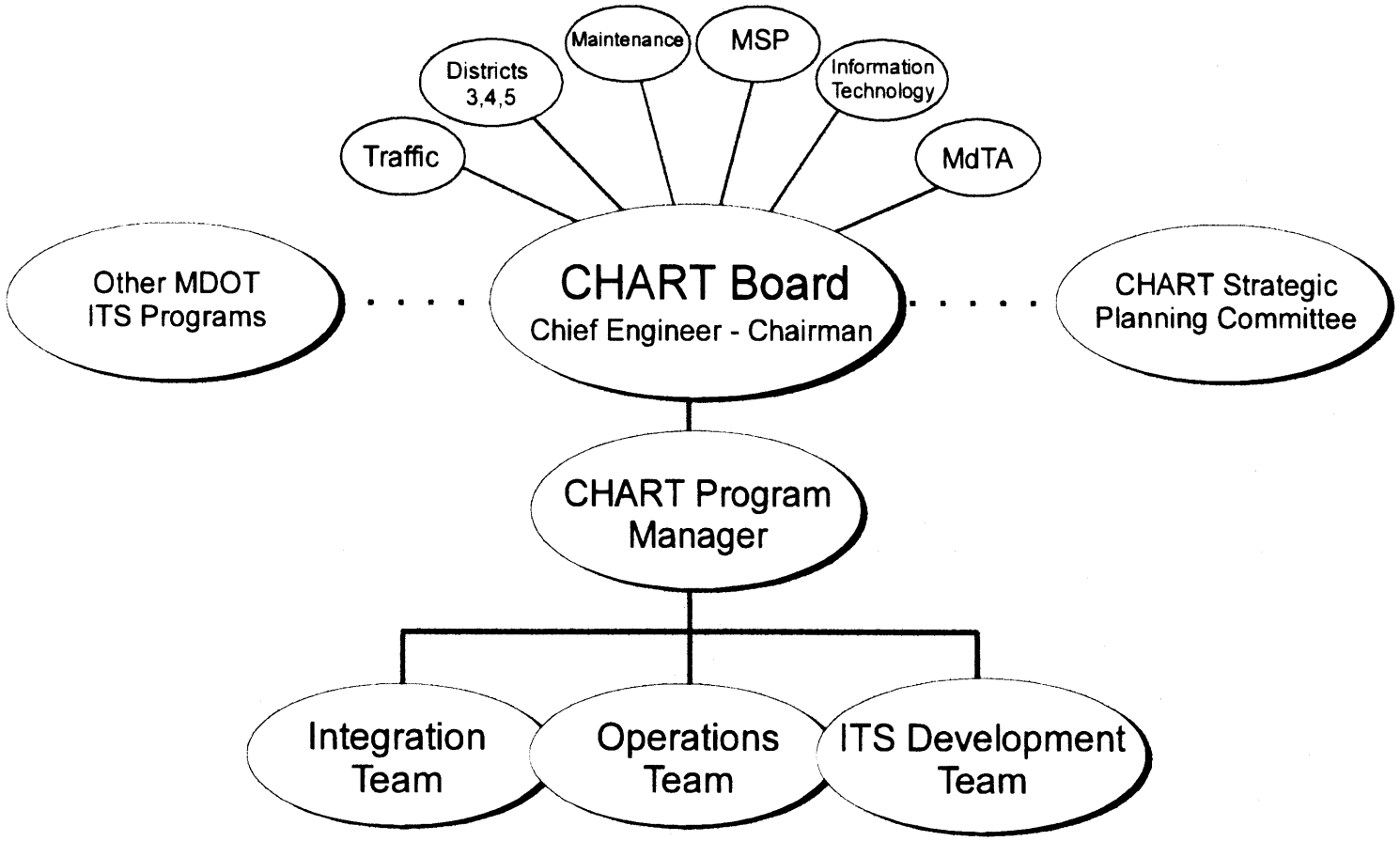
The core partners in CHART are the SHA, MdTA, and MSP. As the program has expanded, so too has the participation to include local governments, local police/fire departments, and the MTA. The Federal Highway Administration (FHWA) has been a major financial partner and a technical support resource as well.

Figure 2 shows the organization that governs the day-to-day activities within CHART. Program oversight is guided by the CHART Board, chaired by the SHA Chief Engineer and made up of eight other senior managers: one from MdTA, one from MSP, three from SHA District offices, and the Directors of Traffic, Maintenance, and Information Technology from SHA. This group meets regularly, and oversees activities in the areas of planning, design, integration, operations, and maintenance.

Day-to-day management of the program is guided by the CHART Program Manager, who is supported by three teams: ITS Development, Operations, and Systems Integration. Each team is made up of core SHA staff supported by contract and consultant resources.

A CHART Strategic Planning Committee will meet quarteriy to guide the development and maintenance of this Business Plan. In addition, the Planning Committee will be used as an opportunity to provide updates and technical education to program participants as well as other interested parties serving as a form of outreach to the transportation community, other state and local government agencies, and the private sector.

Figure 2.
CHART Management & Organization



1.7 CHART Primary Coverage Area

The CHART program has its roots in early efforts that began in Fiscal Year (FY) 1987 to improve summer peak travel to and from Maryland's Eastern Shore. A second initiative started in FY 1988 which involved a joint effort with the State of Virginia to focus on clearing incidents more rapidly on the Capital Beltway. The lessons learned provided the basis for SHA, MdTA, and MSP to begin applying these same principles to the state as a whole with emphasis on the Washington, Baltimore, Annapolis, and Frederick transportation grid starting in FY 1990. CHART now focusses on approximately 375 miles of Interstate highways, and 170 miles of State Highway arterials in this area. The scope of the CHART primary coverage area will be evaluated with each update of the Business Plan to ensure that CHART responds to the changing needs of the traveling public.

1.8 Operations/Communications Facilities

CHART currently operates as a "hub and satellite" system design with the SOC located in the center of the primary coverage area (immediately south of BWI Airport) supported by localized Traffic Operation Centers (TOC's). The SOC combines CHART's traffic management functions with SHA's emergency management and regular maintenance communications, and is the nation's first integrated statewide operations center. The SOC can function as a TOC for the primary CHART coverage area, while simultaneously monitoring weather sensors, speed monitors, CCTV, TAR, VMS, and adaptive control traffic signal systems deployed throughout the state, 24 hours a day, 7 days a week. The more localized TOC's operate primarily on weekdays, from 5 AM to 9 PM focussing primarily on peak traffic periods, rapid clearing of incidents, and providing traveler information on conditions along major highways. TOC's operate during weekdays from MSP barracks in the Baltimore and Washington areas and from Montgomery County's Transportation Management Center. The MdTA's Authority Operations Center operates continuously, and also serves as a CHART TOC, among its other functions. On a seasonal basis, a TOC is activated in western Maryland at SHA's District office to handle winter weather conditions in the mountains. Another TOC is activated seasonally and on weekends at the MdTA Bay Bridge for "Reach the Beach" traffic. Figure 3 depicts the primary coverage area and operations center locations, and Figure 4 displays a picture of the SOC and provides basic information on the facility.

