Safety Service Patrols Priorities & Best Practices

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EXECUTIVE SUMMARY

Safety Service Patrols (SSPs) have been in use in one form or another since the early 1960s, and have emerged as a vital part of Traffic Incident Management (TIM) programs. SSPs may also be referred to as Freeway Service Patrols (FSP), Courtesy Patrols, Emergency Response Units, and Motorist Assistance Patrols (MAP). The different nomenclature reflects the variety of service patrol program implementations. FSP programs focus primarily on freeway services and are implemented by State agencies who operate in the freeway environment. Courtesy Patrols and MAPs are mostly contracted services to remove disabled vehicles from the roadway to maintain operational safety. Emergency Response Units address incident management and quick clearance to reopen or maintain safe traffic movement. For the purposes of this report, a common reference of "Safety Service Patrol" is used to describe service patrols and programs except where specific nomenclature or program references are addressed in examples.

The primary purpose of SSP is to improve safety on the roadway and to minimize the effect incidents have on the operation of the transportation network. Typical goals and related objectives for SSP programs include:

- **Reduce non-recurring traffic congestion and improve travel time reliability**, by quickly and safely removing debris, disabled vehicles, and minor crashes from the travel portion of the roadway. It is important to note that removing disabled vehicles and abandoned vehicles from the shoulders of the roadway as quickly as possible lessens congestion impacts and improves safety for errant motorists and as importantly, the occupants of disabled vehicles along the shoulders.

- **Improve highway safety for responders and motorists** by providing proper traffic control to support a safe incident work area for responders and victims while guiding traffic safely through or around the affected section of roadway and assisting stranded motorists.

- **Provide timely and accurate information to the Traffic Management Center**, allowing staff to activate traveler information devices and systems, such as 511, websites, and the media, to warn motorists when they are approaching an incident or closure, or to alert motorists prior to their departure of the current road conditions, lane or road closures, diversions, and any delays.

SSP goals and objectives vary from program to program. The scopes of the various programs may be impacted by liability considerations as well as funding limitations. For example, some programs will not allow the patrols to remove disabled vehicles or minor crashes from the roadway, while other programs do not provide routine patrols or have limited service hours and only respond to incidents. SSP programs may provide benefits in both urban freeway and arterial environments, depending on the mission of the implementing agency.

The Federal Highway Administration (FHWA) has supported the incident management initiatives of transportation management centers (TMC) and SSP since the advent of TIM programs. FHWA has provided both technical and financial support to many States as they

develop and deploy their programs. This includes development of a training curriculum through the Strategic Highway Research Program 2 (SHRP2) entitled the "National Traffic Incident Management Responder Training Program," that combines classroom training with tabletop exercises. The modules address responder safety, quick clearance, and inter-agency coordination and communication. Within this environment, FHWA continues to promote the use and capabilities of SSP, safe quick clearance, and multi-agency coordination and training.

In addition to being one of the most effective TIM components, SSPs also complement the management and operations efforts of TMCs. One of the key findings in this report is that SSPs and TMCs need to perform as *a coordinated team*. Clear communication between the TMC and the patrollers is essential. In addition, there must also be an understanding between both entities regarding the other's job functions and needs. The patrollers are often the agency representative on the scene in the incident command setting and relay the requests for agency resources from the incident commander to the TMC as well as any information pertinent to the event. Relationships among different incident management stakeholders are critical to the success of SSP as a traffic incident management tool. The most effective programs involve close relationships between law enforcement and SSP personnel who trust and depend upon each other.

The broader the scope of services offered by an SSP program deployment, the greater the benefits realized by the agency operating the program as well as the traveling public. Once the objectives and related performance measures for the SSP services have been defined, it is very important to capture as much data as possible to track the performance of the program and determine if the goals and objectives are being met. Based on focus group activities conducted by FHWA, three TIM specific objectives and associated performance metrics have been identified as follows:

1. **Reduce roadway clearance time** - the time between the first recordable awareness of the incident by a responsible agency and the first confirmation that all lanes are available for traffic flow.

2. **Reduce incident clearance time** - the time between the first recordable awareness of the incident by a responsible agency and the time that the last responder has left the scene.

3. **Reduce the number of secondary incidents** - the number of crashes that occur after the time of the primary crash, either within the original incident scene or within the queue in either direction that is caused by the original incident.

There are many other benefits that an agency can realize as the result of implementing a successful SSP program, including:

- Safer environment for other emergency responders and motorists measured by reduction in staff injuries in the vicinity of the initial incident location.

- Reduction in vehicle delays and environmental-related factors such as emissions and fuel consumption.

- Timeliness of verification and real-time updates on traffic conditions that enable more accurate traveler information about freeway conditions and estimated durations.

SSP activities range, depending on jurisdiction, from providing basic support services for stalled motorists to assisting in the removal of vehicles involved in major incidents and temporary traffic management through the incident site using vehicle mounted dynamic message signs and traffic cones. Each jurisdiction funds, staffs and equips their service patrols to the level they feel justified. For example, many SSPs operate 24 hours per day/7 days per week, but may not use the same number of service patrol vehicles throughout the day or in every geographical area.

Although the purpose of SSP may be clear, the impetus for such programs may differ depending on the region. Examples include:

- Seasonal programs developed to reduce travel delays to vacation destinations while monitoring conditions along key access routes.
- Construction traffic mitigation programs employing SSP to monitor delays and keep work zones clear of crashes and breakdowns.
- Programs focused on the mitigation of non-recurring congestion in order to enhance roadway safety and operations.
- Weather-related programs started as a result of extreme weather conditions.

Many of the current SSP programs evolved from smaller programs in response to justifications for greater network coverage as well as expansion of services from peak travel periods to off-peak hours, weekends and in some cases, 24 hours per day/7 days per week operations. When implementing or expanding an SSP program, factors to consider include:

- Hours of operation.
- Patrol route selection based on historical incident statistics.
- Available personnel.
- Number of vehicles.
- Requirements for the types of vehicles to deploy.
- Equipment needed on the vehicles.
- Tools and equipment needed to perform the SSP support functions safely and effectively.

SSP success involves more than defining and implementing the service patrol program. Many policies, procedures, and multi-agency agreements are required along with strong relationships forged with other response agencies. These relationships facilitate the proper integration of the service patrols into the TIM response team. Training is very important for the patrollers. Multi-

agency training and exercises can initiate and strengthen relationships and trust between the patrollers and the other response agencies.

These considerations are influenced by program goals, funding and resources, so it is important to keep the decision-makers and elected officials properly informed about the progress and successes of the program and the benefits that are realized. As agencies contemplate establishing an SSP program or evaluate options to update their existing SSP program, it is helpful to understand the justification for existing SSP programs. This report provides insights into agencies' SSP program experiences.

While it is still difficult to measure all performance metrics uniformly from program to program, advancements in technology have helped to make some of this data collection more accurate. For example, many agencies with SSPs have used performance data from their existing operations to justify maintaining or expanding operations of these patrols. Such information is especially useful given the difficult funding environments experienced today.

CHAPTER 1. INTRODUCTION

BACKGROUND

Safety Service Patrols (SSP) have existed in one form or another since the early 1960s, and have served as a vital part of Traffic Incident Management (TIM) programs. SSPs are also referred to as Freeway Service Patrols (FSP), Courtesy Patrols, Emergency Response Units, and Motorist Assistance Patrols (MAP). The Federal Highway Administration (FHWA) has promoted TIM program implementation, including SSP and traffic management centers (TMC), in the interest of promoting safety and mobility throughout the United States. The FHWA has provided both technical and financial assistance to many States developing and deploying TIM programs. The safety of incident victims and responders has been of paramount concern, along with the rapid detection and clearance of these incidents.

In the 1990s, FHWA created a multi-agency approach to training incident responders in the form of a two-day workshop as part of Demonstration Project 86[1]. Some of the primary topics of these workshops included SSP, quick clearance, and inter-agency coordination and cooperation. Today, FHWA continues to evolve and promote the use of the SSP along with quick clearance and inter-agency coordination and training. The emphasis is not only on detecting and clearing incidents but also on guiding motorists approaching an incident scene safely past or around the impacted travel lanes. The value of these programs has been reflected in various benefit-cost studies that have been carried out by SSP operators.

Today's SSP deployments may vary in the types of service provided, vehicles used, and staffing. Services may range from a "courtesy patrol" providing simple motorist assistance, to higher-level services providing aggressive roadway clearance of disabled and wrecked vehicles, including removal of large trucks. The operations and maintenance of these SSP services differ from region to region. Some of the simpler operations may be operated by the private sector as "Samaritan patrols" through public-private partnerships, while more complex operations may be operated by a State department of transportation, police agency, transportation authority, or some partnership of the above. Many services maintain all their assets (e.g., trucks, heavy equipment, garages, etc.) in-house, while others may contract the staffing, procurement and/or management of assets such as trucks, garages and heavy equipment.

Patrols can be staffed in several ways including dedicated agency employees, contracted services, or agency personnel assigned to different duties in their routine positions but can be applied on an as-needed or overtime basis.

[1] "Summary of Experiences Related to Demonstration Project 86 – Relieving Traffic Congestion Through Incident Management", USDOT, 1997.

SERVICE PATROLS: A KEY TO EFFECTIVE TRAFFIC INCIDENT MANAGEMENT

SSPs are considered an integral TIM component, and they also complement the efforts of regional TMCs in detecting, confirming and eventually clearing incidents that cause lane blockages. From a public perspective, they serve as the front-line representative of the agency who operates the patrols, providing face-to-face contact when an individual traveler may most need assistance.

SSP duties in TIM may include:

- Provide the initial report, response or verification of an event.
- Provide initial traffic control and scene safety for responders and victims.
- Support the incident commander as needed to manage the lane closure and protect the incident site, victims, and agency personnel.
- Communicate resources needed to their agency.
- Assist in the quick clearance of debris, disabled vehicles, or crashes in or along the travel portion of the roadway.

The FHWA Service Patrol Handbook states, "Communications with the TMC, either directly or through the service patrol at the incident, can only improve responses and advance the treatment and transport of the injured. When service patrols arrive on the incident scene before fire and rescue personnel, they can relay valuable information such as the nature and severity of injuries, and the number and age of any victims."[2] This statement reinforces the need for clear communication between the TMC and the patrollers in the SSP vehicles. Both the TMC operator and the patroller should understand each other's specific job functions and needs. An SSP can greatly contribute to quick incident clearance through reliable information exchanges with the TMC. These actions can reduce the resulting delays to motorists as well as the likelihood of secondary incidents occurring upstream of the original incident.

Service patrollers are often the first agency representatives on an incident scene. The patroller's role in the incident command environment will depend on regional policies and the designated level of responsibility of the SSP when compared with police or other first responders. They may be responsible for communicating particular incident details to the TMC, although other entities such as police or fire departments may typically serve as the actual incident commander. Key relationships for a successful SSP (both patrollers and dispatchers) include those with the first responders and law enforcement agencies, TMC operations staff, other transportation agency staff responsible for incident clearance or clean-up activities, and towing companies.

[2] "Federal Highway Administration Service Patrol Handbook", USDOT, 2008, http://ops.fhwa.dot.gov/publications/fhwahop08031/index.htm

EXAMPLES OF WHY SOME AGENCIES IMPLEMENTED SERVICE PATROLS

It is helpful to understand the reasons why existing SSP programs were founded when contemplating the establishment of a service patrol program or evaluating options to update an existing program. The primary purpose of SSP is to maximize the safety and mobility of the transportation network. SSP accomplishes this purpose through rapid removal of incidents from travel lanes or shoulders, which reduces traffic flow disruption that might result in secondary incidents.

From their initial success and corresponding program results, including favorable motorist feedback, many SSP programs have evolved into much larger programs. Some expand from a focus on specific roadway segments and peak time periods into regional coverage over a longer period (sometimes 24 hours per day/7 days per week) of coverage depending on the resources and funding available from the public agencies, as well as public and/or private partners.

Although the purpose of SSP may be clear, the impetus for such programs may differ depending on the region. Examples include:

- Seasonal programs developed to reduce travel delays to vacation destinations while monitoring conditions along the key access routes.
- Construction traffic mitigation programs employing SSP to monitor delays and keep work zones clear of crashes and breakdowns.
- Programs focused on the mitigation of non-recurring congestion in order to enhance roadway safety and operations.
- Weather-related programs started as a result of extreme weather conditions.

Each of these examples may evolve into more extensive programs covering larger networks over longer periods of the day or week, depending on the effectiveness of current services and demonstrated needs based on current and projected traffic conditions.

Seasonal Program Example - Maryland's Coordinated Highways Action Response Team Program

The roots of Maryland's Coordinated Highways Action Response Team (CHART) Program are derived from a patrol created in the early 1980s focused on improving seasonal traffic flow to and from Maryland's Eastern Shore during the summer months. The patrol focused on the routes connecting Baltimore and Washington to the Chesapeake Bay Bridge along with major routes on the Eastern Shore. In addition to delays on the Bay Bridge, there were other delays along US-50 across the Eastern Shore area, including several at-grade intersections as well as a frequently-operated drawbridge. Issues with disabled vehicles and crashes along this corridor further impacted traffic operations.

In order to mitigate these delays and associated incidents, the Maryland State Highway Administration (MdSHA), in coordination with the Maryland State Police (MSP), implemented a program known as Eastern Shore Traffic Operations (ESTO) that consisted of staff from various MdSHA offices equipped with light trucks. Staff patrolled the main corridors and assisted stranded motorists, removed minor crashes from the travel portion of the roadway, and manually controlled traffic signals at major intersections when needed. The program proved to be a success and was so well received by the public that Governor William Donald Schaffer announced in 1987 a new program called "Reach the Beach." This program included expansion of the MdSHA Emergency Patrols as well as a Traffic Operations Center (TOC) to provide motorists with real-time updates on travel conditions.

In 1989, a serious crash along I-270 northwest of Washington, DC resulted in a very long closure of the interstate. In response, the program was expanded to include a new TOC in the Washington, DC region. The CHART Program evolved into a statewide traffic management program operating 24 hours per day with a Statewide Operations Center (SOC).

Construction and Work Zone Program Examples – Florida and Nevada

In the late 1980s, District 4 of the Florida Department of Transportation (FDOT) started a service focused on assisting stranded motorists within construction zones. The first of this service was for the I-95 expansion in Broward County, and was implemented by the construction contractor at the direction of FDOT. The patrols assisted stranded motorists basic services, such as furnishing a limited amount of fuel, assisting with tire changes, and helping with other types of minor vehicle repairs. In February 1995, the FDOT District 4 initiated the program in its current form that initially covered the entire I-95 corridor Broward County. This effort proved to be so successful that it was expanded to Palm Beach County in 1997 and has since been expanded to include all types of roadway incidents, heavier patrol vehicles with tow capabilities. In December 1999, FDOT began funding the service patrol program on a statewide level, realizing that it was one of the most effective elements of FDOT's Incident Management program. The service patrol program received name "Road Rangers" as a result of a statewide contest held in 2000. The program remains highly successful FDOT service. There were almost 4.4 million assists recorded between and 2013.

Table 1 shows the annual number of assists provided by the Service Patrol since 2000.

Table 1. Florida Service Patrol Assists (2000-2013).

Year	Assists
2000	112,000
2001	198,372
2002	279,525
2003	316,883
2004	342,895
2005	336,684
2006	267,358
2007	383,584
2008	320,217
2009	296,041
2010	351,941
2011	395,516
2012	399,008
2013	374,971

The Nevada Department of Transportation's (NDOT) FSP program started in 1998 in a manner very similar to that of Florida. The NDOT FSP program primarily used vans and had a focus on motorist assistance. The program began on a trial basis in Las Vegas to mitigate traffic congestion caused by the US 95 roadway construction project. The program was operated within the construction limits. From there the program slowly grew to include the Las Vegas and Reno/Sparks metropolitan areas. Today, the NDOT FSP program continues in those regions with corporate sponsorship supporting the operational costs of these services. In addition, NDOT also provides Incident Response Vehicles (IRV) in the Las Vegas area, which assist in the removal of incidents from travel lanes. The purpose of the NDOT FSP program is to improve safety on heavily traveled urban freeways by reducing the time required to remove incidents that disrupt traffic flows and cause traffic congestion during peak travel periods.

Examples of Programs Focused on Mitigation of Issues Related to Non-Recurring Congestion and Safety – Pennsylvania and Colorado

When Pennsylvania Department of Transportation (PennDOT) District 8-0 in the Harrisburg area began operating a TMC, the operations staff noted from congestion studies on their roadway network that even disabled vehicles on the shoulders were causing delays. In order to realize better system operations, crashes and other obstructions needed to be cleared from the roadway quickly and more efficiently, whether in travel lanes or on the shoulder. District 8-0 staff decided to follow the guidance of an FHWA research study that identified service patrols as a good tool to provide incident management services to the district's interstate network. The PennDOT District 8-0 office implemented two service patrol trucks on a trial basis that proved to be successful in clearing incidents and reducing related congestion. PennDOT has since expanded the operation to three trucks patrolling the Harrisburg area during peak travel times. Since the program's inception, PennDOT and the motoring public have realized fewer secondary crashes,

reduced detection times of incidents and disabled vehicles, and a reduction in the amount of time abandoned vehicles sit on highway shoulders during the hours that the patrols operate.

In 1993, PennDOT District 6-0, located in the Philadelphia region, began operating the region's first TMC. PennDOT soon realized that they needed to clear crashes more quickly to lessen the impact of freeway congestion in Philadelphia. They worked with the Philadelphia Police Department who managed the traffic along I-95 at the time. The sponsored Samaritania program was contracted to patrol the roadways and offer assistance to stranded motorists as well as acting as the "eyes and ears" of the District 6-0 TMC. In July 2000, Samaritania ceased operations in Philadelphia, but PennDOT began contracting services to operate the service patrol program on a permanent basis since the need for these patrols was so great. The program started with three patrol trucks and it has grown to 13 patrol vehicles. The program operating area has expanded to include suburban Philadelphia as well as the city. The patrollers operate in the city of Philadelphia five days a week, from 5:00 AM until 7:30 PM (15 hours). In the suburbs, they work five days a week during peak hours (8 hours per weekday).