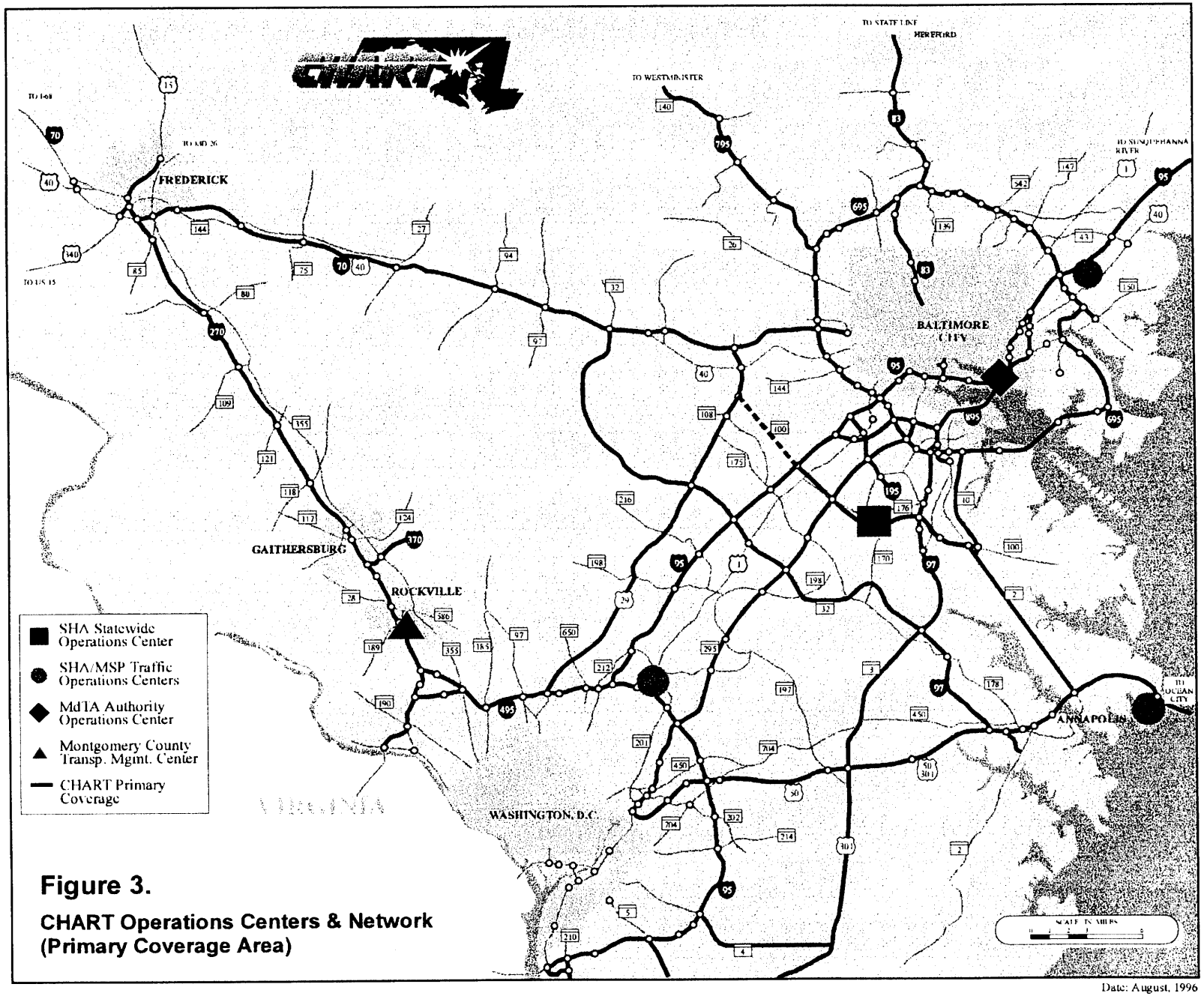
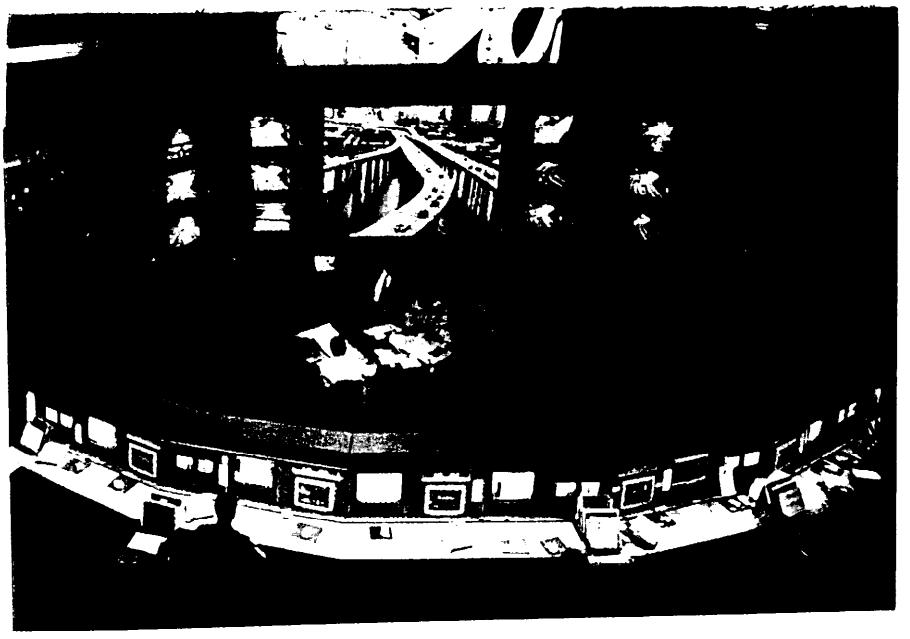


Figure 3.

CHART Operations Centers & Network (Primary Coverage Area)

Date: August, 1996

Figure 4. SOC Fact Sheet



- First Statewide Operations Center (SOC) in the country.
- Inaugural opening date - August 30, 1995.
- SOC operates 24 hours/day, 7 days/week.
- SOC brings together several SHA functions including CHART, signal systems management, maintenance, communications and emergency operations.

1.9 Regional Coordination

Along the "Northeast" transportation corridor from Virginia to Maine, SHA, MdTA, and MSP, along with the 27 other major transportation providers (including state DOT's, toll authorities, and transit operators) are participating in the I-95 Corridor Coalition. It is the Coalition's primary mission to coordinate information on real-time surface transportation system conditions for the benefit of travel customers in the region -- both passengers and shippers. Table 1 shows the individual agencies participating in the Coalition. Each agency is pursuing the deployment of ITS (at their own pace and funding levels), but the Coalition serves as the "glue" that holds the region together from an ITS perspective. By coordinating the deployment and application of ITS concepts and technologies in the corridor, the goal is to make traveling across jurisdictional boundaries virtually "seamless" to the traveler. The Coalition has been supported financially by the USDOT.

With respect to regional coordination, SHA participates with the Baltimore Metropolitan Council, the Metropolitan Washington Council of Governments and the Capital Beltway Safety Team to coordinate plans for the deployment of joint ITS initiatives. The latest regional initiative is a National Capital "Showcase" for traveler information. Utilizing special federal funding, this effort will produce a state-of-the-art ITS application in the Washington, DC metropolitan area.