The Colorado Department of Transportation (CDOT) has had courtesy patrol operations in place for more than 25 years. CDOT's original purpose for the program was to enhance safety and operations along Colorado interstates. The program was funded using grant money for the initial two to three years of operations, and then the program was transferred to CDOT for financial support. Initially, the program provided only motorist assistance, but it has evolved to include quick clearance in recent years. Colorado currently has three active service patrols. The first is called the Mile High Courtesy Patrol (MHCP) that patrols the Denver Metro area. The Mountain Courtesy Patrol (MCP) and a Heavy Tow program along I-70 west of Denver, were added. The Heavy Tow program provides services on heavy traffic weekends to assist with spinouts, crashes, and tractor-trailers that are disabled on mountain grades.

Weather-Related Program Example - Colorado

Due to the severe weather conditions during the winter months, CDOT and the Colorado Motor Carrier Association developed a variant of an SSP service known as the Heavy Tow Program along the I-70 corridor between Denver and Vail. Under the program, heavy tow units are staged at strategic locations along the I-70 corridor during high traffic conditions or when storms are anticipated. When a Class 8 or commercial vehicle becomes disabled, the heavy tow unit in the area responds and removes the vehicle to a safe haven at no cost to the trucking fleet. At that point, the trucking company is responsible for moving the vehicle. The program started in 2008 and was found to be successful in reducing the clearance time of large trucks stuck in the snow blocking roadway lanes. The lane clearance times were cut in half from previous seasons to an average of 27 minutes. The economic benefit is reported by CDOT at over a 20:1 return on investment on a program that the State estimates to cost $500,000 to fund per year.[3]

[3] "Evaluation of the Heavy Tow Quick Clearance Program", Colorado DOT, 2008, http://aii.transportation.org/Documents/TRSP/TRSP-Other-CDOT-program-evaluation-2008.pdf

Example of Evolution from Earlier Programs – Pennsylvania Turnpike

The Pennsylvania Turnpike Commission evolved its SSP activity from an earlier approach that originally stationed ambulances at each maintenance shed location. The vehicles were on-call 24 hours per day to provide a quick response to incidents where there were injuries involved. During the early to mid-1990s, the Turnpike contracted with local fire departments to respond to medical assistance calls on the Turnpike facility the ambulances were replaced by patrol vehicles for emergency response to incidents. One patrol vehicle was stationed at each maintenance shed staffed by maintenance utility workers. These vehicles currently patrol their routes twice per shift and are available at the maintenance facilities for immediate response to any event that occurs when they are not actively patrolling. The patrol staff are assigned other duties when not executing patrol duties.

SERVICE PATROL GOALS AND OBJECTIVES

Service patrol goals and objectives vary from program to program depending on the agency's mission. In general, SSP programs are intended to:

- **Reduce non-recurring traffic congestion and improve travel time reliability** by quickly and safely removing debris, disabled vehicles, and minor crashes from the travel portion of the roadway. It is important to note that removing disabled vehicles and abandoned vehicles from the shoulders of the roadway lessens congestion impacts and improves safety for motorists and the occupants of disabled vehicles along the shoulders.

- **Improve highway safety for responders and motorists** by providing proper traffic control to support a safe incident work area for responders and victims. The SSP guides traffic safely through or around the affected section of roadway and assists stranded motorists.

- **Provide timely and accurate information to the TMC** allowing staff to activate traveler information devices (e.g., dynamic message signs (DMS), highway advisory radio) to warn motorists when they are approaching an incident or closure, or systems (511, websites, media, etc.) to alert motorists of the current road conditions, lane or road closures, diversions, and any delays prior to their departure.

When implementing or expanding an existing patrol program, the goals and objectives need to be carefully defined to address the needs of motorists and the agency. Once the goals and objectives have been set, it is very important to capture as much data as possible to track the performance of the program and determine if the goals and objectives are being attained. FHWA, through a focus group initiative[4], has identified three TIM-specific objectives and associated performance metrics. The three objectives include:

[4] "Federal Highway Administration Focus States Initiative: Traffic Incident Management Performance Measures Final Report", FHWA, 2009, http://ops.fhwa.dot.gov/publications/fhwahop10010/fhwahop10010.pdf

- **Reduce roadway clearance time** - the time between the first recordable awareness of the incident by a responsible agency and the first confirmation that all lanes are available for traffic flow.

- **Reduce incident clearance time** - the time between the first recordable awareness of the incident by a responsible agency and the time that the last responder has left the scene.

- **Reduce the number of secondary incidents** - the number of crashes that occur after the time of the primary crash, either within the original incident scene or within the queue in either direction that is caused by the original incident.

While it is still difficult to accurately measure some of these objectives uniformly from program to program, more information is now available thanks to the availability of Global Positioning System (GPS)-based dispatch data as well as real-time traffic data. For the majority of incidents, the first notification of the event is received by a 911 call center or other public safety answering point (PSAP). As TMCs begin to integrate or receive a cleansed data feed from 911 call centers and other PSAP's Computer Aided Dispatch (CAD) systems, the first recordable awareness data is now available to accurately reflect the response and clearance times of incidents. Numbers and types of incidents are logged. Assists or actions taken by the patroller to clear the motorist and/or vehicle from the roadway are also logged.

It is typically a greater challenge to relate secondary incident data to an original incident because criteria needs to be defined to relate potential secondary incidents to primary incidents. The criteria which involves the association of the time and location of each incident should be defined so that TMC operators and SSP dispatchers can confirm the relationship between particular primary and secondary incidents. This is especially important to capture for later data retrieval and performance measures analysis.

BENEFITS OF IMPLEMENTING OR ENHANCING AN EXISTING SERVICE PATROL PROGRAM

An agency can realize many benefits as a result of implementing a service patrol program that meets the needs of the agency and the communities that it serves. As with any sustainable program, the need for the service must be clearly defined whether it will be a new service, an expansion of an existing service operating area, operating hours, or an increase in the number of patrols. The benefits must be clearly identified for the agency as well as the community and motoring public. Measurement of the benefits from the resulting service implementation is critical to justifying the new or expanded service as well as for managing and maintaining service performance and success.

Typical Measures

The FHWA's TIM Benefit-Cost (TIM-BC) tool[5] provides a standardized approach, using a series of simulation tools, to establishing the potential effectiveness of SSP services given capital and

[5] FHWA Traffic Incident Management Benefit-Cost (TIM-BC) Tool, https://www.fhwa.dot.gov/software/research/operations/timbc/

operating costs. Agencies such as New York State Department of Transportation, FDOT, and others have demonstrated direct means of measuring benefits and costs.

Data collection is an ongoing process. If possible, a before and after data comparison should be compiled to quickly identify and illustrate the added benefits of an SSP program deployment. Typical measures for determining the benefits established by SSP deployments include:

- Safer environment for first responders and motorists measured by reduction in staff injuries in the vicinity of the initial incident location.
- Reduction in incident duration measured by decreased detection, response, and clearance times.
- Reduction of secondary incidents.
- Reduction in vehicle delays and environmental-related factors such as emissions and fuel consumption.
- Timeliness of verification and real-time updates on traffic conditions that enable more accurate traveler information about freeway conditions and estimated durations.

Fundamental Benefits and Core Services

Several service patrol benefits depend on the level of SSP deployment and their assigned missions. Some of the "fundamental benefits and core services cited" according to the FHWA's "Service Patrol Handbook"[6] include:

- Reduced incident duration.
- Quicker debris removal.
- Assistance to stranded motorists and crash victims.
- Traffic control and management.
- Real-time updates on traffic conditions (more accurate traveler information).

Secondary benefits can be gained from the direct services that patrols provide. These include:

- Improved traffic flow as a result of reduced incident duration and better traffic control.
- Reduced travel time, fuel costs, and vehicle emissions.
- Improved travel time reliability.
- Improved motorist and TIM responder safety.

[6] FHWA Service Patrol Handbook, p.8

- Reduced number of lanes closed for an incident.
- Reduced secondary crashes.
- Reduced TIM responder personnel and resources required for incidents when service patrols can handle response (e.g., stalled vehicle).
- Reduced traffic congestion.

Basic Service Capabilities

SSP implementations provide extensive ranges of services which extend to heavy-vehicle clean-up and incident coordination activities. The typical services offered by service patrols include[7]:

- Moving disabled or abandoned vehicles from the travel portion or unsafe location along the roadway.
- Providing fuel.
- Providing water to person(s) being assisted or for overheated vehicles.
- Changing flat tires.
- Providing mechanical assistance such as jump starts, minor mechanical repairs, tire inflation.
- Assisting stranded motorists with cell phone service or a safe place to wait if vehicle is disabled.
- Removing obstacles and objects from the roadway to include debris and other hazards.
- Cleaning up minor vehicle fluid spills.
- Arranging for towing by calling for the motorist.
- Providing relocation services to point of safety.
- Sharing information.
- Acting as the agency's representative in the Incident Command structure.
- Requesting emergency services.
- Providing information and updates to the TMC.

[7] Ibid., p.11

- Assisting other responding agencies such as law enforcement, fire and rescue, Emergency Medical Services, and other response agencies as needed.

Benefit Case Studies and Evaluations – Some Examples

In order to advance the benefits and levels of service provided by SSP, agencies seeking to approve new programs as well as program expansions may compile performance measure data on existing services and the resultant benefits. There are many examples of how agencies have used data to show the success of SSP deployments and demonstrated benefits through studies or pilot programs.

Justification of 24 Hours per Day/7 Days per Week Services for Maryland Coordinated Highways Action Response Team Patrols

The Maryland CHART Program recognized a need to move their patrols from a Monday through Friday, 16-hours-per-day (nights and weekends were on-call) to a 24 hours per day/7 days per week operation as a result of a SSP Pilot project. MdSHA undertook a two-pronged approach using pilot deployments to determine if the need for their patrol services and associated cost was warranted.

One pilot looked at the need for expansion of SSP services to weekends which, prior to May 2012, was only provided for sporting and other special events on an overtime basis. As part of the pilot, MdSHA scheduled Emergency Patrols on two weekends in June 2012, with two sets of patrollers scheduled for three regions (Baltimore, Frederick and National Capital) on two shifts (5:00 AM-1:00 PM and 1:00 PM-9:00 PM on Saturday and Sunday). All communications were handled from the Statewide Operations Center (SOC) rather than regional TOC facilities. Overall the Maryland CHART Program patrols assisted 202 motorists and managed 75 incidents during the four piloted weekend days. Assists and incidents were equally distributed between morning and evening shifts. The results indicated there was value in considering the expansion of the CHART Program patrol operations to include weekend days, although it would likely require overtime costs for staff.

The second pilot was conducted in November 2012 and examined the expansion of the Maryland CHART Program patrol services to weeknight periods. The pilot deployed two Emergency Response Technicians (ERTs) in two trucks, patrolling the beltways around Baltimore and the National Capital Region on weeknights from 9:00 PM to 5:00 AM between Sunday night and Friday morning. They responded to road closure incidents in other areas of the State as well. The eight-week operation was interrupted for two days due to a weather event, Hurricane Sandy, and the MdSHA's preparation and response to the storm and its aftermath. Over the eight weeks of the pilot, the two ERTs assisted 164 motorists and managed 150 incidents. The Wednesday-into-Thursday shifts proved to be the highest day for assists with 47, while Thursday-into-Friday shifts saw the greatest number of incidents with 40. Nearly a quarter of all incidents during the pilot involved lane closures of greater than 50% of the roadway, and a third of those incidents involved closures of the entire roadway. All closures were resolved prior to the start of the normal day shift. The effort of night patrols in managing these closures had a significantly positive impact on the morning rush hour.

The pilot programs provided documentation of the potential benefit of expanding the hours of the service patrol. This information provided justification for the legislature to give MdSHA an additional 24 permanent State positions in order to implement patrols on a 24 hours per day/7 days per week basis. The regional TOCs maintained normal weekday operating hours and the SOC, which was already operating 24 hours per day/7 days per week, maintained all of the communications for overnight and weekend shifts throughout the State.

Demonstrating Benefits and Return on Investment in Hampton Roads, Virginia

A Return on Investment (ROI) study of the SSP in Hampton Roads[8], conducted by the Virginia Transportation Research Council and published in 2007, showed the benefits of service patrols in another context. The Virginia Department of Transportation (VDOT) Hampton Roads SSP program serves approximately 80 miles of roadway on a 24 hours per day/7 days per week basis. It patrols eight routes continuously and provides dispatch service along two other routes. The Hampton Roads region experiences heavy tourist and vacation traffic during the summer months, especially during weekends.

To perform the study, an analysis of route geometrics, traffic characteristics, and incident data was conducted in the Hampton Roads area from July 1, 2005, through June 30, 2006. This data was used to define parameters and inputs into an SSP evaluation model to obtain the benefits of the program. Reviews were conducted on a seasonal basis to assess the fluctuations in cost and benefit during different times of year.

The research found that the total annual benefits of the Hampton Roads SSP, in terms of delay and fuel consumption, were approximately $11.1 million. The costs associated with patrolling the routes in the region were approximately $2.4 million; thus the savings generated by this program were nearly five times the expenditures to fund the program.

The Hampton Roads SSP study compared the average incident duration for crashes, breakdowns and debris along routes that were patrolled routinely by the SSP to similar incidents and conditions without SSP assistance. The study analyzed 33,877 incidents. The study compared the "begin" and "end" times of incidents that had occurred on SSP routes to the times for incidents without SSP assistance that matched in terms of incident type, roadway, and traffic conditions. Incidents on non-SSP roadways only received assistance from the Virginia State Police (VSP).

The analysis performed as part of the ROI comparison not only showed the monetary benefits of the service patrol program, but the benefits of quicker clearance that the patrols provided at incident scenes compared to incidents that were handled solely by the VSP without the SSP services. Some of the findings included:

- SSP assistance at incidents yielded a 70.7% reduction in duration compared to VSP-only assisted incidents.

[8] "A Return on Investment Study of the Hampton Roads Safety Service Patrol Program," VTRC 07-RD33, Virginia Transportation Research Council, June 2007, http://www.virginiadot.org/vtrc/main/online_reports/pdf/07-r33.pdf

- The mean clearance time for all incidents with SSP assistance, including debris, crashes, and breakdowns, was 10.17 minutes.

- The mean clearance time for incidents handled only by VSP was 34.70 minutes.

The research identified other associated benefits, such as freeing State police for law enforcement and reducing the time for emergency service providers to clear the scene of an incident.

CHAPTER 2. TYPES OF SERVICE PATROL PROGRAMS

STAFFING OPTIONS FOR SERVICE PATROLS

Staffing costs are in addition to the costs associated with the procurement and maintenance of the fleet vehicles, and the consumables associated with them. There are service patrol staffing options for an agency to consider when implementing a new Safety Service Patrol (SSP) program or modifying their existing program. The staffing approach selected will depend on the number of permanent agency positions that are allocated to the SSP program. In some cases, the staffing, as well as the physical operation and maintenance of the service patrol, may be contracted out. Regardless of which option an agency selects, a dedicated set of agency personnel is still needed to oversee and operate an SSP program in the long-term.

As with any agency program, the decision of how to implement and maintain a program is a multi-faceted one. Ultimately, the approach followed is dependent on many regional and local factors which may differ from system to system: available funding, available contract mechanisms, procurement requirements, similar contracts that are in use, availability of permanent agency positions, current operations and maintenance facilities that could be modified to host the service patrol vehicles, and any statutes or legislation related to the State's liability in providing direct assistance to motorists.

The following sections address various staffing options. Table 2 provides examples of the staffing options implemented by different agencies. Of importance is the frequent presence of private sponsors or partners that are used to defray a number of the operational costs and in some cases may actually operate the patrol.

Agency Operated and Staffed Services

The most common strategy for staffing a patrol is to keep all resources in-house, or agency-owned and operated. Many agencies that employ this approach appreciate the fact that it requires the least amount of external contracting. By keeping the human resources internal to the agency, the program management has an inherently better understanding of the employment specifics for the staff. More importantly, programs staffed with government personnel, especially those with sworn law enforcement-trained personnel, realize its benefit due to the operators having the authority to make certain decisions at incident scenes that are not normally given to contract employees. They can directly request additional agency resources.

An agency-operated patrol affords the agency full control over every aspect of the program including the flexibility to adjust routes, add drivers (both temporary and permanent), adjust hours of operation, and add or remove levels of service as needed without being bound by an external contract. While reducing service hours or patrols is never an initial goal, ownership allows the agency to make those adjustments without the financial burden that sometimes accompanies an external contract.

Table 2. Examples of Patrol Staffing Options.

Agency	Staffing of Patrols	Comments
Colorado Department of Transportation	100% contractor staffed	Colorado Department of Transportation is currently investigating funding alternatives such as sponsorships.
Florida Department of Transportation (Road Rangers)	100% contractor staffed	Each District manages their patrols. Private sponsor provides supplemental funding.
Georgia Department of Transportation (Highway Emergency Response Operators)	100% agency staffed	Private sponsor provides supplemental funding.
Houston TranStar (Motorist Assistance Program)	100% agency staffed	Use of sworn law enforcement personnel.
Maryland State Highway Administration (Coordinated Highway Action Response Team)	95% Maryland State Highway Administration Staffed	Private sponsor provides several vehicles and contracted patrollers per sponsorship agreement.
New Hampshire Department of Transportation	100% agency staffed	Private sponsor provides supplemental funding.
New Jersey Department of Transportation	100% agency staffed	Private sponsor provides supplemental funding for equipment
North Carolina Department of Transportation	100% agency staffed	
Pennsylvania Department of Transportation District 8	100% contractor staffed	Private sponsor provides supplemental funding.
Pennsylvania Department of Transportation District 6	100% contractor staffed	Private sponsor provides supplemental funding.
Pennsylvania Turnpike Commission	100% agency Staffed	Private sponsor provides supplemental funding.
Utah Department of Transportation	100% agency staffed	Exploring funding options to increase operating hours.
Virginia Department of Transportation	100% contractor staffed	
District of Columbia Department of Transportation	100% agency staffed	
Washington State Department of Transportation	100% agency staffed	Available for 24 hours per day/7 days per week call out.

Agency-operated patrols may be sensitive to budgetary issues and scrutiny, regardless of the SSP operational needs relative to staffing and resources. Reductions in service and staffing may be imposed from legislatures or by required budgetary actions.

Several agencies have developed innovative staffing approaches in order to address the SSP staffing needed at critical times despite budgetary pressures. These approaches typically include the use of other agency employees to bolster the presence of the patrols during peak hours, special events, or major incidents. The following are some examples of innovative staffing approaches.

- The Regional Emergency Action Coordinating Team (REACT) program is a county-based arterial program located in Maricopa County, Arizona. REACT is dispatched to provide arterial traffic management and support to first responders from Fire and Law Enforcement agencies when a major incident occurs. The REACT program responds to incidents 24 hours per day/7 day per week and is staffed by part-time and full-time Maricopa County employees who receive specialized training for their positions. The part-time employees have regular duties within the agency, and when they are needed to respond and support the permanent SSP staff, they stop their regular work activities and respond to the incident scene in REACT Incident Response Vehicles.

- The Maryland State Highway Administration (MdSHA) uses maintenance forces to supplement their current service patrol program. During the morning and evening peak periods, trained individuals from the maintenance shops supplement the existing full-time SSP patrollers as an overtime assignment prior to or after their routine maintenance duties. Each maintenance shop that participates in the supplementary SSP activity has a fully outfitted service patrol vehicle and additional uniforms for the drivers for this purpose.

Contracted Services

Many States have opted to contract their SSP programs to the private sector. Contracted service patrols provide specific services as identified in their contract scope of work for a specific number of years and with requirements for route coverage. Their contracts may also include numbers of staff and vehicles. The contracted services option can be beneficial if implemented correctly and a clear, well-written contract and scope of services has been developed and executed. There should be performance measures in the contract that include monetary incentives for exceeding minimum service requirements. These incentives may include specified maximum response time following reports of an incident, as well as incident clearance time requirements and reduction of secondary crashes. The contract should include penalties for not meeting the required measures over a specific period of time.

Liability and Indemnification of Safety Service Patrol Contractors

When implementing contracts for SSP services, the level of service required of the contractor and the ensuing liability involved is important to consider. The services permitted may differ from region to region depending on laws and regulations in a given State. Some programs will not allow a private SSP contractor to move vehicles from the roadway. Others, such as

Pennsylvania Department of Transportation (PennDOT), allow the contractor to remove disabled vehicles or minor incidents from the travel lanes of the roadway, but require the contractor to carry additional insurance for liability to cover any claims. Concern for insurance costs due to liability claims may make contract patrollers hesitant to move vehicles and debris out of the roadway. Allowing for some indemnification of the contractor while performing expected SSP duties has proven to be beneficial in allowing contracted SSPs to clear incidents from travel lanes.

For example, the Florida Road Ranger program, comprised of private contractors operating the patrols has been allowed by the State of Florida some exceptions to liabilities as the private contractors are acting as an agent of the State while moving incidents, disabled vehicles or debris from travel lanes. Florida has passed legislation, Statute 316.061(3), provided in Appendix B, identifying the contracted SSP operator as an "authorized agent of the department." This allows them to remove damaged or disabled vehicles from the roadway without being considered at fault for any additional damage that occurs to the disabled vehicle. With this additional protection in place, the contract service patrol providers are less hesitant to remove obstructions from the travel lanes and they are able to operate as an agency-operated patrol would.

Business Model Examples

There are various business model examples of agencies contracting SSP functions to service providers. One such model is a competitive procurement of SSP services in which the selected service provider is required to provide patrollers that meet minimum qualifications and training, along with the service vehicles, equipment and facilities, if necessary, that meet the required specifications in the contract. States such as Florida and Virginia follow this business model.

A second business model is an agency contract with conventional towing services, already equipped with trucks, to patrol routes and provide services. An example of this model is the Freeway Service Patrol (FSP) program in Monterey County, California operated by the California Highway Patrol (CHP) in coordination with Caltrans and Monterey County. In this arrangement, CHP's primary role is to oversee the training and operation of the contract towing services which includes conducting background checks of prospective SSP operators, providing initial and refresher training, performing random and planned tow inspections, conducting ride-alongs, evaluating the patrollers, and investigating complaints. The CHP is also responsible for dispatching the contracted FSP trucks from the CHP Monterey Communications Center (MCC). Caltrans' primary responsibility is the allocation of State funding, invoicing, and monitoring the freeways to ensure the patrols are deployed in an efficient manner. Caltrans also conducts special studies in support of the patrol program. The Traffic Agency for Monterey County (TAMC) does the actual contracting with the towing companies as well as other contractors and consultants who support the program. TAMC generates matching funds, prepares the annual budgets, and coordinates any expansions or changes with the other partner agencies.

A more unique business model involves contracting SSP services to a non-profit organization. The West Virginia Department of Highways contracts its SSP to a non-profit organization in West Virginia. The non-profit employs and educates former welfare recipients as courtesy patrol drivers which further benefits the State by reducing the number of individuals on welfare.

Advantages of Contracted Safety Service Patrol Services

Contracted services allow an agency without prior SSP experience to take advantage of the expertise and lessons learned from experienced firms who have successfully operated similar services. Contracted service patrols put the burden of staffing the patrol operators on the contracted service provider minimizing the agency staffing requirements to implement the SSP. If standards and performance are not being met by contracted services and the performance criteria is documented in the contract, the contract can be cancelled and services re-procured with a new contractor. When SSP contracts are re-procured, the transition to a new contractor must be properly managed in order to avoid service disruption and reduction in service quality. Well-written SSP contracts will take into consideration transition periods both at the start and end of the contract term.

By contracting the SSP, an agency can accurately budget the costs for a prescribed period of time. Changes to the parameters of the contract, including change orders involving expansion of services, may result in fluctuations in the agency's cost. Having a known multi-year outlook for SSP costs means that program and budget reviews can occur less frequently, as opposed to annual reviews common for agency-operated patrols.

Hybrid Safety Service Patrol Programs

Most agencies with SSP have implemented either agency-operated or contracted patrol services. However, some agencies have used a combination of these strategies. Hybrid service patrol programs combine agency-operated services with contractor-operated services and are often funded, in part, through sponsorship and advertising. The hybrid programs provide an increased level of service and augment current staffing levels without increasing the agency's operating budget. This is an option for agencies that do not have the funding available to fund their entire program or proposed expansion of current services. An example of this type of arrangement is an agency that wants to increase their service patrol coverage while a sponsorship opportunity is used to augment the existing staff. Another hybrid strategy employed by some agencies includes local law enforcement staff for SSP operations.

Maryland's Coordinated Highways Action Response Team (CHART) Program is an example of a hybrid program using two sponsorship patrols to augment the CHART Program patrols that are 99% State employee operated. This was done to enable an expansion to the network that was needed, but for which State funding was not available. In Maryland's case, if the sponsor was offering funding, the money would be directed to the State's treasury department and possibly never seen by the Maryland CHART Program to offset the cost. As a way to gain the added support of the sponsorship, the contract was prepared so the sponsor would offer "in kind" services in the form of patrol staff and vehicles that would come under the supervision of the CHART Program. These sponsored patrols are limited in the services they can provide, but they are able to augment and compliment the agency patrols by assisting disabled motorists and being an extra set of eyes and ears on the roadway network.

LEVEL OF SERVICE

The United States Department of Transportation's (USDOT) benefit data for Mobilization and Response activities[9] provides consistency in the types of benefits for service patrols, including measurable reductions in incident duration, secondary crashes, and congestion along with corresponding improvements in emissions and fuel consumption. These benefits, which impact safety and mobility, encapsulate the goals of SSPs, regardless of their size or complexity. As SSP teams throughout the country work to detect, respond to, and assist in the clearance of various types of incidents, the overall goal of restoring traffic capacity as safely and quickly as possible remains common among all programs. Coordinated and systematic approaches to addressing Traffic Incident Management (TIM) challenges have been the necessary ingredients for SSP programs to remain successful in the communities they serve.

Service patrol areas range from relatively short roadway segments to major highway networks within a defined geographic area. Service capabilities can range from a handful of patrol vehicles to a fleet of more than 150 vehicles in Los Angeles. The original Illinois Department of Transportation "Minutemen" Emergency Traffic Patrol in the Chicago area was the prototype for the modern SSP. It was first implemented in 1961 and now boasts 70 vehicles ranging from medium-duty tow vehicles to heavy duty vehicles which can remove large trucks with boom cranes.

Patrolling periods for various programs include rush-hour coverage to 24 hours per day/7 days per week service for Illinois Department of Transportation's Chicago area services, Florida's Turnpike, and Florida Department of Transportation's (FDOT) Road Rangers within major metropolitan areas.

Service patrol types have been grouped and named in several ways. For this document, the following terms are used:

- Baseline Service Patrol.
- Mid-Level Service Patrol.
- Full-Function Service Patrol.

These three types of service patrols are distinguished by function and level of service. However, the differences between the types are not always clear. Each jurisdiction funds, staffs and equips their service patrols to the level that is justified based on their available funding and operational needs, such as time of day and route coverage.

There are some service patrols that provide non-typical services. The aforementioned Federal Highway Administration (FHWA) Service Patrol Handbook gives examples of unique services that a jurisdiction may choose to provide. Often the unique service requires specialized training

[9]Intelligent Transportation Systems Joint Program Office Knowledge Resources, http://www.itsbenefits.its.dot.gov/its/benecost.nsf/SearchBenefits?SearchView&Query=service%20AND%20patrol&Start=1&Count=10&SearchFuzzy=FALSE&SearchWV=TRUE

which could require additional staff and budget resources. Examples of "non-typical" services include:

- **Defibrillators** – The Freeway Incident Management Safety Team (FIRST) in Minnesota outfits its vehicles with defibrillators. Using this equipment enhances the operators' first-aid service provided as part of their program. Patrollers need specialized training to use the defibrillators.

- **First aid** – Most jurisdictions require first-aid training at the awareness level, although others require it to be at the first responder level.

- **Quick clearance with flatbed tow vehicles in toll express lanes** – FDOT in the Miami-Dade area uses flat-bed "roll on" tow vehicles for their service patrols that operate in the I-95 toll Express Lanes. Because of the financial implications for this facility, it is considered especially important that incidents are cleared quickly. Non-drivable vehicles are immediately placed on the tow trucks and moved to a "holding area."

- **Hazardous materials, fires, and blood-borne pathogens** – Georgia's Highway Emergency Response Operators (HERO) program trains personnel to carry equipment to handle hazardous materials (HAZMAT), fires, and blood-borne pathogens. Some of the HERO units also have diesel off-load pumps with storage tanks in the vehicle to pump fuel from leaking tanks.

- **Fire eradication** – Personnel in the Tennessee and Washington State highway incident management programs are trained in fire eradication techniques.

While there are a wide variety of SSP programs and services, it is important for an agency to select the type of program that delivers the level of service needed within their budget and their legal and political environment constraints. Agencies may want to include or eliminate a particular service due to their needs. This is reasonable as long as the implications and costs of including or eliminating that service are understood.

Baseline Service Patrol

Baseline (or Motorist Assistance) Service patrols generally focus on assisting stranded motorists. Many current SSP programs were initiated as Motorist Assistance or Courtesy Service patrols. Some of these programs have evolved to provide higher levels of service. Some motorist assistance service patrols are privately operated and sponsored by private companies. One example of this type of arrangement can be found in Massachusetts. The Massachusetts Department of Transportation (MassDOT) provides emergency roadside assistance for motorists whose vehicles break down on their roadways. Their program is known as the Highway Assistance Patrol (HAP) and is sponsored by an Insurance Company. These patrols operate in metropolitan areas of Massachusetts during the morning and evening peak hours and offer services such as changing flat tires, fixing minor mechanical issues, removing debris from the roadway, and supplying small amounts of fuel. They also call for emergency medical services, if necessary.

Error! Reference source not found. provides examples of programs providing baseline service patrol components as described in the FHWA Service Patrol Handbook. These types of service patrols operate during peak traffic hours five days a week and provide typical services that many programs offer today. Baseline service patrol vehicles are designed to push a stalled or abandoned automobile or light truck out of the highway travel lane.

The Los Angeles Metro FSP is an example of a Baseline Service Patrol introduced by the Los Angeles County Service Authority for Freeway Emergencies (SAFE) in 1991. It is managed in partnership with Metro, California Highway Patrol, and Caltrans on all major freeways in Los Angeles County. Today, the program is the largest of its kind in the nation, performing approximately 25,000 assists to stranded motorists each month. The program uses roving tow and service trucks to reduce traffic congestion by getting disabled vehicles running again or by moving them off the freeway.

Table 3. Program Examples with Baseline Service Patrol Components.

Services	Dallas	North Texas Tollway Authority	Nevada Department of Transportation
Peak hours, 5 days per week.	●	●	●
Provide limited emergency temporary traffic control at incident scenes.	●	●	●
Remove vehicles from travel lane.	●	●	●
Respond to stranded motorist within one hour.	●	●	●
Communicate with Traffic Management Center.	●	●	●
Supervisor participates in incident debriefs.			●
Dispatched by traffic management center or law enforcement.	●	●	●
Provide minor repairs, refer additional services to tow company.	●	●	●
Remove debris.	●	●	●
Provide fuel.	●	●	●
Traffic control equipment onboard.	●	●	●
Communication equipment installed.	●	●	●
Basic tools on board.	●	●	●
Collect customer feedback.	●	●	●

The Houston TranStar Motorist Aid Patrol (MAP) program is comprised of a partnership of four government agencies (Texas Department of Transportation, Harris County, City of Houston, and Houston Metro) that are responsible for providing Transportation Management and Emergency Management services to the Greater Houston Region. MAP is designed to help stranded motorists, but also to clear the freeways of minor incidents and stalls. One unique aspect of MAP is that it is staffed by sworn law enforcement officers who operate the service patrol vehicles. The services include the following:

- Change flat tires.
- Jump-start cars.
- Refill radiators and tape leaky hoses.
- Provide up to a gallon of fuel.
- Tow disabled vehicles to designated safe locations off the freeway.

Mid-Level Service Patrol

Mid-level service patrols provide incident response service, clearance resources, and free motorist assistance on a peak hour basis, a minimum of five days a week. These service patrols may also be available for emergency call out 24 hours per day/7 days per week and for planned special event coverage. The mid-level service patrols operate patrol vehicles capable of relocating stalled or crashed vehicles from the travel portion of the roadway to a safe location. Examples of programs with mid-level service patrol components as described in the FHWA Service Patrol Handbook are provided in Table 4.

Table 4. Program Examples with Mid-Level Service Patrol Components.

Services	Iowa	Springfield, MO	Wisconsin (Dane & Milwaukee Counties)	Florida Road Ranger
Peak Hours, 5 days per week and on-call 24 hours per day/7 days per week.	●	●	●	●
Provide full emergency temporary traffic control at incident scenes.	●	●	●	●
Trained in Incident Command System (ICS) courses ICS-100 and ICS-200.	●	●	●	
Designed to push vehicles from travel lane, use a wrecker/flat-bed or towing contractor.	●	●	●	●
Respond to stranded motorist within 30 minutes.	●	●	●	●
In contact with traffic management center and law enforcement.	●	●	●	●
Participate in incident debriefs.	●	●	●	
Dispatched by traffic management center or law enforcement.	●	●	●	●
Provide minor repairs and motorist assistance including fuel, tire inflation (air compressors).	●	●	●	●
Remove debris.	●	●	●	●
Provide first-aid.	●	●	●	●
Assist at vehicle crash scenes.	●	●	●	●
Traffic control equipment onboard.	●	●	●	●
Communication equipment installed.	●	●	●	●
Basic tools on board.	●	●	●	●
Collect customer feedback.	●	●	●	●

Full-Function Service Patrol

Full-function service patrols provide the same basic services as the mid-level service patrols, but they operate 24 hours per day/7 days per week. The patrollers that operate at this level have the highest level of SSP training. National Incident Management training is required for the four programs described in Table 5. The full function service patrol vehicles are designed and equipped to relocate a stalled or abandoned automobile or light truck from a highway to a safe location. These service patrols provide a frequency of coverage to support statewide incident clearance goals. The goals for this level of service patrol deployment include reducing traffic congestion, improving travel time reliability, and improving safety on freeway and arterial systems. Examples of programs with full function service patrol components as described in the FHWA Service Patrol Handbook are provided in

Table 5. Program Examples with Full Function Service Patrol Components.

Services	Kansas City Scout	Harris County TX Toll Road Authority	Tennessee	Michigan
Provide 24 hours per day/7 days per week services.	●	●	●	●
Provide full emergency temporary traffic control at incident scenes.	●	●	●	●
Trained in Incident Command System (ICS)-100, ICS-200 and ICS-700, American Traffic Safety Services Association road safety training, First Aid and Cardiopulmonary Resuscitation (CPR), Wreckmaster specialist training.	●	●	●	●
Designed to remove vehicles from travel lane, use a wrecker/flat-bed or towing contractor.	●	●	●	●
Respond to stranded motorist within 30 minutes.	●	●	●	●
Fully integrated with traffic management center operations including automatic vehicle location services.	●	●	●	●
Participate in incident debriefs.	●	●	●	●
Provide minor repairs and motorist assistance including fuel, tire inflation (air compressors).	●	●	●	●
Remove debris.	●	●	●	●
Assist at vehicle crash scenes.	●	●	●	●
Traffic control equipment onboard including vehicle-mounted variable message signs.	●	●	●	●
Communication equipment installed.	●	●	●	●
Basic tools on board.	●	●	●	●
Defibrillators and medical supplies.		●	●	●
Fire, animal and Hazardous Materials supplies.	●	●	●	●
Public address system with external speaker.	●	●	●	●
Collect customer feedback.	●	●	●	●
Defined method for quantifying costs and benefits.	●	●	●	●

CHAPTER 3. SERVICE PATROL OPERATIONS

CONSIDERATIONS

Safety Service Patrol (SSP) programs should provide a frequency of coverage that supports regional or statewide incident clearance goals, which typically include reducing traffic congestion, improving travel time reliability, and improving safety on the roadway system. When implementing or expanding an SSP program, there are several factors to consider such as hours of operation, service patrol route selection, personnel availability, and the number of vehicles. It is important to consider the funding needed to deploy and maintain the number of personnel and vehicles to provide the desired level of service. Other factors to consider include identifying and designing the types of vehicles to be used, what equipment to install on the vehicles, and the tools and equipment needed to perform the service patrol functions safely and effectively.