At the operational level, SHA and VDOT enjoy a long history of cooperation particularly in regard to the management of traffic and incidents in the vicinity of the Woodrow Wilson and American Legion Bridges. There are several programs that parallel the programs being developed for CHART. SHA and VDOT staff meet regularly to exchange data and information to the overall betterment of the National Capital area.

Of all the local jurisdictions in the United States, none are more advanced in intermodal ITS applications than Montgomery County. The County has made a major commitment to integrating real-time ITS efforts for transit and traffic. CHART and the Montgomery County Transportation Management Center are closely coordinated in this effort, including day-to-day operations.

Another coordination resource for CHART is ITS America's state chapter - ITS-Maryland. ITS America is the national organization of public agencies, private companies and academic institutions that, together with the US DOT, are supporting and promoting the coordinated development of technologies to make the transportation system function with

greater safety and efficiency. ITS-Maryland, a grassroots component of the national program, provides a forum for education, coordination and communication among all interested organizations. The CHART program will utilize this organization as a forum for professional interaction with the academic and private sectors in Maryland.

Table 1. I-95 Corridor Coalition Membership

State & Local DOT's	Transportation Authorities	Affiliated Organizations
Connecticut	Delaware River & Bay Authority	AAA Foundation for Safety
Delaware	Delaware River Port Authority	Amtrak
District of Columbia	Maine Turnpike Authority	ATA Foundation
Maine	Maryland Transportation Authority	American Bus Association
Maryland	Massachusetts Turnpike Authority	Association of American Railroads
Massachusetts	Metropolitan Transportation Authority	Coalition of Northeast Governors
New Hampshire	MTA Bridges and Tunnels	Federal Highway Administration
New Jersey	New Jersey Highway Authority	Federal Railroad Administration
New York City	New Jersey Turnpike Authority	Federal Transit Administration
New York	New York State Thruway Authority	High Speed Rail/MAGLEV Association
Pennsylvania	Pennsylvania Turnpike Commission	ITS America
Rhode Island	Port Authority of NY/NJ	IBTTA
Vermont	South Jersey Transportation Authority	Nat' l Industrial Transportation League
Virginia		National Private Truck Council
		TRANSCOM
		USDOT Office of Intermodalism

2.0 CHART Planning, Funding, and Evaluation

2.1 Business Planning Process

In early 1996, the Maryland General Assembly directed MDOT to "prepare a report to the budget committees which outlines a master plan for the development of intelligent transportation systems (ITS). This report should address the justification of ITS and outline: (1) the scope of the system, including routes and mileage to be included; (2) the estimated total cost to construct ITS in Maryland by funding source; and (3) measures to ensure that the State realizes the maximum benefits in coordination with other technology resources to meet the information goals of the entire State."

Unlike a majority of other SHA programs, CHART is based on concepts, strategies and technologies that have not been available for more than ten (10) years. This has led to a planning process that is iterative and dynamic, and which will be reviewed and updated on an annual basis.

The development of this Business Plan is the culmination of an effort that began with research on other programs nationally, involved dozens of meetings with SHA, MdTA and MSP field personnel, and was capped-off with a retreat that included six national experts in ITS presenting their ideas and synthesizing them with our own. This Business Plan has received input from many sources including:

Public Sector

- Maryland Department of Transportation Headquarters
- Maryland State Highway Administration
- Maryland Transportation Authority
- Maryland State Police
- Montgomery County Department of Public Works & Transportation
- Federal Highway Administration
- Volpe National Transportation Systems Center

Private Sector

- AlliedSignal, Inc.
- Computer Sciences Corporation
- Edwards and Kelcey, Inc.
- JHK & Associates, Inc.
- Lockheed-Martin Corporation
- PB Farradyne Inc.

2.2 CHART Strategies

The CHART program has evolved into a major effort with national recognition. For the next six years, the strategic challenge for CHART will be to achieve a proper balance between overall needs and funding; between pressures to expand versus the need to provide the most basic services; and among the various components of the program.

The CHART Business Plan is predicated on four key strategies which will provide a focus for the program over the next six years.

Prioritization – For CHART to continue successfully, the program must devote adequate resources for planning, system design, system integration, system operations and system maintenance. In a period of severe budgetary constraints, only high priority projects can be programmed. The projects in this Business Plan have been carefully assessed as to priority.

Deployment Options – The fundamental choices for CHART in the near term were to either expand further in scope (in terms of functional areas, technology and geography) or concentrate on backfilling the gaps created by limitations in early deployment funding. The basic choice has been to fill in the voids in the current CHART primary coverage area and concentrate on improving the effectiveness of existing functions and facilities.

Funding - Clearly, to achieve its full potential, CHART will require financial resources beyond what is currently available. Funding in the future will represent a mix of federal, state, local and private sources, utilizing these resources in concert so as to maximize their efficiency.

Education & Outreach – CHART must function in reality -- and be perceived – as a critically needed program. It is essential that the benefits of CHART be carefully assessed and explained to policy makers, the press and the public – our base of customers.

2,3 Funding Sources

Figure 5 graphically shows the split of federal, state, and private funds over the past six **(6)** years.

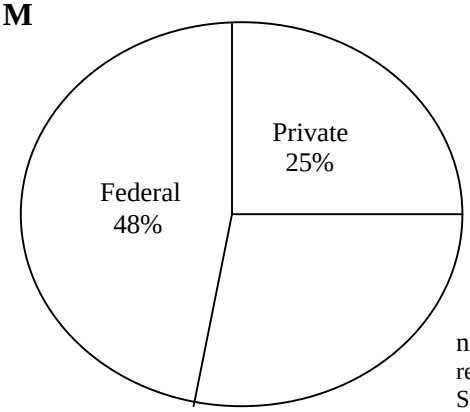
Federal funds have been and continue to be the predominant funding source for the CHART program. Federal funds include sources from the Intermodal Surface Transportation Efficiency Act (ISTEA) as well as annual USDOT Appropriations for special projects (such as the National Capital "Showcase" project). The ISTEA programs include Congestion Mitigation and Air Quality (CMAQ) Improvement, Surface Transportation Program (STP), National Highway System (NHS), and Title VI Research – Intelligent Vehicle-Highway Systems Act. In addition, a major portion of future capital projects will be funded with Interstate Discretionary Funds (IDF), specifically earmarked for ITS applications.

State Funds have come from the Transportation Trust Fund as well as toll revenues from the MdTA.

Figure 5:

FUNDING SOURCES
CHART Expenditures 1990-1996

Total Expenditures = $70.6 M



note: private funds represent value to the State of the MCI/TCG telecommunications public/private partnership

Local Funds for ITS in Maryland have been very limited, except in the case of Montgomery County, which has been aggressive in its deployment of intermodal ITS technology at the local level.