Achieving success does not stop with defining and implementing the service patrol program. There are many policies, procedures, and multi-agency agreements required as well as strong relationships with other response agencies to allow for the proper integration of the service patrols into the Traffic Incident Management (TIM) response team. Training is paramount for the patrollers, and multi-agency training and exercises can establish relationships and trust between the patrollers and the other response agencies. These considerations are influenced by program goals, funding and resources, so it is important to keep the decision-makers and elected officials informed as to the progress and successes of the program and the benefits that are realized.

Hours of Operation

Service patrol operating hours are derived from traffic operational and safety needs based on time of day, as well as available resources.

Typical levels of temporal coverage include:

- Peak Hours Only.
- Monday-Friday, 16 hours per day.
- 24 hours per day/7 days per week.
- On-call.

At a minimum, the hours of operation for a service patrol should be peak travel times during the week or weekend during which congestion and incidents historically occur. Incidents can also impact the roadways prior to peak travel times. Starting service patrol operations prior to peak travel periods on weekdays and extending through the day beyond the afternoon (PM) peak travel period has the added benefit of removing traffic incidents and their impacts prior to the peak travel times.

The expansion to all-day operations (16 hours per day) is generally driven by traffic volumes and crash rates during mid-day, pre-peak and post-peak periods, but is also limited by available funding and resources. The Pennsylvania Department of Transportation (PennDOT) developed a formula for determining the minimum requirements which would need to be met for a roadway to be considered for establishing a service patrol along a route. The formula involved developing an Incident Factor (IF) by relating the amount of traffic traveling along a section or limited access roadway to the number of crashes. If the IF factor calculated resulted in a number of 4.0 or greater, the roadway would be considered for SSP since the higher IF reflected greater impacts of recurring congestion on the evaluated roadway segment.

The operation of an SSP for 24 hours per day and seven days per week is generally limited by funding as well as relative need. Regions with limited traffic volume on main routes during off-peak periods and justification for SSP services must be considered in terms of the cost of operating those services for a particular route and time period. A segment that is not normally congested during particular periods may not offer justification in itself for SSP coverage. However, other considerations such as driver safety in specific areas may also be measured, for instance, assuring that a stranded motorist receives a response within a specific amount of time, such as 30 minutes.

When 24 hours per day/7 days per week services are not justified, having patrollers on call for after-hours response may allow for flexibility in addressing disablements or assisting with major incidents. This is especially applicable if incident frequency, while not justifying full coverage, may substantiate staffing for providing these limited services over sections of the roadway network.

Beginning a program by focusing on operations during morning and evening peak hours typically can provide a good assessment of SSP benefits as well as providing the maximum program visibility to the public. Expanding SSP services beyond weekday peak travel hours requires consideration of whether there is significant non-recurring congestion during off-peak periods as a result of disabled vehicles or crashes. In several large metropolitan areas such as Los Angeles and Washington, off-peak and weekend traffic on specific routes can approach or even exceed peak hour traffic levels. These conditions make it easier to demonstrate potential benefits with the expansion of SSP activities.

The following should be considered regarding hours of operation.

- When there are significant numbers of incidents that occur prior to peak periods that may warrant SSP response prior to peak periods.

- If there could be a cost savings by assisting incidents with SSP instead of dispatching maintenance personnel during off hours to assist at incident scenes, as well as benefits due to reduced response time.

- Specific crash rates on specific routes during the hours when there are no patrols operating.

- Hourly volumes and/or Level of Service along the major roadways during hours when the patrols are not operating.

Expanding the hours of the patrols can often be proven feasible, it requires proper justification to obtain the necessary funding and other approvals to implement. It is possible to increase temporal coverage of SSP through various staffing options as discussed in section 2.1 of this report. Use of the aforementioned Traffic Incident Management Benefit-Cost (TIM-BC) model or other benefit-cost comparisons based on collected data and known operational costs can assist in identifying the likely impacts of adding additional coverage both temporally and across the network. As presented in Chapter 1, the Maryland Coordinated Highway Action Response Team (CHART) Program expanded the hours of service from a 16-hour day, five days a week program with patrollers on call 24 hours per day/7 days per week during non-operating hours to a 24 hours per day/7 days per week response program in the major metropolitan areas. This was accomplished after collecting the crash rate and average daily traffic (ADT) data to show there was a need for the services and the benefits that the extended hours would bring. Pilot tests demonstrated the potential benefits of expanding services. As a result, after almost 25 years of operating the program, funding for the additional patrols for the extended hours materialized and has since brought many additional benefits to the program.

The District of Columbia DOT (DDOT) is another example of a program that has expanded their operating hours as the program has matured. DDOT initially began their program operating the patrols Monday through Friday, 8:00 AM to 8:00 PM. The initial deployment had two to three trucks on each shift. As the demand grew for their services and the added benefit they brought to the transportation system was recognized, they gradually added an overnight shift on weeknights and finally migrated to 24 hours per day/7 days per week operations with four trucks per shift.

Table 6 illustrates program examples of service patrols and their associated hours.

Prioritizing Routes to Patrol

Agencies have used different methods to prioritize which routes to patrol. Some programs patrol only freeway routes while others may patrol freeway and key arterial routes. The following paragraphs provide examples of route prioritization based on various factors such as traffic volumes during peak periods, by average daily traffic, crash rates, or some combination thereof. Regardless of the method followed to choose the service patrol routes, the choices should be focused on the agency's performance goals, expectations, finances, and resources.

Table 6. Example Service Patrol Operation Hours.

Agency	Hours of Operation
Colorado Department of Transportation (CDOT) (Mile High Patrol).	Monday-Friday 6:30 AM-9:00 AM, 3:30 PM-6:30 PM
CDOT (Mountain Patrol/Heavy Tow).	On-call based on weather and demand
Florida Department of Transportation (Road Rangers).	Varies between districts, counties, and roadways. 24 hours per day/7 days per week in most areas and roadways to only peak commute hours in others based on demand.
Georgia Department of Transportation (Highway Emergency Response Operators).	24 hours per day/7 days per week
Maryland State Highway Administration (Coordinated Highways Action Response Team).	24 hours per day/7 days per week
New Hampshire Department of Transportation (I-95 patrols).	Winter Months Monday-Friday 5:30 AM-8:00 AM, 3:30 PM-6:00 PM Summer Months Monday-Thursday 5:30 AM-8:00 AM, 3:30 PM-6:00 PM Friday 5:30 AM-8:00 AM, 3:30 PM-7:00 PM Saturday 9:00 AM-5:00 PM, Sunday 10:00 AM-6:00 PM
New Hampshire Department of Transportation (I-93 patrols).	Monday-Thursday 5:00 AM-8 AM, 3:30 PM-7:00 PM Friday 5:00 AM-8:00 AM, 3:30 PM-9:00 PM Sunday 2:00 PM-8:00 PM
Pennsylvania Department of Transportation (PennDOT) District 8.	Monday-Friday 6:00 AM-9:00 AM, 2:30 PM-6:00 PM
PennDOT District 6 (Philadelphia Area).	Monday-Friday 5:00 AM-7:30 PM
PennDOT District 6 (Philadelphia suburbs).	AM and PM peak only
Pennsylvania Turnpike Commission.	24 hours per day/7 days per week Routes are driven three times per shift
South Carolina (Charleston, Columbia, Florence, and Myrtle Beach).	Monday-Friday 7:00 AM-7:00 PM Saturday 9:00 AM-7:00 PM Sunday 9:00 AM-5:00 PM
South Carolina (Rock Hill).	Monday-Friday 6:30 AM-6:30 PM Saturday 8:00 AM-6:00 PM Sunday 10:00 AM-6:00 PM
South Carolina I-85 (Anderson, Greenville, Spartanburg).	Monday-Saturday 6:30 AM-7:30 PM
South Carolina (Cherokee County).	Monday-Friday 6:30 AM-6:30 PM Saturday 8:00 AM-6:00 PM Sunday 8:00 AM-4:00 PM
Utah Department of Transportation.	Monday-Friday 6:00 AM-7:00 PM
Washington, DC Department of Transportation (DDOT).	24 hours per day/7 days per week
Washington State Department of Transportation.	Monday-Friday 5:00 AM-8:00 PM, On-call 24 hours per day/7 days per week

Pennsylvania Example

PennDOT has developed a number of criteria for selecting SSP coverage. First, PennDOT has developed a formula for determining the minimum requirements for a route to be a candidate for service patrol coverage. The initial criteria was to establish the patrols only along limited access roadways. An Incident Factor (IF), was developed for each candidate roadway segment, or unidirectional portion of roadway between interchanges, to be covered. The IF formula is illustrated in Figure 1. The IF is calculated by multiplying the average annual daily traffic (AADT) of the segment by the annualized crashes per mile for the segment which is averaged over the most recent three years of crash data. The calculated number is then be divided by 100,000 to obtain the resulting IF.

$$\frac{(AADT) \times (\text{average annual number of crashes/length of segment in miles})}{100{,}000}$$

Figure 1. Formula. Pennsylvania Department of Transportation Incident Factor Formula.

The IF related the amount of traffic traveling along a section or limited access roadway to the number of crashes. A low IF indicates that crashes are less likely to have a major impact on travel conditions. A high IF indicates that crashes may have a significant impact on traffic, especially during peak periods. Figure 2 illustrates the IF statistics map for 2005-2007. Where the IF is 4.0 or greater as highlighted by the roadways colored purple in Figure 2, the roadway will be considered for coverage.

Once the IF is determined, roadway segments are then selected to create an SSP circuit route. The criteria used are:

- Find segments meeting IF of 4.0 or greater.
- Recognize segments in the opposing direction of travel of those segments meeting the required IF.
- Classify segments which may have an IF of less than 4.0 but which connect two segments that have a minimum IF of 4.0.
- Isolate segments on logical feeder routes that connect to the Freeway Service Patrol (FSP) circuit route.

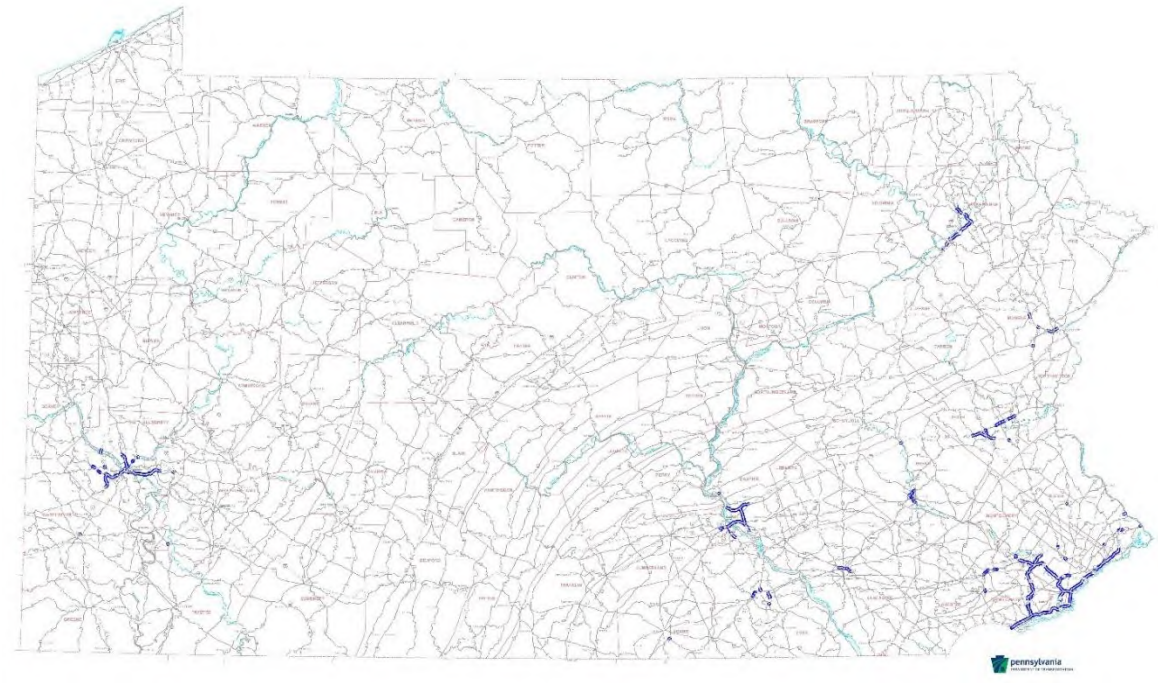

Figure 2. Graph. Pennsylvania Department of Transportation 2005-2007 Incident Factor Statistics Map.
Source: Pennsylvania Department of Transportation

- Other roadway segments may be reviewed and approved by the particular PennDOT District Executive and the Director of the Bureau of Highway Safety and Traffic Engineering (BHSTE). The segments must meet the following criteria:
    - Deemed critical for maintaining traffic flow where incidents would cause excessive delay and safety concerns.
    - Identified by the planning partners as a congested corridor and included in their Congestion Management Plan (CMP).
    - Measured shoulder areas less than 6 feet in width.
    - Collected in groups that are less than 1-mile in length for evaluation purposes.

Finally, any PennDOT district operating an SSP program must conduct an annual benefit/cost analysis. The analysis is based on:

- Reduction in incident duration.
- Reduction in fuel consumption.
- Reduction in motorist lost wages spent in congestion.
- Annual cost of FSP program.

Roadway segments can be grouped together for analysis purposes. All benefit/cost analyses are submitted to the Director of BHSTE for review and approval. Roadways with a benefit/cost of less than 2:1 may be subject to further review and analysis.

Florida Example

The Florida Department of Transportation (FDOT) Road Rangers do not use a standardized methodology to prioritize routes for patrol. The legacy approach is to identify high problem/high traffic areas, such as I-4 in the Orlando area and I-95 near the Miami-Dade area. Typically, two to four vehicles are used to patrol these highly congested areas. Individual districts have been using historical crash data to prioritize patrol routes.

FDOT is working with the University of Florida to develop a Road Ranger Allocation Model to assess rural and urban areas that currently do not have Road Ranger patrols. This project will develop a model algorithm to assess which other rural and urban areas need patrols and the benefits and costs.

One observation of note, based on anecdotal data, is that the workloads for individual Road Ranger vehicles remained the same or higher on new route segments when patrols were expanded in District 7, the Tampa Bay region. The implications were that although there may not be a formal process to determine route segments for SSP coverage as with PennDOT, the expanded deployments on the added routes contained similar totals of assists as on the original routes.

Nevada Example

Similar to the Florida Department of Transportation (FDOT), the Nevada Department of Transportation (NDOT) also looks at high problem/high traffic areas and sends patrols out accordingly. Freeway Service Patrols are typically deployed in areas that have high traffic volumes. They are charged with clearing obstructions such as debris and disabled vehicles from roadways and assisting State police with traffic control at crash scenes. Figure 3 shows the tracking NDOT used for how many vehicles were involved in the situation and the resolution for all the mitigation types.

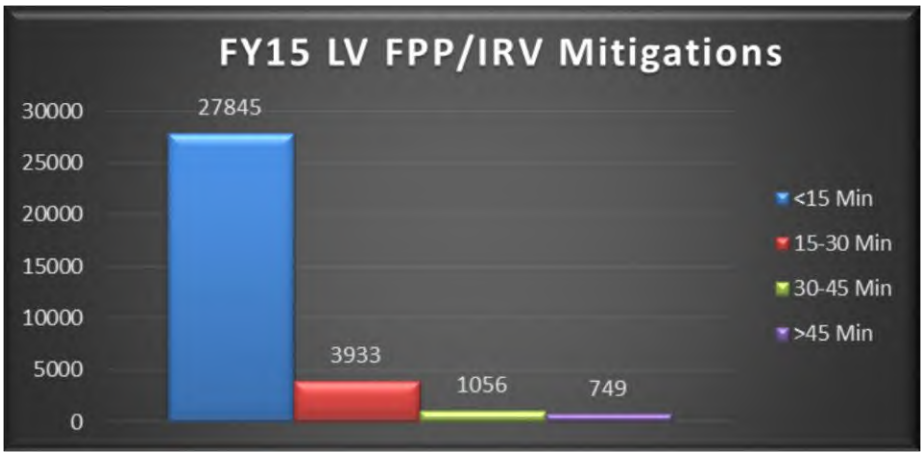

Figure 3. Graph. Nevada Department of Transportation Incident Mitigation Example.
Source: Nevada Department of Transportation

The performance of the NDOT FSP is currently being measured and analyzed in terms of mitigations per vehicle hour (MPVH) of each route. This metric allows for evaluation of each route and service hours of operation to ensure the most effective application of FSP and Incident Response Vehicle (IRV) resources as illustrated in Table 7.

Table 7. Nevada Department of Transportation Mitigations per Vehicle per Hour.

Service Patrol	July 2014	August 2014	September 2014
Reno FSP: Total Mitigations.	615	574	582
Reno FSP: Vehicle Hours.	474	449	466.5
Reno FSP: Cost.	$30,810	$29,185	$30,323
Reno FSP: Mitigations/Vehicle/Hour.	1.3	1.3	1.2
Las Vegas FSP: Total Mitigations.	1834	1590	2145
Las Vegas FSP: Vehicle Hours.	2152	2064	2060
Las Vegas FSP: Cost.	$132,348	$126,936	$126,690
Las Vegas FSP: Mitigations/Vehicle/Hour.	0.9	0.8	1.0
Las Vegas IRV: Total Mitigations.	668	690	714
Las Vegas IRV: Vehicle Hours.	704	664	674
Las Vegas IRV: Cost.	$48,576	$45,816	$46,506
Las Vegas IRV: Mitigations/Vehicle/Hour.	0.9	1.0	1.1

Maryland Example

The Maryland CHART Program service patrol program initially based its network on specific routes connecting to a particular region, such as the Eastern Shore. As the program evolved into a statewide program, the focus was on providing coverage on all interstate routes within the Baltimore, Frederick and National Capital regions without considering crash rates or volumes. With operational experience and evolution into a 24 hours per day/7 days per week program, average daily traffic and crash numbers have been used as criteria for expansion onto additional routes in the State.