Private investment in ITS is possible where there is the likelihood for an adequate return on investment. One possible source is the packaging and distribution of real-time travel information. The National Capital "Showcase" project, which relies on up front public sector funding from special federal funds, will be exploring the potential to market information to a level that becomes attractive to private sector investors. The outcome of this project will have a profound impact on realizing private sector support for traveler information. Another significant opportunity for private sector support for CHART is in the communications arena, where the State of Maryland has already successfully participated, with SHA support, in the fiber optic resource sharing project. Further possibilities for such resource sharing opportunities are being pursued.

A more detailed description of these two examples are described below:

Fiber Optic Resource Sharing: In 1993, the State of Maryland, MCI Telecommunications, Inc. and the Teleport Communications Group (TCG) entered into an agreement that benefits each communication provider as well as the citizens of Maryland. Through this agreement, the State receives communications capacity over fiber optic cable in exchange for access to the state highway's right-of-way. State right-of-way is attractive to communication providers due to the fact that most major roadways and railways run along direct routes between urban centers. The sharing of this resource to the mutual benefit of the participating parties is the concept behind Resource Sharing.

As part of this agreement, MCI provided 75 miles of fiber optic cable inside state right-of-way, predominantly along the I-83, I-695, and I-95 corridors. TCG provided $1 million to purchase electronics for the communication system. The State is also guaranteed 25 percent of any capacity which is added to the system. The private entities will maintain this system for 40 years. The State realized a savings in capital investments in excess of $18 million under this agreement.

The Department of Budget and Management's Office of Information Technology (DBM OIT), in cooperation with MDOT, will soon release another Request-for-Proposal (RFP) soliciting resource sharing proposals where right-of-way access is bartered for communications capacity. The passage of the recent Telecommunications Act of 1996 has deregulated the telecommunications

industry, allowing open competition in both local and long distance markets. While the impact of this important piece of legislation will not reveal itself for some time, Maryland is poised to take advantage of any new business investment in this area through the advertisement of a resource sharing RFP. Should the State receive offers and obtain additional communications capacity, it could be incorporated into a well-defined network architecture like the one already outlined by SHA. This is a unique opportunity for the State of Maryland and SHA will continue to work closely with DBM OIT in this area.

National Capital Region Traveler Information Showcase: SHA is currently active in a project in the Washington, DC metropolitan area, focussed on creating a public/private partnership to deliver traveler information throughout the region. The project is designed to begin returning on the investment after 36 months, and is projected to pay back the entire amount (at a 50% public/private sharing rate) by month 72.

Public sector partners include: SHA, Prince George's County, Montgomery County, VDOT, Fairfax County, FHWA, Washington Council of Governments, Washington DC Department of Public Works, Washington Metropolitan Area Transit Authority, and other local transit agencies. The private sector partners are led by the prime contractor Battelle, and team members include: SmartRoute Systems, Castle Rock Consultants, DeLeuw Cather, ETAK, Global Exchange, JHK & Assoc., Scientex, Street Smarts, System Resources Corp., and TRW. This project is currently in the contracting stage, and should be underway by the end of 1996.

In sum, the areas of traveler information, communications, system administration, network management and maintenance may be attractive to the private sector since these are their areas of strength. These areas are being closely scrutinized at this time. However, it is recognized by all CHART stakeholders that a balance of public and private participation is required in all areas to achieve the objectives of this Business Plan.

2.4 Shared Goals

For CHART to thrive while providing the most benefit to taxpayers, it is essential to coordinate CHART's future with others and to share goals and initiatives to the maximum extent possible.

Shared Operational Goals - As mentioned throughout Section 1, CHART is a partnership of the SHA, MdTA, and MSP. The continued cooperation of these agencies at the operational level, along with other state and local transportation providers, is necessary in order to provide motorists with a “seamless” transportation system -- accidents must be cleared and information must be provided accurately and timely, regardless of jurisdictional boundaries.

Shared Information Goals - The CHART program has fostered an open policy in working with various organizations both from a policy and organizational perspective as well as a technological one. This approach offers excellent opportunities for sharing information and building compatible technological infrastructures, and to a great extent has been a key to the development of CHART’s technology configuration particularly in the area of telecommunications. The Resource Sharing initiative described earlier is a prime example of cooperation between CHART and DBM OIT.

As a statewide program, the CHART system will require a statewide telecommunications infrastructure to support field devices and facility connectivity. Building a statewide network is a large and costly effort and to build a network in isolation of statewide telecommunications initiatives would miss technology sharing opportunities. Because of this, SHA continues to work closely with the newly formed DBM OIT.

In keeping with its open policy, SHA undertook an intensive telecommunications study that defined the CHART program business requirements, defined a network architecture that can work with either leased or owned media, and defined an architecture that can scale as usage grows to allow other potential users access to the network. The study included examining what the statewide telecommunications direction was and looked at how the CHART/SHA network fit into that direction. DBM OIT participated in the study and supported its conclusions and recommendations. SHA will now design and build the network over the next few years and will continue to work closely with DBM OIT in this effort.

Shared - In order to maximize the possible benefits of CHART, it is important that SHA recognizes its role as part of the overall MDOT ITS program. As CHART continues to grow and increase its benefit to customers, and other MDOT ITS programs are supported and show a similar level of growth, the State will have another tool to attract business and industry to Maryland. A functional and efficient transportation system is the backbone of most businesses.

- Commercial vehicle operations depend on roadways that are not immersed in total gridlock caused by unanticipated incidents, or at least on having available and accurate information that can allow them to adjust their route or departure time - just-in-time delivery will be possible on our roadway systems;

- Inter-modal access and cooperative efforts among port, rail, and highway are critical to enhancing the ability to move goods -- shippers can rely on moving commodities in and through Maryland;

- Employers locating their business in Maryland want assurances that their employees will have reliable and safe transportation options to move between home and work -- Maryland's transportation system will accommodate new business and industry, and work cooperatively with potential employers to provide timely and accurate information to their employees;

- Travelers coming to and through Maryland need a transportation system that guides them easily to and from their destinations, and provides them with accurate and timely information on conditions that will affect their travel.

2.5 Evaluation

SHA is currently developing a program to systematically evaluate CHART as it evolves. Every facet of the program will be evaluated in order to provide for continuous improvement. The first evaluation effort was recently completed, focusing on the incident management elements of CHART. Future efforts will include evaluating enhancements to the incident management program as well as the evaluation of traffic and roadway monitoring, traveler information, communications and traffic management.

The initial evaluation project, performed by the COMSIS Corporation in cooperation with Edwards & Kelcey, Inc., demonstrated that the benefits of the CHART incident response program, supported by a small core of traffic and roadway monitoring devices, exceeded the system's capital, operating, and maintenance costs by a ratio of over 7 to 1. This evaluation compared the estimated reduction in delay, fuel consumption, and secondary incidents (benefits) to the capital, operating, and systems maintenance costs of the program. The data used in this evaluation encompassed FY 1990 to FY 1994.

The evaluation was performed at three levels: system-wide, corridor-level, and site-specific, and comparisons were made between the findings and conclusions from each

level of evaluation. The findings also concluded that the incident management patrols that are deployed on the CHART network are being used where they are needed most. They are covering the segments of the network that experience the most non-recurring delay and the highest number of incidents per mile.