OUTFITTING A SERVICE PATROL

Once the types of patrol services have been identified, the vehicles can be specified to accomplish the service mission. The design of the patrol vehicle should start with the type of vehicle to be deployed and progress to the equipment that will be installed on the vehicle as well as carried in the vehicle. The factors to consider in the design of the patrol vehicle are:

- Cab and chassis specification.
- Body style.
- Engine and drivetrain.
- Combined weight of the vehicle including all of the equipment installed on the vehicle as well as tools and equipment the vehicle will be required to carry.

Safety equipment items such as a truck-mounted arrow board or dynamic message sign (DMS), reflective tape or decals on all four sides of the vehicles, reflective chevrons on the rear of the vehicle designed to National Fire Protection Association (NFPA) standard and emergency lighting should be included on all service patrol vehicles. The Federal Emergency Management Agency (FEMA) Emergency Vehicle Visibility and Conspicuity Study (2009) offers particular guidance on safety and visibility for emergency vehicles.[10] Personal Protective Equipment (PPE) such as class 3 safety vests, hard hats, safety glasses, work gloves, latex gloves, hand sanitizer, and first aid kits at a minimum should be included in all vehicles. Depending on the level of service desired, it is important to identify the proper type of vehicle, equipment, and any technology that will support the expected level of service.

Choosing the Correct Type of Vehicles

The selection of the type of vehicle to use for an SSP program requires identification of the services to be provided, the types of incidents requiring response, the duties the vehicle will be performing, and the equipment that will be carried. If the vehicles will be used to push or pull vehicles out of the roadway, the vehicle needs to be designed with the proper capacity to perform those tasks. One of the challenges that face many agency response programs is designing a response vehicle capable of housing all of the equipment that is needed to manage traffic, protect the incident scene, and help mitigate the incident scene. The equipment needs to be stowed in such a manner that it is easily accessible to the vehicle operator while not becoming a hazard or projectile during rapid deceleration or if the vehicle is involved in a crash. The equipment and tools also need to be easily removable from the vehicle limiting lifting or traffic exposure hazards. Agencies have developed a wide variety of vehicle designs based on the types of equipment they carry and the missions they perform. Some agencies use more than one design to accommodate additional support capabilities or different environmental conditions in which they operate.

Overall Considerations

The vehicle design should consider the services to be provided, the environmental conditions, the equipment that will be installed on the vehicle, and other equipment carried on board the vehicle.

In developing the initial specifications of the drivetrain and suspension, there are three factors that need to be considered:

1. Will these vehicles be required to push/pull/tow vehicles and large debris from the travel portion of the roadway?

2. Will the vehicles be operating off-road or in severe snow or unplowed areas?

3. How heavy will the vehicle be when the vehicle weight, mounted equipment and carried equipment are added together?

[10] Emergency Vehicle Visibility and Conspicuity Study, FA-323, Federal Emergency Management Agency, August 2009, https://www.usfa.fema.gov/downloads/pdf/publications/fa_323.pdf

Vehicles that have under-designed drivetrains and suspensions are susceptible to maintenance problems and usually will not have the longevity of vehicles that are built to accommodate the load they will be carrying. To realize the efficiency and longevity of the vehicles, the vehicles should be designed for a higher capacity than might actually be required for day-to-day operations.

Engine Considerations

SSP engine type alternatives have been subject to a number of debates. Alternatives, such as diesel, gasoline or Compressed Natural Gas (CNG), have proponents and critics. The Washington State Department of Transportation is using some CNG vehicles but most use diesel or gasoline engines. Diesel engines will provide more torque for pulling, pushing, and towing, but gasoline engines generally provide better acceleration for maneuvering back into traffic from the shoulder or median of the roadway creating an added safety factor. Gasoline and diesel engine types have good longevity if properly maintained. Missouri Department of Transportation reported that they are getting 500,000 miles out of their diesel-powered vehicles.

Before deciding on which type and size of engine to use, it is recommended to compare the mileage per gallon as this could be a big factor in making the fleet more efficient. Some of the engines today have various configurations to improve the miles per gallon rating, but power must be sufficient to support the weight and performance requirements. Agency fleet maintenance providers can be of assistance in selecting a suitable engine type and size.

Cab and Body Type Considerations

The vehicle cab and body type considerations are dependent on the mission of the vehicle, the operating environment, and the equipment required to be installed inside the cab and carried on the vehicle. As with all decisions on the design of the vehicles, there are some tradeoffs to consider. Vehicles with a large cab, such as a crew cab with four doors, will allow for transport of stranded motorists to a safe location, or the ability to keep some equipment properly stowed in the rear of the cab. An extended or standard cab can also transport people, but it is not as easily accessible and it will not carry as many people as the crew cab. Another tradeoff includes maneuverability in tight spaces. The larger the size of the cab and body, the greater the turning radius and the less maneuverable it is in tight spaces such as shoulders, bridges, or tunnels.

The vehicle body type depends on the primary mission of the vehicle, the amount of equipment it is expected to carry, and accessibility to the equipment in a safe manner. Thought should be given to what equipment is being accessed the most. The driver should be able to avoid having his back to traffic while removing any equipment, or having to climb up into the vehicle and have a door blocking on-coming motorist views of the driver. The vehicle body styles include a basic utility style body with compartment doors on the side, a covered or customized utility body, a van, a pickup truck with or without a cap, or a tow truck style body. The goal is to be able to house all of the SSP support equipment in an organized and secured manner so it does not become a hazard or projectile during a crash.

Everything needs to be readily and easily accessible for ease of use and injury reduction, and certain equipment needs to be protected from the weather. For example, some programs use

pickup trucks with camper shell caps. This option is applicable as long as the equipment can be secured properly and retrieved effectively and safely by the vehicle operator. These vehicles could be modified to have a pull out tray with custom racks for equipment storage and access. It is also important when designing the vehicle to leave room for growth and additional equipment that may be added in the future.

Examples

In determining the vehicle size needed, the North Carolina Department of Transportation's Incident Management Assistance Patrol (IMAP) program weighed existing SSP vehicles fully loaded and found that the weight was approximately 12,000 pounds. They decided to go with a Ford F450 one-ton cab and chassis with a utility body as illustrated in Figure 4. These vehicles are four-wheel drive and powered by diesel engines. The current models have used a 6.7-liter diesel engine in the 2009 to present model years and users have been very satisfied with this engine.

Figure 4. Photo. North Carolina's Incident Management Assistance Patrol Vehicles.
Source: North Carolina Department of Transportation

Several programs have used more than one type of vehicle to address varying missions and priorities. The Washington State program is an example which uses different types of vehicles for different regions of the State based on different weather conditions or other operational needs as illustrated in Figure 5. In the Seattle area, where the SSP patrols floating bridges and tunnels, a Ford F450 Super Duty cab and chassis are outfitted with a tow body in order to clear stopped or stalled vehicles from the facilities as quickly as possible. Most of the other vehicles in the State use a design consisting of a Ford F450 Super Duty cab and chassis with a fully covered utility body. In rural areas, a light duty open bed pickup truck is used.

Figure 5. Photo. Examples of Washington State Department of Transportation's Vehicle Types.
Source: Washington State Department of Transportation

Another example of a program with many styles of patrol and response vehicles is the Maricopa County, Arizona Regional Emergency Action Coordinating Team (REACT) program. The County performed a study that surveyed several States to determine what vehicle types might be best suited for their SSP operations. Minimum standards and functional requirements were identified. A brief description of the different types of REACT response vehicles are listed below:

Regular Responder Vehicles:

Ten of the vehicles in the REACT fleet are regular response vehicles (RRV), illustrated in Figure 6. These are one-ton vehicles with a service body and extended cab to carry emergency traffic control and support equipment. The primary role of these vehicles is to carry essential traffic control equipment and have the flexibility to quickly support the traffic control required at the incident site.

Figure 6. Photo. Regional Emergency Action Coordinating Team Regular Response Vehicle.
Source: Maricopa County Department of Transportation

Heavy Duty Responder Vehicles:

REACT has two 'heavy duty' one-ton, four-wheel drive vehicles with dual rear tires called Heavy Duty Response Vehicles (HRV). The primary role of these vehicles is to carry additional REACT traffic control equipment such as cones and light sticks that are needed for setting up longer length closures or detours specifically in support Emergency Traffic Management Operations. These vehicles also carry equipment that may not fit in the regular response vehicles and quick clearance equipment. In addition, these vehicles are also equipped with heavy duty quick clearance equipment, 50-gallon water tanks, chainsaws, leaf blowers, Hazardous Materials spill containment pools and absorbent materials, and other tools that may be needed for support at an incident scene. Newer vehicles have been proposed with shorter beds to allow for tighter turning radii on particular roads and facilities being patrolled.

Incident Command Vehicles:

Two of the REACT vehicles in the fleet are half-ton pickup trucks with camper shell caps as illustrated in Figure 7. These vehicles are also four-wheel drive to enable off-road access. They are primarily used by Incident Commanders to serve the purpose of incident command for the REACT program as well as to participate in the Unified Command. They are equipped with additional communication devices to coordinate with local Traffic Management Centers (TMC)/Arizona Department of Transportation Traffic Operations Center (TOC) and emergency departments within the County and with outside agencies. As these are supervisory or command vehicles they also carry additional equipment to document incident scenes as well as various saws, cameras, bleach, and tow straps for clearing vehicles or large debris from the roadway.

Figure 7. Photo. Regional Emergency Action Coordinating Team Incident Command Vehicle.
Source: Maricopa County Department of Transportation

Traffic Management Center Response Vehicle:

The REACT TMC Response Vehicle (TRV), typically a van, is used for TMC response. The primary purpose of this vehicle is to provide TMC traffic management support for REACT responders and the traveling public. The responder using this vehicle activates and operates TMC systems such as signal systems, traveler information systems, and camera systems in the area affected by the incident. This vehicle reports to the TOC and serves as a spare vehicle.

Vehicle Safety Markings

A safety enhancement to consider for the patrol vehicles is the use of conspicuity tape or reflective markings on the vehicles. The reflective tape and decals or wraps need to provide reflectivity on all four sides of the vehicle to realize the highest safety standard. The greatest need for reflectivity on these vehicles is on the rear of the vehicle and uses the chevron configuration. These markings are designed to channel approaching motorists away from the vehicle thus increasing the safety of the responders as well as the approaching motorists. Examples of these markings are shown in Figure 4 and Figure 8.

Figure 8. Photo. Example of Rear Conspicuity Striping.
Source: Maryland State Highway Administration

On-Board Equipment

On-board equipment can be divided into two different categories. The first category includes the equipment mounted on or to the vehicle, and the second includes the equipment and tools carried in the vehicle. The type of equipment carried by the SSP is dictated largely by the functions which they are expected to perform as well as any agency-mandated safety equipment such as traffic safety vests, safety glasses, and gloves.

Vehicle Equipment

The vehicle equipment can aid in providing safety at the scene of an incident such as emergency lighting and an arrow board or vehicle-mounted DMS for traffic direction and management. The Manual on Uniform Traffic Control Devices (MUTCD) also provides direction for the use of emergency vehicle lighting in section 6I.05. Arrow boards or vehicle-mounted DMS are regulated by the MUTCD and can serve similar yet very diverse functions. The arrow boards are limited to only providing caution or traffic direction to approaching motorists via an arrow or caution mode. The vehicle-mounted DMS can also serve the traffic control and warning functions similar to an arrow board, but can be more visible and discernable due to the addition of a broader stroke on the directional arrows. The DMS also has the flexibility to post messages to support the incident or event, or provide advance warning where there is not a permanent DMS along the road.

Equipment is also available to expedite quick clearance practices using a push bumper or towing strategy to remove vehicles and large debris from the travel portion of the roadway. Table 8 provides a sampling of standard vehicle equipment used by a number of agencies.

Table 8. Examples of Vehicle Equipment.

Special Equipment	Maricopa County REACT	North Carolina Department of Transportation	Washington State Department of Transportation	Missouri Department of Transportation
Push Bumpers	No	Yes	Yes	Yes
Winches	Yes	Front and rear	Some	No
Arrow Board	Through Dynamic Message Sign	Yes	Yes	On Motorist Assistance Vehicles
Dynamic Message Sign	Yes	No	Yes	On Emergency Response Vehicles
Spotlights	Yes	Yes	Yes	Yes
Plug in for Jumper Cables	No	Yes	Yes	Yes
Generator	Yes	No	Yes	Yes
Air Compressor	Yes	Yes	Yes	Yes
Closed Circuit Television	Exploring option	No	Some	No but looking into
Global Positioning System (GPS)	GPS/ Automatic Vehicle Location (AVL)	No	GPS/AVL	Yes
Mobile Data Terminal	Exploring an iPAD solution	No	Yes but not used as computer-aided dispatch	No
Backup Alarm	Yes	Yes	Yes	No
Hands Free Cellular	Some	No	Yes	No
Siren/Air horn	Yes	Air horn	Both	Yes
Emergency Lights	Yes	Yes	Yes	Yes
Radios	Yes	Yes	Yes	Yes

Table 8 does not provide an exhaustive list of equipment installed on patrol vehicles, but it includes some of the most important items. Other types of equipment can be used, dependent on the support the patrols need in their daily functions. The following are descriptions of the vehicle equipment listed in Table 8 and the uses or justification for including this equipment:

- Push Bumpers: The push bumpers can be used to remove wrecked or disabled vehicles as well as large debris from the travel lanes to expedite the reopening of the roadway.

- Winches: Winches can be used to remove wrecked/disabled vehicles and large debris from the roadway, in particular where the circumstances do not allow for the use of a push bumper. An example of this application would be when the wheels of a wrecked vehicle are immobile due to the collision.

- Vehicle-Mounted Arrow or DMS Boards: It is beneficial for response vehicles to be equipped with either arrow boards or DMS boards as they are a primary form of traffic control for responders to inform and guide motorists through or around the incident scene. Truck-mounted DMS or arrow boards should be mounted high enough on the body of the truck to ensure that approaching drivers can see them over the tops of other vehicles.

- Spot Lights: Vehicle-mounted spot lights can be installed in a variety of positions, including in front of the driver and passenger doors, on the roof, or on a tripod after being detached from the vehicle for mobile scene lighting. The detachable lighting can be powered by a generator or portable battery pack.

- Plug-In Jumper Cable or Booster Box: The plug-in jumper cable connection offers a safer and more convenient way of jump starting batteries. Some agencies carry portable rechargeable jump start boxes in lieu of jumper cables to allow for more portability and accessibility to vehicles or equipment. Having a jumper box and jumper cables is the preferred solution to provide the portability of the box and the reliability of the cables.

- Generator: If there is room, many types and styles of generators can be deployed on an SSP vehicle. Generators can provide electrical power to the scene of an incident including powering removable scene lighting or other pieces of equipment. The generators must be mounted in a well-ventilated compartment of the vehicle or remain portable, enabling them to be used in areas that the patrol vehicle may not be able to access.

- Air Compressor: There are many types of air compressors with differing mounting configurations to suit the needs of the service patrol. Some of the compressors such as the gas-powered versions, need to be mounted on the outside of the vehicle, but there are also electric versions which can be mounted under the hood or inside of one of the compartments of the vehicle. Compressors allow the patroller to inflate low pressure spare tires for motorists. The compressors may also be used to power tools such as impact wrenches.

- Closed Circuit Television: Video capture of an incident scene and the related traffic situation can be provided to the TMC using a closed circuit television (CCTV) mounted or carried in the SSP vehicle. The patroller can initiate the CCTV operation upon arrival at the scene and capture the video under local control at the vehicle or turn control of the CCTV over to the TMC to operate remotely while the patroller attends to the incident scene. The mobile CCTV provides additional information to the TMC operators to make traffic management decisions on a wider scale beyond the incident scene.

- Global Positioning System: SSP dispatchers can dispatch SSP vehicles more efficiently when they know the location of the vehicles on the roadway network. The Global Positioning System (GPS) provides vehicle location data and when coupled with Automatic Vehicle Location (AVL) technology, the SSP vehicle's location can be automatically provided to the TMC or dispatch center as the vehicle is on patrol.

- Mobile Data Terminal: A Mobile Data Terminal (MDT) provides the patroller the ability to enter information using a keyboard into MDT which is connected wirelessly to the TMC or SSP dispatch system. Information can be provided to the patroller on the MDT screen in graphical, textual or image formats providing more data at the scene for the patroller to use in response activities.

- Backup Alarm: SSP vehicles at an incident scene operate in close proximity to first responders and their vehicles. A common safety feature on large vehicles is a backup alarm that audibly beeps when the vehicle is put in reverse. The alarm warns responders near the rear of the SSP vehicle that it is backing up and to be aware.

- Hands Free Cellular: The patroller is often in communication with SSP dispatchers or TMC operators while operating the SSP vehicle. Hands Free Cellular devices facilitate safer vehicle operation by allowing the patroller to use both hands to operate the vehicle while communicating via cellular communications devices.

- Siren/Air Horn: Audible warning devices such as sirens and air horns make other roadway users aware of the SSP vehicle's presence while it navigates to an incident scene. While at the scene and conducting traffic control operations, air horns provide a method of gaining roadway users' attention when working in close proximity to or directing traffic.

- Emergency Lights: Emergency lights used on service patrol vehicles range from rotating lights to light-emitting diodes (LED) or strobes. Colors can be amber, white, red, or blue, depending on State regulations. Normally, red and blue lights denote police vehicles, and red lights denote emergency vehicles. The lighting configurations may vary from lights installed on top of the vehicle to lights in the grille and tail lights. Emergency lights provide a warning to other vehicles that the SSP vehicles are en-route to an incident scene, and if possible, vehicles should move out of the way to the let the patrol vehicle pass. Emergency lights typically require very strict usage policies to prevent misuse or abuse. Some States have installed red lights on the rear of the vehicles to allow the patrol vehicles to be eligible for coverage under "Move Over Laws." Section 6I.05 in the MUTCD provides guidance on the use of emergency vehicle lighting.

- Radios: Radio communications are the lifeline of a service patrol. Dedicated agency radio communications and standard cellular communications support reliable connectivity with the TMC or SSP dispatch center. A portable radio that the patroller can carry outside of the vehicle is also useful. Radio communications have evolved with many agencies moving from legacy communications channels to the 800 and 700 Megahertz bands. This allows for more flexibility and interoperability with police and fire/rescue agencies. If shared communications are not available, scanners can be included in the SSP vehicles so

other response agency activities can be monitored providing information to the patrol operator about traffic diversion and alternate route viability.

Other Equipment, Tools, and Supplies

Table 9 provides a sample listing of the type of equipment, tools, and supplies carried by various service patrol agencies. This is not meant to be an all-inclusive list but it represents some of the items to consider including in the vehicle. It is important to identify the items which will be carried in the vehicle to ensure the specifications for the vehicle design and weight are appropriate, as well as accommodating for the safe storage and access to the tools and equipment. For example, traffic cones which are one of the most used and first deployed pieces of equipment that the patrol vehicle is carrying. The cones need to be placed in the vehicle to be easily accessible and to maximize the safety of the patroller while accessing them.

The equipment list in Table 9 is not intended to be exhaustive but meant to be a starting point for agencies to consider. The equipment carried depends on the role or level of service provided by the specific SSP program. For example, a baseline service patrol focusing on motorist assists may only require basic equipment, while a full-service SSP may train and equip their patrol operators with items such as diesel off-load pumps, chainsaws and cutoff saws for addressing crashes and hazardous materials (HAZMAT) conditions.

Technology Applications

Existing and emerging technology applications can assist patrollers with their duties and enhance their safety, as well as providing situational awareness and incident condition information to the TMC as they support incident response and management. While emerging technologies have not been implemented on a wide scale due to adoption progress, there are emerging trends toward innovative technologies which improve the effectiveness and efficiency of the SSP operation. The technologies that exist today help with the coordination between the TMCs or SSP dispatch centers and the patroller, and can facilitate inter-agency coordination and communication between the patroller and other response agencies. Example technology applications include:

- **Automatic Vehicle Location/Global Positioning System** applications allow SSP dispatch personnel to see where their entire fleet of vehicles is located. When an incident occurs, the nearest service patrol vehicle can be dispatched immediately, reducing the response and clearance times for that event. This technology has other uses as well:
    - Vehicle status can be tracked to include speed and routes driven. The use of the geofencing concept alerts the TMC or SSP dispatcher when an SSP vehicle strays beyond a defined area. This implementation can be used as a protective measure for the patroller, such as in a carjacking situation.
    - Vehicle maintenance schedules can be linked to the vehicle mileage or hours of operation data to preschedule or alert the fleet coordinator of the need for routine service. This facilitates an effective maintenance program which extends vehicle life.

Table 9. Types of Safety Service Patrol Vehicle Equipment.

Equipment	Need
Employee personal protection equipment (Vest, Safety Glasses, Work Gloves, Latex Gloves etc.)	Essential
Advance Warning signs	Optional
Stop/Slow Paddle	Basic
Cones	Basic
Flares (Fuse and Battery Powered)	Essential
Light Sticks (carried by some agencies but require certain storage requirements)	Optional
Floor Jack	Optional
Lug Wrenches (standard and metric)	Basic
Tire Repair Kits (If used provide instruction)	Basic
Tire Pressure Gauge	Basic
Air Tank	Optional
Small Hand Tools (screw drivers, wrenches, hammer, wire cutters, etc.)	Essential
Battery Powered Tools	Optional
Electrical/Duct tape	Basic
Bailing Wire	Optional
Lockout Kits (Check agency policies and if allowed provide training on usage)	Optional
Jump Start Box	Optional
Jumper cables	Basic
Water for Overheated Vehicles	Basic
Gasoline	Basic
Diesel	Basic
Drinking Water and Cups	Essential
First Aid Kit (Commensurate with Training Level)	Essential
Blood Borne Pathogens Kit	Optional
Cardiopulmonary Resuscitation (CPR) Kit	Optional
Extra Safety Vests	Basic
Chains/J Hooks/Tow Straps/Rope	Basic
Bolt Cutters	Optional
Pry Bar	Basic
Brooms	Basic
Shovels	Basic
Trash Bags	Basic
Bucket for Debris cleanup	Basic
Flashlight	Essential
Hand Cleaner/Sanitizer and Rags/Paper Towels	Basic
Reference Manuals	Basic
Leaf Blowers (Gas powered)	Optional
Cut-Off Saw (Proper safety equipment, training and, certification if required)	Optional
Chain Saw (Proper safety equipment, training and, certification if required)	Optional
HAZMAT Plug and Dyke Kit (Training Item)	Optional
Diesel Off-Load Pump (Training Item)	Optional
HAZMAT Spill Pool (Training Item)	Optional
HAZMAT Absorbent Material (could include kitty litter)	Optional
HAZMAT Absorbent Pads or Booms	Optional

  - AVL data can be linked to an Advanced Traffic Management System (ATMS) mapping database to allow for precise location of the incident scene the patroller is working. This pinpoints incident locations to support specific traffic management strategies, particularly in addressing temporary lane closures.

- **Mobile data terminals** are frequently used in patrol vehicles. MDTs allow the patrollers to readily access databases and information they need to perform their duties. MDTs can be connected to a Computer Aided Dispatch (CAD) System to allow reporting of incident status and conditions electronically from a specific location. A CAD-based MDT uses GPS and mapping databases for routing to an incident scene, and storing plans such as alternate routes and evacuation plans that the patroller can access from the scene. An MDT can offer the ability to see any cameras that may be available to determine the type of incident. For example, the Washington State Department of Transportation uses MDTs as a tool to transmit and receive video feeds, allowing the responders to send their onboard CCTV images to the TMC and view CCTV feeds from the TMC, prior to responding to an incident scene. This facilitates verification of the incident location and type prior to SSP arrival. In the past, MDTs consisted of laptop computers installed between the driver and passenger areas. More recently, the use of tablets provides more portability and a smaller footprint within the vehicle. Some agencies require the patroller to keep a log of their activities and MDTs can streamline the reporting process sending information in real-time to the TMC. The SSP reported data can also be incorporated into the ATMS to support traffic and incident management strategies. The MDTs can also be used for interagency response and coordination. For example, the Washington, DC area's Capital Wireless Information Network (CapWIN) allows law enforcement, fire, and transportation agencies to communicate directly on the same wireless network as well as provide access to other database resources.

- **Vehicle-Mounted CCTV** technology includes on-board cameras in patrol vehicles. These cameras can be permanently mounted or portable so they can be moved from one vehicle to another. Early camera applications were mounted to the windshield of the patrol vehicle as dash cameras and could send the images back to the TMC via a cellular connection for situational awareness in areas where CCTV coverage was lacking. Magnetic mounts support permanent and temporary mounting to the outside of the patrol vehicle. The newest generation of on-board cameras also provides pan, tilt and zoom capabilities, which can be viewed and controlled wirelessly from the TMC. The remote control allows the patroller to go about their assigned duties and provides the TMC operator with the camera control to view the delays or the event. Camera images can be shared with other response agencies to determine the appropriate response that should be initiated. SSP vehicles outfitted with the cameras have been used to monitor major storms providing images to the agency or emergency management for damage assessments. Agencies such as the Washington State Department of Transportation (WSDOT) and Maryland State Highway Administration (MdSHA) are successfully using CCTV technology. Transmitting video from the vehicle over a cellular connection can be costly so it is important to ensure that the agency has an appropriate data package to keep communications costs under control.

- **Crowd-sourced technologies** are often smartphone-based technology applications which use crowd-sourced incident data. Many agencies are entering into agreements with service providers to use and share the data to reduce congestion and delay on the regional road network. Agencies can use the incident data provided by the service provider to quickly identify an incident and, using agency resources, verify the incident data and location. The service provider-reported incident data can provide a first notification of real-time incident information. If deployed in the service patrols or in the operations center, the crowd-sourced incident data can alert the patroller of potential disabled vehicles that they may be approaching. The crowd-sourced technologies can provide a conduit to motorists for incident-related information. The Florida Turnpike Enterprise operations centers use their crowd-sourced service provider to send alerts of incident locations to motorists so they are better prepared when approaching these locations. This increases patroller and responder safety. Similar approaches are being piloted in New Hampshire, Maine, and Vermont to send alerts to motorists as they are approaching snow plows along their routes. The information from the plow trucks is received by the agency and passed on to crowd-sourced service provider in real-time to alert their users.

- **Unmanned Aerial Systems (UAS) Applications** use Unmanned Aerial Vehicles (UAV) to view an incident scene and its associated traffic delays in areas where cameras may not be available. UAS applications are an emerging tool that yields potential benefits to SSP programs. UAVs can monitor traffic queues and alternate route operations.

SERVICE PATROL INTEGRATION

The integration and coordination between SSP programs, traffic operations and other agencies is vital to its effectiveness. The following sections will discuss the approaches taken by agencies regarding coordination, policies and procedures as they affect service decisions as well as established organizational processes and structure.

Traffic Management Center Operations

The operation of SSPs complement the mission of the TMC. An important part of a successful TIM program relies on strong communications linkages between the TMC and the patrollers and an understanding of each job function and needs.

It is beneficial to cross-train the operations center staff with the SSP staff so they can form relationships and, more importantly, learn each other's roles and responsibilities during a response to a major event compared to a minor event. This provides all parties involved with an understanding of the wider perspective of the actions being taken and their involvement. When a patroller arrives at an incident scene they should be reporting to the operations center their initial report prior to exiting their vehicle. At that point the operations center staff should know that they may not be able contact the patroller for a few minutes as they are busy implementing the traffic control to protect the scene. The cross-training should include the patrollers spending time in the TOC and learning and performing some or all of the functions of the operations center operator. Consideration can be given to patrollers providing assistance in the operations center when they are on light duty assignments or cannot work in the field.

Cross-training for the operations center operators should include SSP ride-alongs to learn what the patroller duties are and to familiarize themselves with the roadway networks that they are responsible for.

It is critical that there is a trust and understanding between the patrols and the operations centers because operations centers are responsible for managing incidents and events remotely, as well as for ensuring the safety and well-being of the service patrol operators and other responders who are on the scene or responding.

To be effective, the operations center personnel need to have accurate and timely information from the patrollers or other agencies in the field, so they can accurately alert motorists of the road conditions that they may be approaching. The center operators can relay information or describe the incident scene to the patrollers or other responders if there is a camera in the area. The ability to confirm and dispatch a vehicle based on the detection and verification of an incident using CCTV provides useful information to guide the service patrol driver and arrange for other first-responders if the incident appears to contain injuries or a fire, which typically require resources well beyond that of a service patrol. Conversely, the patroller who sees a stranded vehicle also becomes a valuable part of the incident detection process by providing the incident location and details to the operations center, which can then be monitored through CCTV if available.

Policies and Procedures

A robust set of policies and procedures is crucial to guide SSP activities and responses. These policies and procedures must support patroller safety, meet the agency's expectations for performance, and inform every agency member and partner about the roles and responsibilities of the SSP. Memorandums of Understanding (MOU) between the service patrol program and other response agencies should outline common goals and operational procedures to be followed when working together at the scene of an incident.

The following are example strategies successfully used by agencies to define their Service Patrol programs. These examples serve as a starting point for an agency to consider when implementing their Service Patrol.

Inter-agency Agreements and Memorandums of Understanding

An initiative that involves a multitude of stakeholders needs a consistent set of agreements to understand the roles and goals of each organization. MOU and Inter-agency Agreements detail how each agency will interact with other agencies, as well as defining which agency takes a leadership role in different situations.

Inter-agency agreements and MOUs come in many forms. Many of these agreements already exist between transportation, law enforcement, and other agencies. In those cases, agencies need to regularly review the agreements to ensure they remain current or need revision to include new elements that are unique and/or new to the Service Patrol or TIM program. Inter-agency agreements and MOUs improve response agency coordination at the scenes of incidents.

Inter-agency agreements need to be explicit. Stakeholders need to be clearly identified, their roles and responsibilities documented, and issue resolution approaches defined. An agency will not know all of the issues it will face over time, but detailing a process to follow is the fundamental goal of the agreement. The process should include how the unforeseen situations will be considered and managed among the responding agencies. The relationships built through the process of creating the agreement are ultimately what will make the agency and their partners successful.

An example of an Inter-agency MOU between the MdSHA and other response agencies in Maryland can be found in Appendix C. The MOU outlines the responsibilities of all disciplines at the scene of an incident as well as how they will work cooperatively to get the roadway open in a safe and efficient manner. At the highest level, the agreement covers topics such as:

- Provide necessary and rapid assistance, consistent with the nature of the incident.
- Provide an integrated response.
- Provide sufficient manpower and resources to facilitate a seamless response.
- Delineate duties and responsibilities appropriately.
- Prevent injuries and destruction of property.

Standard Operating Procedures / Standard Operating Guidelines

SSPs serve as the visual representation of an agency's real-time engagement with travelers and every action, or inaction, is noticeable. It is important that the service is provided in a high quality, uniform, consistent and repeatable manner. An effective way to ensure a consistent product or service is to define actionable and meaningful Standard Operating Procedures (SOP).

An important reason for SSP SOPs is the fact that Service Patrol drivers are literally in "harm's way". By creating procedures that are designed to maximize safety and efficiency, the agency and its resources are better protected.

SOPs, also referred to as Standard Operating Guidelines (SOG), cover every activity performed by the Service Patrol program. When developing or updating the SOP/SOG it is important to remember that the content needs to align and support the agreements and response procedures of all agency incident response partners.

Some example components of SOPs/SOGs include the following taken from programs such as the Tennessee Department of Transportation's HELP Program and the Virginia Department of Transportation's Safety Service Patrol. Detailed procedures are written around each of these topic areas defining steps and actions to be taken for various situations. SOPs/SOGs are living documents that should be reviewed periodically for changes in operational approaches to incorporate changes due to lessons learned during operations and incident response including:

- Vehicle Operations.
- Patrol Operations.
- Incident Response & Clearance.
- Motorist Assistance.
- Dispatch Procedures.
- Communications Protocols.
- Standards of Conduct.
- Coordination with Partners (and Others).

Open Roads Policies

A common objective for agencies deploying a Service Patrol is rapid and efficient Incident Response and Quick Clearance. Most SSP programs focus on minimizing incident clearance times. To that end, a common practice or policy of most patrols is an Open Roads or Quick Clearance Policy. Open roads and quick clearance policies are designed to maximize all efforts towards the objective of clearing an incident from the roadway in a safe and efficient manner in order to minimize the likelihood of secondary crashes and limit the exposure of responders working around live traffic lanes. An unfortunate reality of an incident event is that secondary crashes can sometimes be more severe and lethal.

A catalyst for implementing a Quick Clearance Policy is to be compliant with the TIM National Unified Goal's (NUG) objective #2: safe, quick clearance. The guidelines and training associated with the Strategic Highway Research Program 2 (SHRP2) Reliability Program can be used as a reference or starting point. SHRP2 focuses on many objectives, but the overarching theme is safe rapid incident clearance to promote maximized travel time reliability.

Open Roads and/or Quick Clearance Policies require close coordination with other stakeholders as each agency has its own responsibilities to perform at the scene which correspond to the severity of the event. These policies commonly lead into more formal policies, which may become laws and/or statutes in many States. An example of an "Open Roads Policy" between the Maryland State Highway Administration and the Maryland State Police can be found in Appendix C.

Laws and Statutes

Laws and statutes may apply to, or may need to be expanded in support of an effective TIM program and, tangentially, a successful SSP program. Most laws and statutes that would be applicable to Service Patrols are intended to maximize the safety of those who carry out the program. Most States already have some type of law or statute associated with TIM and/or their Service Patrol. The most prevalent laws associated with Quick Clearance are those that pertain to Move Over, Driver Removal, and Authority Removal.

Move Over laws were enacted to help protect first responders working on or alongside the roadways by having motorists slow down or move over when approaching an emergency vehicle on the shoulder or in a lane of travel. The language of these laws differ from State to State. In some cases the laws cover responders with red or blue flashing lights visible from the rear of the vehicle. In many cases that could exclude department of transportation (DOT) and towing personnel. Some DOTs have designated emergency response vehicles and have gained the proper approvals to add red flashing emergency lighting to the rear of their service patrol vehicles so they are covered under the law the way it was written. Maryland passed a bill which took effect in October of 2015 which included commercial tow trucks in the "Move Over" legislation. It is very important to know and understand the way this law is written in your State and the possibilities of covering all responders to improve overall safety by requiring all travelers to "move over" or clear the lane adjacent to any service vehicle in an active response mode.

Driver Removal laws, also known as "Steer It Clear It" or "Move IT", are those that require drivers involved in a minor incident to move their damaged vehicles out of the travel lanes to the nearest safe location, if at all possible and practical. There is some ambiguity associated with Driver Removal, as drivers are not expected or desired to move their vehicles if doing so would cause further harm to themselves or others in the area. Furthermore, Driver Removal laws only apply to accidents without physical injury. In Florida, if a vehicle is blocking a travel lane, Florida law requires the driver to make every effort to move the vehicle so as not to block the regular flow of traffic. The Road Rangers provide motorists with a copy of the Florida Statute 316.061 card informing them that they may be cited for a nonmoving violation, punishable as provided in Florida Statute 318. The Road Ranger Operator is required to remain on the scene until law enforcement personnel arrive.

Authority Removal allows agencies a level of indemnification for removing vehicles from an accident scene to provide safer passage by others. Contracted service patrols can be included with the same indemnifications as long as they are not found to be grossly negligent.