3.0 CHART Program

3.1 Summary of the Program

This Business Plan defines a six year program for CHART which includes planned projects in the areas of operations, capital investment, and system maintenance. The program is summarized to provide several different levels of detail, as shown below:

Overall Level	–	Entire CHART program
Program Area Level	–	Operations — Capital — System Maintenance
Category Level	–	incident Management, Traffic & Roadway Monitoring, Traveler Information, System Integration & Communications, and Traffic Management
Project Level	–	Detailed by individual project (included in the CTP)

This introductory section addresses the overall level of detail, outlining the budget for the entire CHART program, and briefly summarizes the Program Areas. The remainder of Section 3 covers each program area, providing details of each project category. Individual projects are described in the Department's Consolidated Transportation Program (CTP).

Table 2 provides historic costs for the CHART program, covering FY 1990 through FY 1996, and projected costs, covering FY 1997 through FY 2002. In addition, Figure 6 graphically displays both the past and projected funding levels, broken down by Program Area level.

CHART is funded through a mix of federal and state monies. Operational costs are 80% federally funded and 20% state funded. Capital costs have historically been, and should continue to be 100% federal funds. Maintenance costs are funded at a rate of 80% federal and 20% state dollars for preventative maintenance. Repairs and replacements, however, require 100% state funds.

Table 2 – CHART PROGRAM COSTS

Funding Levels (000's)

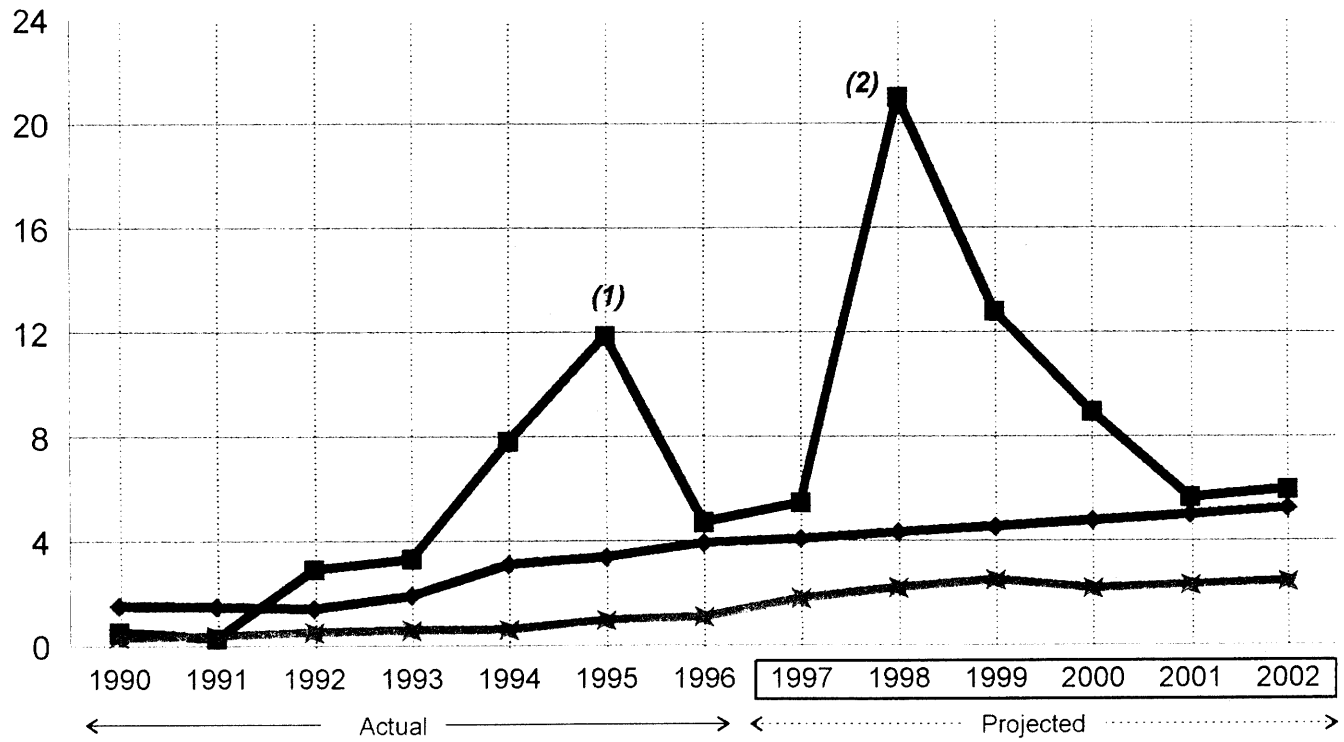
FY 1990 – FY 1996 (actual)

	1990	1991	1992	1993	1994	1995	1996	TOTAL
Operations	$1,490	$1,473	$1,439	$1,942	$3,172	$3,368	$3,908	$16,792
Capital	$529	$275	$2,968	$3,298	$7,783	$11,853	$4,721	$31,427
System Maintenance	$329	$377	$507	$585	$606	$961	$1,084	$4,449
Total Program	**$2,348**	**$2,125**	**$4,914**	**$5,825**	**$11,561**	**$16,182**	**$9,713**	**$52,668**

FY 1997 – FY 2002 (projected)

	1997	1988	1999	2000	2001	2002	TOTAL
Operations	$4,073	$4,314	$4,529	$4,762	$4,987	$5,237	$27,902
Capital	$5,457	$20,975	$12,803	$8,934	$5,649	$5,961	$59,779
System Maintenance	$1,789	$2,185	$2,484	$2,165	$2,294	$2,424	$13,341
Total Program	**$11,319**	**$27,474**	**$19,816**	**$15,861**	**$12,930**	**$13,622**	**$101,022**

Figure 6.
CHART Expenditures 1990-2002
($ millions)



(1) Major costs associated with SOC construction
(2) Major costs associated with communications infrastructure

Capital
Operations
Systems Maintenance

The Business Plan covers a six-year period and will be updated annually. The Current Year (FY 1997) and Budgeted Year (FY 1998) represent the most important focus. These efforts are the foundation on which many future projects are based. Tables 3 and 4 present the programs for FY 1997 and FY 1998 in greater detail, broken down to the Category level:

Table 3. TOTAL FY 1997 Projected CHART Funding Levels (000's)

Category	Operations (*)	Capital	System Maintenance	Total
Incident Management	-	$921	-	$921
Traffic & Roadway Monitoring	-	$2,090	$200	$2,290
Traveler Information	-	$1,616	$89	$1,705
Systems Integration & Communication	-	$530	$1,500	$2,030
Traffic Management	-	$300	-	$300
TOTALS	$4,073	$5,457	$1,789	$11,319

(*) Operations costs have been aggregated, since they often cross categorical areas. However, Incident Management represents the vast majority of operational costs.

Table 4. TOTAL FY 1998 Projected CHART Funding Levels (000's)

Category	**Operations (*)**	**Capital**	**System Maintenance**	**Total**
Incident Management	-	$851	-	$851
Traffic & Roadway Monitoring	-	$1,971	$450	$2,421
Traveler Information	-	$1,762	$272	$2,034
Systems Integration & Communication	-	$15,991	$1,463	$17,454
Traffic Management	-	$400	-	$400
TOTALS	$4,314	$20,975	$2,185	$27,474

(*) Operations costs have been aggregated, since they often cross categorical areas. However, Incident Management represents the vast majority of operational costs.