There are certainly other laws associated with or relevant to Service Patrols and assisting them to meet their objectives. A good reference to learn more about the laws discussed above is the Federal Highway Administration's (FHWA) "Traffic Incident Management Quick Clearance Laws: A National Review of Best Practices."[11]

[11] Traffic Incident Management Quick Clearance Laws: A National Review of Best Practices, Federal Highway Administration, December 2008, FHWA-HOP-09-005

Inter-Agency Coordination and Cooperation

Inter-agency coordination, cooperation, and communication are important to overall response team success. Building the relationships and trust between the various responder agencies as well as learning each organization's roles, goals, and capabilities is paramount. There are many ways to realize this type of team building, but one of the most successful is through regularly scheduled TIM Team meetings.

Service Patrol leadership should be engaged with other agencies providing incident response. State and local law enforcement agencies, transportation and public works departments, fire departments, rescue squads, emergency medical service agencies including medical evacuation aircraft services, and towing and recovery operators are the major participants involved. There may be multiple agencies from a particular discipline involved due to geographic jurisdictions and service area boundaries. Metropolitan Planning Organizations (MPO) can be instrumental in initiating and sustaining TIM team meeting platforms.

Regional TIM teams have been established to help facilitate coordination, communication and collaboration between various disciplines. These teams, groups, committees or task forces meet periodically to discuss current freeway operations, issues, upcoming construction or large-scale events. They review recent incidents and look for areas that need improvement. These meetings provide an opportunity to recognize well-coordinated incidents where all agencies have handled an incident safely, quickly and efficiently as a team.

In New Jersey, the State Police have developed an Incident Management Unit (IMU) to coordinate TIM activities across the State. This specialized unit, made up of first sergeants led by a lieutenant, are referred to as Regional Incident Management Coordinators (RIMCs). The RIMCs are a major part of New Jersey Department of Transportation's (NJDOT) TIM strategy and assist in providing TIM training and outreach to other law enforcement agencies regarding inter-agency coordination efforts as well as special event coordination. The RIMCs respond to major traffic incident scenes which are two hours or longer with a representative of NJDOT's Incident Management Response Team (IMRT) to coordinate mitigation and clearance of the incident scene with all response agencies. The IMU coordinates activities with NJDOT and other agencies in the development of detailed diversion plans, promotion of statewide incident management initiatives, and support of the New Jersey goal of "Keeping the Traffic Moving".

In order to promote inter-agency coordination and cooperation, each agency should have a clear understanding of the other agencies' capabilities, staffing, response times and operational procedures. Operating guidelines should be shared and compared and any operations that conflict should be discussed and modified until all agencies are operating under the same general protocols. Each agency should clearly understand their roles and responsibilities at incident scenes and agree to an incident command structure and unified command protocols. TIM team meetings are valuable forums for discussing procedures and developing common terminology, response guidelines, and incident command systems.

Meeting frequency is flexible. In the early stages of a new team, monthly meetings will help organize the group, set up roles and responsibilities, designate leadership positions, develop goals and objectives, organize task groups for special needs and set meeting agendas and

schedules. Once organized and functioning, meeting frequency should be at least quarterly to foster and promote networking, communication, and coordination. Service patrols should have representatives available to meet with the group on whatever schedule the members agree to follow.

In addition to meeting and developing regional response procedures, TIM team meetings can also be used for joint training events. Tabletop exercises are an excellent way for multiple agencies to learn about each other's capabilities and procedures. Simulated incidents with specific problems built in can be used to develop procedures that all agencies can follow. These meetings can also provide an effective forum for after-action reviews for incidents that have already occurred addressing what went well, what needs to be improved, who needs to be informed, and what follow-up is needed. Success stories should be highlighted and the discussion used to reinforce the positive aspects of how the incident was handled.

Service patrols are important regional resources for highway incident response. Each patrol needs to be represented on TIM teams in their region. Service patrols can also take a leadership role in establishing new TIM teams where they do not already exist. TIM teams are the most efficient way to establish and maintain ongoing inter-agency coordination and cooperation.

FHWA's "2010 Traffic Incident Management Handbook Update"[12] has an entire section devoted to TIM Teams that can be helpful for regions that do not currently have a team. In Section 2.3 "Multi Agency TIM Teams/Task Forces," the handbook states, "Every effort should be made to designate a Service Patrol senior manager as the steady representative on a regional TIM team. It is important that the representative know the service patrols operations and procedures and that they can speak on behalf of the patrol. It is important that the same people attend meetings regularly to provide for consistency and an effective network."

Training

The level of training for service patrol programs depends on the level of service that the patrol is expected to provide. Cross-training and operational exercises with responder agencies builds trust, relationships, and knowledge of each organization's resources and capabilities. The FHWA has developed training curriculum through the SHRP2 program entitled the "National Traffic Incident Management Responder Training Program" which combines classroom training with tabletop exercises.

Service patrol capabilities, staffing, and equipment vary widely across the country. There is no national standard or guideline for service patrol training requirements. Each agency is responsible for developing its own training program content, goals, objectives and delivery model. Service patrol operators must be capable of performing a number of different duties and the training they receive is critical to their ability to operate safely and properly in any number of different situations.

[12] 2010 Traffic Incident Management Handbook Update, Federal Highway Administration, 2010, www.ops.fhwa.dot.gov/eto_tim_pse/publications/timhandbook/index.htm

A service patrol training program should cover all areas of operation, procedures, and documentation, and should include general subject areas, such as:

- General Information.
- Personal Safety.
- Communications.
- Traffic Incident Management.
- Motorist Aid.
- Vehicle and Equipment Operation.
- First Aid/CPR/Automated External Defibrillator (AED).
- Regional Protocols.
- Legal Liability Issues.

Each of the subject areas should include the various topics that need to be addressed in each agency. For example, the Traffic Incident Management section might include topics such as:

- Work Zone Traffic Control (MUTCD Chapter 6 and/or State Supplement).
- Traffic Incident Management (SHRP2 TIM 4-Hour class).
- Traffic Direction & Control (Flagger techniques).
- Human Factor & Traffic Controls.
- Liability Considerations.

Patrol operators should complete the SHRP2 TIM & Responder Safety Training Program offered nationwide. The class is designed for all highway incident responders and is intended to be delivered to mixed audiences with representatives from each responding agency in the region. It is advisable to include joint training with TOC personnel and any central or regional dispatchers used by the service patrols. All agencies should be using the same terminology while responding to incidents, for example the same lane numbering system.

The National Fire Protection Association (NFPA) published a new standard in 2015 that will be useful for agencies that want to design their own training programs for traffic incident management. NFPA 1091 (2015): Standard for Traffic Control Incident Management

Professional Qualifications[13] provides job performance requirements for anyone in any discipline that provides traffic control at incident scenes.

Worker safety topics should include all appropriate Occupational Safety and Health Administration (OSHA) requirements such as Personal Protective Equipment (PPE), Hazardous Materials Awareness, blood borne pathogens, and other topics as required by OSHA or State-specific OSHA plans. The topics will vary by State and by service patrol depending on the level of services provided. The FHWA manual "Field Operations Guide for Safety/Service Patrols"[14] offers a starting point for developing an appropriate training plan for service patrol agencies.

Training programs should take into consideration the needs of new employees prior to field deployment and the training needs of all other employees as part of an annual in-service training curriculum. Some subjects, procedures and protocols should be reviewed at least annually and in some cases more frequently.

While there will most always be some classroom-style training, it is important that service patrol operators also get hands-on experience while being mentored by a more experienced operator. Most programs require new operators to ride along with, and be trained by more experienced staff. In addition to on-the-job training in the field, tabletop exercises develop for new operators a sense of potential hazardous situations, so they can anticipate protecting the scene while allowing traffic to pass the incident in a controlled manner. With tabletop exercises, various types of situations can be simulated. Experienced personnel, using small die cast vehicles, can coach operators how to position their response vehicles, and where to deploy temporary traffic control devices. The instructor can introduce something unexpected such as a secondary crash, disabled equipment, weather that is changing like fog, snow or rain, or other variables that can change the nature of a highway incident quickly and with little warning. Students learn to identify and anticipate hazards and develop a sense of how to deal with unexpected situations in a controlled environment and in the safety of a classroom.

Proper records of training offered and completed should be maintained. Each class should have a document that states the date and title of the class, location, instructor name, information covered, amount of time spent on the subject, a list of attendees with their signature, and a copy of any handout material with a list of any references used. Service patrol operators should also keep track of their own training records and notify management of any training that is out-of-date or needs to be renewed. This is especially important when tracking OSHA-required training classes or certifications with expiration dates such as CPR/AED, Commercial Driver's License (CDL), or driver's license. Annual or recurring training may be required as well in specific topics such as CPR, traffic safety, and incident site management.

[13] "NFPA 1091: Standard for Traffic Control Incident Management Professional Qualifications", National Fire Protection Association, 2015

[14] "Field Operations Guide for Safety/Service Patrols", FHWA, 2009

CHAPTER 4. FUTURE INFLUENCES

PROGRAM EVOLUTION

Service patrol programs evolve over time due to many factors including organizational changes, network expansion, funding, agency and community needs, and a host of other reasons. New technologies such as emerging the connected vehicle initiative will influence the capabilities and processes of Safety Service Patrol (SSP) programs promising safer and more efficient operations. In order to keep the service patrol programs intact through these evolutionary times, it is important to stay informed of the trends that lead to these changes. Institutionally, it is important to keep the elected officials, decision-makers, stakeholders, and the public aware of the current program, its benefits, and pending or future changes that may positively influence program operations.

Organizational

Service patrol programs can evolve through organizational changes by bringing new visions and goals to the incident management program. These changes can occur at the very top of an organization down to the management of the day-to-day operations. These changes may involve the number of service patrols, the level of service, or the hours of operation.

SSP operations have been organized in several different ways, depending on agency missions and responsibilities as well as related laws and legislation. Some organizational examples have included but are not limited to the following:

- Operation by State departments of transportation (DOT) or road operator (e.g., toll agency) with coordination as needed with police and other first responders in the event of accidents or major emergencies. In some cases, police may be involved in dispatching patrols even as they are manned by the State DOT or road operator.

- Operation by a standalone entity as a cooperative effort with a State DOT or road operator and police, e.g., the California County Service Authorities for Freeway Emergencies, which, depending on the county, may be a metropolitan transportation authority, Caltrans district, or association of governments.

- Contracted operations through the State DOT or road operator, where region-specific or statewide contracts are provided for dispatch, operation and maintenance of SSP services. The services may include operation of State-owned equipment or may require the contractor to supply the required vehicles and ancillary equipment.

While agency-owned services and equipment for SSP have been highly effective, some agencies have considered the outsourcing of SSP services as part of an overall move toward reducing the size of government and staff. The outsourcing of SSP may have benefits to the public sector by reducing the agency labor overhead costs, although in cases where the SSP was previously

agency-owned and operated, there may be continued or perhaps interim use of existing State assets such as vehicles, buildings, or dispatch systems.

With new SSP systems, the contracting of all services including dispatchers, vehicle operators, vehicles, vehicle tracking systems, ancillary equipment and operation/maintenance facilities potentially allows the private sector to assume the specific operational risks. They may provide facilities in a cost-effective fashion, including use of private facilities and land rather than being limited to State facilities. The focus of the State DOT and road operator should be on providing a clear set of functional and physical requirements and performance measures. These would be combined with financial incentives and/or penalties to meet specific performance measures such as response time, reduction in secondary incidents, and time to provide service.

As with all SSP activities, coordination between SSP and traffic management center (TMC) operators continues to be a paramount function, regardless of who is operating the SSP activities. Likewise, coordination and cooperation with law enforcement and other first responders should remain a clear function within SSPs, whether agency-owned or contracted as a service, requiring that such responsibilities be clearly stated within contract documents. As with any change there are always risks involved in how the operations will perform. One key item to consider if moving from public agency-owned and operated patrols to contracted services is the liability aspects of performing the duties as required in reopening roadways as safely and quickly as possible. As mentioned in Section 2.1.2 Contracted Service Patrols, in order to maintain the quick clearance functions of the patrols, there must be some sort of liability indemnification as the contractor is performing those duties as directed by or as an agent of the State.

It is important to measure the performance improvements resulting from the organizational changes and communicating the results to management and stakeholders. Capturing and documenting data and performance measures at the program outset provides a baseline from which to measure and evaluate program performance changes. Any modifications to the program should be identified and tracked with before and after results. Performance metrics illustrate the benefits of a service patrol program and justify future program evolution decisions.

Network Expansion

Another way that service patrol programs can be established or expanded is through the expansion of the roadway network. Some programs, such as one in New Hampshire, began during the construction phase of their roadways and continued after the project was complete. Public/private partnerships, formed to expand the capacity of roadways, have started their own service patrol programs to assist in delivering more reliable travel along those facilities. An example of the public/private partnership expansions can be seen with the emergence of facilities which have been expanded to include High Occupancy Toll (HOT) lanes where it is very important to the operating entity to keep the lanes open and flowing to the greatest extent possible. Any issues which constrict travel on these toll lanes cost the operators substantial amounts of money. One example of a HOT patrol can be found in Northern Virginia where express toll lanes have been added inside the right of way of I-495 and I-95. The private operator has added service patrols to this facility which operates independent of the Virginia Department of Transportation (VDOT) patrols in providing motorists assistance.

TECHNOLOGY EVOLUTION AND CONNECTED VEHICLES

Service patrols are typically known for the low technology approach of pushing or pulling obstacles from the travel lanes of roadways, providing motorist assistance, and protecting other responders and victims at incident scenes by providing traffic control and setting up safe work areas, not for high technology devices. There is promise that future service patrol operations will be able to operate more efficiently as a result of new and emerging technologies being introduced. These technologies will offer operational improvements that can further strengthen the exchange of information between the TMC/TOC and the patrols in an automated atmosphere. These technology advances should increase the safety of responders and motorists. One of the largest technology advances is rapidly approaching with the connected vehicle technologies.

The Connected Vehicle (CV) program is a set of research activities centered on a vehicle or a mobile device that is equipped with communications and data processing, allowing the equipped platforms to be aware of their location and status, and to communicate with each other and with the surrounding infrastructure. This enables Cooperative Intelligent Transportation Systems (C-ITS) or, as commonly known in the United States, "connected vehicle".

From the infrastructure perspective, agencies own the rights of way and deploy and control their own devices to manage the flow of traffic, passengers, and freight. In the CV environment, agencies will have access to data about their network that was generated by in-vehicle devices and collected through various communications channels. The data collected will provide a more refined picture of the traffic network in that the data is not collected from fixed locations along the roadway but from vehicles traveling every inch of the roadway and reporting data every tenth of a second.

Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications will use high-speed wireless capabilities that will mix dedicated short-range communications with evolving generations of high-speed wide area wireless communications. Ultimately, the vehicles, the infrastructure, the TMC Operations and First Responders will have more visibility into the real-time activities of the entire transportation network.

CV technology will make possible the use of the SSP vehicle as a data source for traffic operations as well as a source of incident scene information and incident management. CV-compliant service patrol vehicles will be able to inform other vehicles of incidents and events they are addressing and supply real-time information and guidance through or around an incident scene, greatly improving the safety of the responders as well as the motorists approaching the scene. The CV-equipped service patrols will autonomously send information to the TMC to aid in the management of the incident. Examples of the data that the SSP vehicle could report back to the TMC or send to other approaching vehicles includes position, traffic conditions, video, roadway conditions such as rain, snow, and pavement temperature, and other conditions collected as part of in-vehicle sensors and systems.

Connected vehicles will be able to alert TMC and SSP when they are disabled and advise the location of the vehicle, whether or not it is blocking a travel lane, along with the issue that the vehicle is experiencing. This will reduce response time, increase motorist safety, and enable the

SSP vehicle to maneuver into position when approaching the location with more reliable information about the anticipated scene.

CV will allow for other first responders to know about the service patrol's whereabouts, and the actions the operator has already taken at the scene. Other first responders will be able to share their data, allowing for full transparency across the incident response team in real-time. Rapid data sharing is afforded and the information is shared in real-time without interrupting/distracting the driver. The SSP driver will be able to see where all of the other response vehicles are set up at the scene of an incident allowing for instructions to be relayed to the incoming personnel about response vehicle positioning at the scene or to proceed to a designated staging area.

CHAPTER 5. PROGRAM ESTABLISHMENT OR EXISTING PROGRAM ENHANCEMENT

SELECTING THE RIGHT SERVICE PATROL PROGRAM

Whether beginning a new Safety Service Patrol (SSP) program or exploring the possible enhancement of an existing program, there are several factors to take into consideration in order to provide the most efficient and effective program that will meet the needs of the agency, other responders, and the public. This chapter provides suggestions based on best practices of existing SSP programs regarding the recommended type of service patrol program, features, and challenges. When assembling the elements of an SSP program, there is no one-size-fits-all solution.

Factors to Consider

The choice of which aspects to implement should be determined by the identified needs of the agency, what issues the agency would like to address, and the cost of the implementation, operations, and maintenance of the programs. Budget constraints are often the biggest factors in determining the level of service and type of program to implement. Visiting agencies with existing SSP programs and talking with the staff that oversee and operate the program on a day-to-day basis can reveal ideas about operations, implementation, Traffic Incident Management (TIM) strategies, and lessons learned for further consideration.

Pilot implementations will aid the agency in determining if the option or options chosen will fulfill the needs identified and produce a benefit to the agency and the traveling public. Gathering performance data as a baseline to measure the pilot results against will provide a basis for evaluating benefits of the pilot implementation toward addressing the agency's needs. The needs, operational issues to be addressed, performance measures to be collected, and the cost of the implementation, operations, and maintenance should be documented in an implementation plan for the SSP program.