3.2 Operations

CHART Operations are broken into three categories: Incident Management Operations, Facilities Operations and Program Management. Each category is described below:

Incident Management Operations: The predominant operational element of CHART is responding to incidents. An incident either blocks the travel lanes or otherwise reduces the capacity of the roadway. The types of incidents that CHART operations are involved with include accidents, disabled vehicles, spilled loads, adverse weather, special events and construction/maintenance. Nationally, it has been shown that person hours of delay due to congestion are greater as a result of unexpected incidents than from recurring (i.e. rush hour) congestion.

Strategies for reducing the impact of freeway incidents on traffic congestion are categorized as "incident management" which is the cornerstone element of CHART operations. Incident management is defined as a coordinated and preplanned use of people and equipment to restore full capacity as soon as possible after an incident occurs, and to efficiently manage traffic during the incident. Incident management does not eliminate all congestion, but it does reduce the period of delay as well as secondary accidents (where back-ups on the freeway become the cause of rear-end collisions.)

The SHA, MdTA, and MSP initiated an incident management program throughout the state several years ago. The objectives of the incident management program include:

- Reduce the time required to detect the occurrence of an incident (i.e., awareness)
- Reduce the time required to verify the incident, identify the types of vehicles involved, and determine the proper response (i.e., identification)
- Reduce the time required to notify the necessary agencies and organizations, and then for the appropriate equipment and personnel to arrive on the scene (i.e., response)
- Reduce the time required to clear the incident from the roadway, restoring full capacity, while exercising proper on-scene management of traffic flow (i.e., clearance)
- Provide traveler information as it relates to incident management activities.

Incident management operational costs include:

- Salaries and overhead for regional traffic operations centers and staff
- Salaries and overhead for ERU operators
- Fuel and maintenance of ETP/ERU's
- Additional response equipment provided by the District or Maintenance Shop
- Training of the highway operating technicians (HOT), ETP & ERU operators
- Miscellaneous items that include office supplies and expenses.

Facilities Operations The central command and control for CHART is accommodated through the SOC, and the costs associated with statewide incident management are the primary entry in this category. The facility operations costs include:

- Salaries and overhead for SOC staff
- Salaries and overhead for Maryland State Police stationed at the SOC
- Salaries and overhead for the Signal Timing Team stationed at the SOC
- Telecommunication costs that include use of vehicular cell phones, the transmission of data from field devices to the TOC's or SOC and the transmission of video from CCTV devices to the SOC

Program Management Program management encompasses the internal efforts to develop and oversee the technical and operational facets of the CHART program. Program management includes the necessary coordination with FHWA, MDOT and other SHA divisions to ensure that the program is deployed, operated and maintained on time and within budget. This includes the measurement, evaluation and outreach efforts for CHART. Coordination is also necessary with other agencies including MdTA, MSP, the two metropolitan planning organizations in the State (Baltimore Metropolitan Council and Metropolitan Washington Area Council of Governments), local agencies and SHA consultants to progress each element of the CHART program. Regional coordination is regularly provided via I-95 Corridor Coalition and Capital Beltway Safety Team meetings as well as frequent incident management meetings with VDOT and Montgomery County.

The program management costs include:

- Salaries and overhead for the CHART Program Manager and ITS Division Staff
- Measurement and evaluation of the overall program, as well as individual portions for use in planning and continuous improvement. Every facet of CHART would be evaluated as part of this effort.
- Education on the benefits of CHART/ITS to the state legislature, professional community and general public.
- Assistance in the development of a vision plan and concept and strategies in association with the Virginia Department of Transportation and the Washington Council of Governments as part of the National Capital Region ITS Umbrella Study.
- Assistance in the development of the ITS regional plan for metropolitan Baltimore in association with the Baltimore Metropolitan Council.

The projected funding levels for CHART Operations categories are shown in Table 5.

Table 5 – Summary of FY 1997 – FY 2002 Programs
OPERATIONS
Funding Levels (000's)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	TOTAL
Incident Management Operations	$1,901	$2,009	$2,120	$2,241	$2,367	$2,500	$13,138
Facility Operations	$1,437	$1,520	$1,609	$1,706	$1,805	$1,912	$9,989
Program Management	$735	$785	$800	$815	$815	$825	$4,775
TOTAL CHART	**$4,073**	**$4,314**	**$4,529**	**$4,762**	**$4,987**	**$5,237**	**$27,902**

3.3 Capital

The CHART Capital program includes the implementation of specific projects which will contribute to the progress and development of the five functional areas of CHART (as described in Section 1). These functional areas, which include Incident Management, Traffic and Roadway Monitoring, Traveler Information, Communications and Traffic Management, define the categories of CHART Capital expenditures. Each category is described below.

Incident Management

Incident Management, which includes providing traffic control, clearing incidents and re-opening lanes as quickly as possible, is a cornerstone of the CHART program. The capital investment program for incident management includes the replacement of ETP's and ERU's as they reach the end of their useful life, development of a Computer Aided Dispatch/Automatic Vehicle Location system to enhance fleet management of the CHART vehicles, and the purchase of Total Station units for the efficient investigation and documentation of accidents by the Maryland State Police.

Traffic and Roadway Monitoring

Traffic and Roadway monitoring, which relies on a combination of remote devices and human reporting to obtain the information necessary to assess real-time traffic flow and roadway conditions, is another essential element of CHART. The capital investment program for traffic and roadway monitoring includes the installation of video cameras at selected key interchanges, radar-based traffic speed monitors at one mile spacing, in-pavement loop-based traffic speed monitors and in-pavement weather sensors. These devices will be installed in moderate numbers to complement and complete the current CHART monitoring system. This program category also includes a project to install a video camera in an aircraft (in potential partnership with a private sector traffic service) to provide a roving aerial platform for monitoring traffic conditions and incident response operations associated with major incidents. Lastly, in order to prepare for future technological improvements, two studies will be performed, one to evaluate the application of portable automated systems for monitoring traffic in work zones and one to evaluate the application of in-vehicle electronics (which could include electronic tags or cellular phones) to monitor the movement of vehicles as "mobile probes."

Traveler Information

Traveler information, which involves providing details of travel conditions to the public, will be a critical product of CHART. As with the traffic and roadway monitoring category, traveler information will require additional deployment of devices to complete the CHART system. These device deployments will include variable message signs at major freeway to freeway interchanges, signs notifying motorists of messages on Travelers Advisory Radios (TAR's), and the conversion of TAR's to solar power. Traveler information will also branch into new areas, providing travelers advisory telephone (a telephone informational system which provides regional reporting of real time traffic conditions), and an Internet interface (providing static and dynamic information on the World Wide Web).

In addition to pursuing the travelers information techniques mentioned above, Maryland is also a partner in the National Capital Region Traveler Information Showcase. This showcase is a large-scale traveler information demonstration project for the Washington, D.C. area, which is multi-jurisdictional and multi-disciplinary in its approach. It involves a public-private partnership for information dissemination, with public sector participation funded by the federal government under a special appropriation.

Systems Integration/Communications

Although not a functional area, communications is a critical element to the CHART program. It provides the necessary connectivity from field device to operations center to consumers of transportation information. Simply put, the communications infrastructure in at the core of the CHART program. It is, at the outset, the most costly capital investment and as such needs to be carefully planned and architected to support CHART functional areas in a cost-effective manner. Given this large investment and the statewide nature of the CHART program, it is equally important to give consideration to a network architecture that can potentially support non-CHART applications. The funds programmed are based upon a landmark study that developed a prudent and cost-effective strategy for deploying a communications network to meet CHART needs, while also providing a valuable resource for other SHA, other MDOT and potentially other State applications.

The following outlines the strategy to use these funds:

- As a prerequisite element for CHART systems, develop and deploy the network early in the program. Strategically structure device deployment and technology to take advantage of technology trends such as deregulation of the telecommunications industry and new lower-cost technologies.

- Build one statewide backbone using a combination of existing fiber optics cable and leased services. This network will support CHART and other SHA applications and will be design to potentially support other State applications. This includes acquiring hardware, software and services to build the network.

- Design the network to be change-tolerant. In other words, design the network such that it work with a variety of mediums (copper, fiber, etc.) for maximum flexibility and to avoid any future substantial change to equipment or software.

- To reduce lease charges and provide greater capacity, pursue resource sharing opportunities with private sector firms to obtain communications capacity in exchange for State right-of-way access.

- Working with the Department of Budget and Management's Office of Information Technology (formerly, Department of General Services' Telecommunications Office), design the network within the context of the statewide communications policies and direction.

Communications, while critical, are only a part of the necessary CHART technology infrastructure. Systems Integration is the key to processing the data collected from field devices (video, speed, surface conditions) and turning it into useable information for operations personnel and the traveling public. The CHART subsystems will help operators control critical elements such as changeable message signs, signal timing, traveler's advisory radio, vehicle dispatch and resource allocation and will provide pre and in-trip information to the public through Internet access, radio, television and signage. To pull all these elements together into a coordinated system requires subsystem development and integration.

In order to improve the cost effectiveness of the CHART communications network, SHA will also study wireless technologies which could prove to have significant benefits over wireline media. Specifically, technologies such as spread spectrum and microwave

should be examined and field tested to determine if the technology can be employed for roadside communication.

Traffic Management

Traffic Management involves the application of traffic control devices (signs and signals) to manage freeway and arterial traffic flows with the goal of improving efficiency and safety of the highway system. The capital improvement program for Traffic Management includes the following projects:

- A Bus Priority Control System to provide transit buses with priority movement through signalized intersections to shorten travel times.
- A study of ramp metering systems which use traffic signals at the ends of on-ramps to “meter” the rate at which traffic enters the freeway.
- A study to examine the feasibility of using electronic “tags” on vehicles to augment the detection system along freeways.
- A study of lane control systems and/or lane-specific speed limits along congested portions of freeways.
- A study of real-time information to both pre-trip and en-route motorists on the status of park & ride lots and transit lots and the status of arrival and departure of AMTRAK, MARC and light rail trains.

Many of these projects and programs are continuations of previously initiated efforts and some have funding already secured. Efforts that are funded will continue to progress. Other efforts will be studied and designed at the same time funding is being identified. The projected funding levels for CHART capital expenditure categories are shown in Table 6.

Table 6 - Summary of FY 1997 - FY 2002 Programs
CAPITAL
Funding Levels (000's)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	TOTAL
Incident Management	$921	$851	$747	$727	$408	$889	$4,543
Traffic & Roadway Monitoring	$2,090	$1,971	$2,096	$1,850	$1,479	$1,579	$11,065
Traveler Information	$1,616	$1,762	$1,737	$1,211	$1,188	$1,188	$8,702
Systems Integration & Comms	$530	$15,991	$7,623	$4,846	$2,274	$2,305	$33,569
Traffic Management	$300	$400	$600	$300	$300	$0	$1,900
TOTAL CHART	**$5,457**	**$20,975**	**$12,803**	**$8,934**	**$5,649**	**$5,961**	**$59,779**

3.4 System Maintenance

CHART operates in a demanding physical environment which will subject its infrastructure to extremes in weather, temperature, and electrical disturbances, as well as potential physical damage from construction, accidents and vandalism. Its daily operation will be in full public view of travelers, and successful operation not only reduces delay but affects safety. As such, a 99% plus system reliability is essential. Having a critical device or system unavailable for as much as than 3 to 4 days a year (excluding regularly scheduled maintenance) could have major adverse consequences, especially if an incident occurred in the vicinity of that device and the SHA was unable to properly respond because of it -- public confidence in CHART would be eroded, and the public's trust in traveler information would diminish.

Maintenance issues currently being addressed include policies regarding how preventative and emergency maintenance will be performed. Preventative maintenance schedules will need to be developed and adhered to for all CHART software, hardware, and field devices. Guidelines for maintaining an adequate supply of spare parts will be developed for emergency repairs. Preventative maintenance will be eligible for federal funding, while emergency repairs will need to be financed with state, local, or private funds.

CHART maintenance will rely on a mix of public and private services, including:

- In-house maintenance (limited staff experienced in technical and project management cross functional skills).

- Contract maintenance to supplement limited in-house capability and to provide highly specialized services.

Currently, SHA utilizes a mix of these types of services to optimize the resources of in-house staff within the constraints of maintenance budgets.

System Maintenance includes labor costs as well as the tools and materials to maintain the CHART Operation. Projected funding levels are shown in Table 7.

Table 7 - Summary of FY 1997 - FY 2002 Programs
SYSTEM MAINTENANCE
Funding Levels (000's)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	TOTAL
Traffic & Roadway Monitoring	$200	$450	$550	$630	$710	$790	$3,330
Traveler Information	$89	$272	$322	$372	$422	$472	$1,949
Systems Integration & Comms	$1,500	$1,463	$1,612	$1,163	$1,162	$1,162	$8,062
TOTAL CHART	**$1,789**	**$2,185**	**$2,484**	**$2,165**	**$2,294**	**$2,424**	**$13,341**

4.0 On The Horizon

Predicting the future in a rapidly advancing technological world can be precarious. Ten years in today's era of technology can be like a lifetime of change. For example:

> When America Online (AOL) was formed in 1994, it struggled to provide access to the Internet, at a time when this service was not in major demand. In 1996, AOL suffered a minor software problem, that kept the service from functioning for 19 hours. If this had occurred during their start-up phase, this problem would have gone unnoticed -- but today this "software glitch" was a major news story and had 6 **million customers** angry that their business interests were suffering or their personal computing needs weren't being met.

This exemplifies the newest challenge in meeting customer expectations, and can be summarized by the theory that what exists as a product or service today, may seem archaic tomorrow -- and what exists as a product or service tomorrow, may seem impossible to live without the next day. More simply put, what is new and innovative today may be commonplace in less than a few years. The obvious conclusion that can be derived from the AOL example is that the public may place even greater demands on CHART's services in just a few years.

While the public's expectations of CHART beyond 2002 haven't been defined, we can develop a vision that is dynamic enough to accommodate changing customer expectation. The bottom line for this future thinking is balance:

- CHART will demonstrate a balance between existing services and accommodation of new services, making sure current ones are reliable and accurate, while new ones are offered only where significant benefits can be realized.

- CHART will reflect a balance between public and private sector participation, providing flexibility in the timing of planning and deployment in order to take advantage of private business needs and market trends. This will at times require adjusting programs in order to achieve optimum deployment results. It will also require SHA to examine its procurement practices, considering more innovative and effective methods of dealing with rapidly advancing technology.

- CHART will demonstrate a balance between technology and people, remembering that clearing incidents quickly will always be a program requirement, and will always require human intervention. The people who are involved in the process can be supported by the

technology, but never replaced. An effective workforce will require cross-functional capabilities among CHART personnel, enhanced by technology.

- CHART will demonstrate a balance between local and regional services, relying on an open technical as well as institutional architecture. Procedures and technical systems will be compatible or interoperable with those of neighboring jurisdictional entities, providing services to the customer that are “seamless” in nature, eliminating the notion that they have crossed into another provider’s or agency’s purview.

The five CHART program categories will remain as our primary focus for the time being. While each will evolve at different levels over the next 10 years, it is important that certain goals are set that will help shape the future planning efforts for CHART:

- Incident Management will always be the critical element of CHART, as clearing accidents quickly and safely will remain the cornerstone to all benefits perceived by customers.

- Traffic and Roadway Monitoring will continue to provide the information necessary to enhance incident management activities, as well as provide the data needed to disseminate traveler information. Coverage will be increased to encompass the entire CHART primary coverage area, but types of technology will likely evolve over the next several years. Public and private financing is possible for the future of monitoring, and enhanced integration across modal lines will occur.

- Traveler Information will become the largest perceived benefit by customers, and will develop into a service they rely upon much as they do weather reports today. Inter-modal integration will be a given, and private participation will likely become a critical element in the success of future traveler information initiatives.

- Traffic Management will continue to be provided largely by CHART public partners, but will evolve in many different ways. Signal systems will continue to be enhanced to provide additional adaptation to current conditions, and new traffic control technologies or strategies will evolve that will help guide customers through the system more efficiently. Most signicantly will be the technical integration of freeway and arterial traffic management, providing automatic adjustments on surface arterials related to real-time traffic conditions on freeways.

- Communications will be the backbone to providing all CHART services, and will continue to evolve in a manner that brings enhanced functionality with reduced cost. Just as

electricity provided the power for progress into the industrial age, communications will provide the power for progression into the information age. Communications will be the single largest cost area in CHART, and will also become a significant opportunity for public/private cooperation and for achieving shared public sector goals.

As a conclusion to this Business Plan, it is appropriate to reflect the views of six distinguished ITS experts from private industry who gathered as part of a CHART Strategic Planning Retreat held this summer to focus our activity in preparing this Business Plan and laying the groundwork for the future of CHART. Their words help to provide a beacon to the future of CHART (more excerpts are available in Appendix B):

- "There is a growing recognition that future highways and motor vehicles will have far greater computer and communications capabilities than those of today. Information technology is transforming virtually every aspect of our lives, and ITS is a manifestation of the information revolution in surface transportation. The ability of travelers to be informed of traffic conditions and options prior to and during trips is likely to produce profound changes in public expectations regarding traffic operations and management practices."

  Mr. Gary T. Ritter, ITS Program Coordinator, USDOT/Volpe Center, Cambridge, MA

- "The desire for integrated multimedia between businesses and homes is currently the major driver for telecommunications competition. New technology will be devised to fit this need and ITS can capitalize on this."

  Mr. Ben A. Gianni, Consulting Engineer, CSC, Hanover, MD

- "Although most people view ITS as only technology, CHART has demonstrated that the people and the vision is what makes the ITS technology viable."

  Mr. Patrick F. McGowan, ITS Engineer, Lockheed Martin, Denver, CO

- "As systems are deployed, an imbalance among system elements can develop. For the system to be in balance, each of its elements must have the same strength. In other words the information being distributed must not give more than the information is capable of describing."

  Mr. Walter Kraft, Senior Vice President, PB Farradyne, Inc., New York, NY

- "An effective maintenance program will be critical to the successful operation of CHART. This will require an adequate staff of well-trained personnel, up-to-date documentation on all system components, adequate budget for spare parts and expendables, and a long-term commitment on the part of the transportation agency to utilize the system to its full potential, including keeping the various displays and system algorithms up-to-date on a continual basis. A "set-it-and-forget-it" policy will not work. Daily operation of the system is in full public view of travelers who are directly affected by it as well as the decision makers who are responsible for allocating the funding necessary to the continued success of CHART."

  Mr. Jack L. Kay, President & CEO, JHK & Associates, Emeryville, CA

- "Public/private partnerships maximize the total ITS investment and improve market-responsiveness by providing incentives to private entities for their role in the development and operation of ITS services."

  Mr. Phil Tarnoff, President, PB Farradyne Inc., Rockville. MD

Appendix A - Definitions of Acronyms

ABBREVIATION/ACRONYM	DEFINITION
AOL	America Online
AVI	Automated Vehicle Identification
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
CCN	Closed Circuit Television
CHART	Chesapeake Highway Advisories Routing Traffic
CMAQ	Congestion Mitigation and Air Quality
DBM	Department of Budget and Management
Del DOT	Delaware Department of Transportation
ERU	Emergency Response Units
ETC	Electronic Toll Collection
ETP	Emergency Traffic Patrols
ETTM	Electronic Toll and Traffic Management
FHWA	Federal Highway Administration
FITM	Freeway Incident Traffic Management
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positionina Svstem
HOT	Highway Operating Technicians
IDF	Interstate Discretionary Funds
IEN	Information Exchange Network
INFORM	Information for Motorists
ISTEA	Intermodal Surface Transportation Efficiency Act
ITI	Intelligent Transportation Infrastructure
ITS	Intellinent Transportation Systems
ITS America	The Intelligent Transportation Society of America
ITS Marvland	The Intelligent Transportation Society of Marvland
ITS Program	Intelligent Vehicle -Highway Systems Act
MARC	Maryland Rail Commuter
MDOT	Maryland Department of Transportation
MdTA	Maryland Transoortation Authoritv
MSP	Maryland State Police
MTA	Mass Transit Administration
NHS	**National Highway System**
OIT	**Office of Information Technology**
OOM	**Office of Maintenance**

ABBREVIATION/ACRONYM	DEFINITION
OOTS	Office of Traffic and Safety
Penn DOT	Pennsylvania Department of Transportation
RFP	Request for Proposals
SHA	State Highway Administration
SOC	Statewide Operations Center
STP	Surface Transportation Program
TAR	Travelers Advisory Radio
TAT	Travelers Advisory Telephone
TCG	Teleport Communications Group
TOC	Traffic Operations Center
TRANSCOM	Transportation Operations Coordinating Committee
UPS	Uninterruptable Power Supply
US DOT	United States Department of Transportation
VDOT	Virginia Department of Transportation
VMS	Variable Message Sign