Funding Options

Funding availability will determine the level and scope of services the SSP program can provide. There are many options available for funding SSP programs and services. One of the most important aspects of an SSP is public and legislative awareness of the program. Awareness of the benefits that the SSP program contributes to increasing or sustaining program finances. The Safe Highway Matters newsletter[15], quoted Ricky Via of the Virginia Department of Transportation saying, "Greater awareness of the program enhances everyone's safety and helps sustain the program," adding that the public's perception of the program is obvious when budget cuts loom. "There have been years past when the SSP program has been cut in whole or in portion and the

[15] "Raising SSP Awareness", Safe Highway Matters Newsletter, 2015, www.safehighways.org/safe-highway-matters/fall-2015/raising-ssp-awareness/

public rallies up and creates a lot of chatter on why. It creates a firestorm of media outreach and feedback from citizens saying they need it."

Federal funding is available to support these types of programs for up to three years, but the availability of these funds depends on how the agency is currently using this pool of money and its eligibility. The various funding programs for which SSP operations are eligible for a three-year period include:

- Congestion Mitigation and Air Quality (CMAQ)

  Two of the categories eligible for these funds for incident management efforts include:

  1. Establishment or operation of a traffic monitoring, management, and control facility, including the installation of advanced truck stop electrification systems.

  2. Projects that improve traffic flow, including efforts to provide signal systemization, construct HOV lanes, streamline intersections, add turning lanes, improve transportation systems management and operations that mitigate congestion and improve air quality, and implement ITS and other CMAQ-eligible projects, including efforts to improve incident and emergency response or improve mobility, such as through real time traffic, transit and multimodal traveler information.

- Surface Transportation Program (STP)

  Activities that can be funded using STP include capital and operating costs for traffic monitoring, management, and control facilities, highway and transit research and development and technology transfer programs, as well as infrastructure-based intelligent transportation systems capital improvements.

- National Highway System (NHS)

  Activities that can be funded using NHS include operational improvements for segments of the NHS, Highway-related technology transfer activities, capital and operating costs for traffic monitoring, management, and control facilities and programs.

An example of how some of the State and federal funding can be used to help fund a program is from the Maryland Coordinated Highways Action Response Team (CHART) Program and how they are using their funds.

- Most of Maryland CHART Program's activities are funded under the Federal Highway Administration (FHWA) STP, NHS, and CMAQ programs. The federal share is 80% of the estimated cost of the operations-related program activities and the State matches with 20% of the costs. The Maryland State Highway Administration (MdSHA) takes care of the 20% match primarily through "Toll Credits."

  In the last several years, the MdSHA has partnered with bordering States and local jurisdictions to apply for Homeland Security Grants for a number of initiatives that include ITS device deployment on emergency evacuation routes and development of

evacuation plans for weather and man-made emergencies. Funding obtained through these grants are considerably less than the funds dedicated for the CHART Program through the MdSHA Consolidated Transportation Program.

- Funding for Georgia's Highway Emergency Response Operators (HERO) program has been provided by CMAQ funding under the guidance of the Atlanta Regional Commission's Incident Management Task Force. Sponsorship contributions from a private provider are also being made to the program.

Another strategy for funding the deployment and maintenance of a Service Patrol is through a sponsorship program or public/private partnerships. Agencies should not depend upon sponsorships to fully fund their programs. In fact, even the most successful sponsorship programs pay for only a small percentage, typically 10% or less, of an agency's entire program. It is not unrealistic to subsidize a percentage of an agency's annual costs through sponsorships, although the number of such sponsorships may need to be limited for practical and business purposes.

There are various types of sponsorship agreements. The sponsorship approach provides part of the funding necessary for operating the service patrols in exchange for public acknowledgement for the sponsor. In some cases, the sponsor will also provide the patrollers and the service patrol vehicles at no charge to the agency. These service patrols may be limited in the level of services they can provide contingent upon the executed agreement between the agency and the sponsor.

The most common concessions in sponsorship agreements include providing visual acknowledgements directly on the fleet vehicles and sometimes patches on the uniforms of the drivers. This is typically accomplished via sponsor logos and decal wraps being applied directly on the vehicles themselves. Additional acknowledgement is usually offered via roadside signage.

Some agencies have chosen to use an external contract with professionals that specialize in sponsorship and advertising. This allows the agency to take advantage of other activities that are performed by that contractor. Typically those types of contractors represent many different mediums and products for potential sponsors, and they have ties to companies already accustomed to investing resources into sponsorships and advertising.

There are important issues to remember in relation to sponsorships. The Manual on Uniform Traffic Control Devices (MUTCD) allows for agencies to accommodate concessions to sponsors via roadside signage. However, "advertising" is not permitted. Agencies should pay close attention to the distinction between sponsorship and advertising before making their decision to use this strategy, as well as any laws and/or policies in their States and jurisdictions that might preclude them from pursuing a sponsorship program. Some agencies chose sponsorship only to learn later that their State statutes clearly precluded them from collecting any revenues via advertising and/or sponsorships or the revenues are directed to the general fund rather than the department that acquired the funding. To eliminate these issues, agencies are encouraged to get the necessary approvals before entering into any sponsorship agreements. Before entering into or renewing a sponsorship agreement it is beneficial to query other States and agencies who use sponsorships to ensure the program is realizing the maximum benefit.

Several organizations have been frequent sponsors of service patrols in the United States, including insurance companies, pharmacy chains, and even public transit agencies. One insurance company sponsors SSP activities in at least 14 States. Benefits of sponsorship include a favorable association with a successful safety and operations program as well as different forms of visual acknowledgement of their sponsorships.

Staffing Options

A variety of staffing options are available for an SSP program, which were discussed in Section 2.1. While it may be desirable by many agencies to manage the SSP completely in-house, this can also be a difficult option to implement or maintain when agencies decide to reduce their workforce. In lieu of agency personnel, many SSP programs have been using contracted services. To pay for some of the contracted services sponsorship agreements are often implemented to support funding and staffing of the programs.

Service Patrol Justification

Service patrol justification is important to initiate, sustain, and enhance the growth or level of service of a service patrol program. To sustain or enhance a program, strong performance measures coupled with benefit/cost information are invaluable tools to raise public awareness and support of these programs. Agencies sometimes downsize service patrol programs during lean economic times as an easy way to cut spending. Public requests for the SSP programs, coupled with the justified benefits that these programs deliver, have reversed agencies' SSP downsizing approaches and reinstated the programs. Agencies, such as the Hawaii State Department of Transportation, have demonstrated the benefits of their SSP programs and have been able to expand patrols, hours, and/or routes.

Performance data is needed to justify and support expansion or implementation of services. The data collected needs to measure the variances in the issues being addressed with the introduction of additional services or even to defend the continuation of an existing program. Collecting transportation system performance data prior to the implementation of an SSP pilot program will provide a baseline from which to compare data collected after the SSP pilot program has been operational. The comparison analysis of the before and after data will provide the insight into the effectiveness of the pilot on the issues to be addressed. The performance measurement information equips an agency to demonstrate the cost benefit information for the patrol operation.

In 2009, as a result of a focus group initiative, FHWA developed basic performance measures viewed as obtainable and valuable to warrant TIM programs, including SSP. These performance measures included:

- Roadway clearance time.
- Incident clearance time.
- Secondary incidents.

While these performance measures are typical, other data sets can be useful to an agency in determining the cost benefit of the program. These include patrol routes, operating hours, and functional levels of service patrols which can be used when justifying TIM programs and their related activities. The following list from the National Cooperative Highway Research Program (NCHRP) Guidance for Implementation of Traffic Incident Management Performance Measurement[16] provides a non-exhaustive set of performance measures for TIM evaluations including:

- Number of incidents.
- Frequency of incidents.
- Incident delay.
- Times related to the closure/opening of individual lanes.
- Severity of incidents.
- Number of fatalities.
- Service patrol statistics (e.g., roadway miles covered, number of assistance calls, etc.).
- After-action statistics (e.g., number of reviews, percent of participating agencies, etc.).
- Travel delay.
- Queue length.

Other data sets should be collected to measure the safety of the SSP program operation, such as responders struck as a secondary incident, work zone related crashes, and weather related events. One data set used in many States, including Maryland and Virginia, consists of incident clearance times for different levels of incident severity, for both routes with SSP and routes without SSP. As discussed in Chapter 2, several evaluations have shown a decrease in the clearance time for incidents as a result of SSP and very favorable benefit-cost ratios have been realized over time.

The Maryland CHART Program performed pilot operations for weekend and weeknight operations to justify expansion of the SSP program. Assessment of the resulting data ultimately supported a justification for 24 hours per day/7 days per week operations. The expansion in services included increases in the vehicle fleet, increased permanent State employee staffing, and an increase in the SSP budget allotment. Program expansion justification and awareness of the program's benefits to the decision-makers can take years to collect and analyze. Some of the data that Maryland has used to justify the SSP expansion, such as accident data as well as data showing their performance on a daily basis coupled with data collected during two pilot initiatives are summarized in Table 10.

[16] "Guidance for Implementation of Traffic Incident Management Performance Measurement", National Cooperative Highway Research Program (NCHRP), 2014, www.nchrptimpm.timnetwork.org/

Table 10. 2008 Accidents by County (in Maryland) and Time of Week.

County	Week Day	Week Night	Weekend Day	Weekend Night	Total Accidents	Night And Weekend Total	Night And Weekend Percent Of All Accidents
Baltimore	8,725	797	2,452	784	12,758	4,033	31%
Frederick	1,809	143	541	124	2,617	808	31%
Howard	1,968	176	557	170	2,871	903	31%
Montgomery	7,591	445	2,069	506	10,611	3,020	28%
Prince George's	8,064	730	2,796	1,024	12,614	4,550	36%
Total	28,157	2,291	8,415	2,608	41,471	13,314	32%

In 2014, the Maryland CHART Program:

- Assisted 36,612 motorists (one every 14 minutes).
- Managed 24,212 incidents (one every 22 minutes).

In 2013, the Maryland CHART Program:

- Conducted a pilot project for overnight and weekend patrols.
- Gathered and analyzed data.
- Provided justification for expansion of the service patrol program.
- Received expansion support from FHWA due to a projected cost benefit ratio of 32:1.
- Doubled its patrol workforce and added equipment and vehicles in order to accommodate the expansion.

The Maryland example shows how good data and performance measures can be used to justify programs and enhancements.

The Washington State Department of Transportation made progress over the last several years in securing consistent, reliable TIM program funding from their State legislature as a result of TIM performance measurement. The Washington State Department of Transportation (WSDOT) reports notable success in improving the public perception of their agency which is a major benefit in supporting the program.

Not all programs use a common formula for developing their cost benefit ratios, but the majority of these numbers are very conservative. There are many examples of the data and performance

measures captured by agencies that operate service patrol programs that can be used as models. The following are examples from some of these agencies.

Washington State Incident Response Program

Washington State maintains most of their data in a publication known as the "Grey Notebook". According to the Grey Notebook latest edition[17], WSDOT's Incident Response (IR) teams responded to 11,784 incidents in the second quarter of 2013 (April 1 through June 30), clearing them in an average of 12.1 minutes".

These responses are not broken down by motorist assists and incidents, and they have included 606 responses where the problem was never located but these were not figured in with the benefit data. These actions provided public with $17.4 million in economic benefit. The benefits are broken down into two categories. The first is quick clearance which accounted for about $9.7 million of the benefit. The quick clearance benefit is calculated based on the reduction in delay and the savings in fuel consumption and time that motorists experienced. The second benefit is the reduction of secondary incidents and their associated costs by proactively managing traffic at incident scenes. The estimated number of secondary collisions prevented was about 2,236, which yielded a benefit of about $7.7 million. According to the 2012 WSDOT Annual Congestion Report[18], WSDOT's IR Program responded to 44,492 incidents in 2011 with an overall savings of more than $72 million realized by the public.

The Incident Response program itself had a 2011-2013 budget of $9 million which yields an estimated annual benefit to cost ratio of 16:1.

Missouri Department of Transportation's Motorist Assist/Emergency Response Program

The Missouri Department of Transportation's Motorist Assist and Emergency Response Program reported a cost to benefit ratio for 2009 of 38.25:1 according to "The Evaluation of Motorists Assist Program"[19] February 2010 report.

The ratio estimate was based on a nationally accepted the American Association of State Highway and Transportation Officials (AASHTO) methodology and was based on a reduction of 1,082 secondary crashes at an average crash value of $72,350 per crash resulting in a savings or social benefit of $78,264,017. The estimated reduction in congestion cost due to clearing incidents quicker resulted in an estimated annual savings of $1,130,000. The Missouri Department of Transportation produced a report that is based on an arterial service patrol named the I-64 Traffic Response program. This Arterial Service Patrol was part of a regional traffic management strategy to address mobility issues during the two-year full closure for the I-64 construction project which relied on arterials to divert impacted traffic. The title of the report is "Evaluation of Arterial Service Patrol Programs December 2009"[20] and was an interim report to show the benefits of the arterial strategy.

[17] "The Gray Notebook", Washington State Department of Transportation, 2013
[18] "The 2012 Congestion Report", Washington State Department of Transportation, 2012
[19] "Evaluation of Freeway Motorist Assist Program", Missouri Department of Transportation, 2010
[20] "Evaluation of Arterial Service Patrol Programs", Missouri Department of Transportation, 2009

The report was prepared by the University of Missouri-Columbia and Missouri Department of Transportation. The initial results show an estimated conservative annual benefit cost ratio of 8.3:1 based on the factors of traffic delays, emissions impact, secondary crashes, and staff savings. Some of the highlights of this report that helped to make up the benefit cost ratio were that the program reduced secondary crashes by 183 per year with a potential annual benefit of $4,980,468. The program realized annual congestion-related costs savings of $1,034,000. This effort supported community emergency response, promoted safer and quicker incident response and clearance as well as reduced the amount of Emergency Response resources for TIM activities freeing up responders for other community needs.

Challenges

Service patrol programs face institutional challenges, such as the loss of key personnel through attrition, which can change the program's performance or direction. There are other challenges that programs deal with on a daily basis, such as inter-agency coordination and cooperation, staffing with dedicated qualified personnel, delivery of a successful program under tight financial constraints, vehicle maintenance and replacement cycles, and many others. These issues that can be major impediments to the formation and continuation of Service Patrols. The following are challenges experienced in Florida.

- **Legislative Support Issues.** In April 2008, due to budget cuts, the Florida House and Senate approved a reduced budget with no monies budgeted to the Road Rangers Freeway Service Patrol (FSP) program. At the time, State legislators perceived the program to be a free service that was similar to that provided to American Automobile Association (AAA) members, with a focus on providing "free gas and changing tires." The program was scheduled to cease operations statewide on July 1, 2008. However, the program was popular with the public, who stated their objections with the proposed program cancellation. Many sympathetic public and private organizations lobbied for restoring Road Ranger funds due to their demonstrated benefits related to TIM and congestion reduction.

  Before the legislative session ended, the Florida Legislature had reversed their decision and funded the program at 50% of the requested budget. The following year the program was 100%-funded. Although the motorist assistance aspect of the Road Rangers was visible and popular with the public, the primary purpose of the program was incident response, which generated the most significant mobility and safety benefits. A robust and on-going education and outreach effort about SSP programs is critical for the general public and for elected officials, including legislators. Such an education effort allows public officials to understand the necessity and value of SSP and provides them with basic facts about the service.

- **Towing Industry Issues.** The second issue in Florida involved political pressure brought by "Towing Associations" and lobbyists working with or for the towing industry. The towing industry was concerned that SSP would take away some of their business which could be detrimental to their companies. This perception has been realized in other parts of the country as well and once the SSP program officials have met with the towing industry, typically the concerns have been resolved. The education of the public is

valuable, as is the education of the towing industry relative to what the SSP's mission will be. The towing industry should be involved at the inception of the SSP program, if possible, to reduce misinterpretations of the SSP's role. Private towing operators should be included in "Traffic Incident Teams," and included in multi-agency training and exercises. This will strengthen relationships within the team and confidence in the program. SSPs generally work well with the towers and bring an added amount of protection to towing industry employees working in or along the highways.

According to the NCHRP TIM Guidance, the most prevalent issues facing most TIM programs is the availability of data and data sharing between agencies responsible for incident response. Discussions of the challenges with performance measurement data list several common themes, including:

- Whether performance measures represent a key concern.
- Inconsistent definitions.
- Data availability.
- Cost of data collection.
- Data quality/completeness.
- Data sharing.
- Data exchange.
- Data integration.
- Appropriate comparisons to other operations.
- Partial coverage extrapolation.
- Extraneous influences in the data.
- Conflicts with other measuring programs – which is "right"?
- Timeliness of data.
- Performance measures in the allocation of funding.
- Liability for action, or lack thereof, based on performance measurement results.
- Responsibility for measures for which there may be limited control.

There are a host of other daily challenges service patrol program operators face such as maintaining the vehicle fleet in order to perform to expectations, personnel issues, and providing the level of expected service consistently day in and day out.

CHAPTER 6. CONCLUSIONS

Not all Safety Service Patrol (SSP) programs are alike, and not all agencies or regions where these patrols are deployed have the same needs. The research conducted for this project found that even though the service patrol programs had different characteristics, they all had basically the same goals. The goals are to provide a service that adds a layer of safety for the motoring public while improving mobility along their roadway networks by mitigating lane-blocking incidents in a safe and timely manner. The agencies that operate the service patrols are very proud of their programs and are very enthusiastic to share what they have done. Many programs share some of the same issues when it comes to operating their programs.

BEST PRACTICES

There were several suggestions for best practices that were identified from various agencies which could benefit other programs. Agencies that feel their programs may benefit from these best practices may find that further study of these best practices is warranted in light of their specific needs. The practices can improve the safety of the patrollers and other responders, increase the efficiencies realized in the operations of the service patrols, and improve inter-agency coordination and cooperation.

Integration of Safety Service Patrol Location Data for Traffic Incident Management

When first responders do not notify the traffic management center (TMC) in a timely fashion when there is a lane blocking event on the roadway network, SSP dispatching may be delayed. Timely notification of the TMC of a lane blocking event can get the SSP patrollers or other transportation assets to the incident scene to quickly assist and possibly shorten the clearance time of an incident or provide a safer environment for the other response agencies to perform their duties. The integration of cleansed Computer Aided Dispatch (CAD) information provided directly from the 911 call centers or Public Safety Answering Point (PSAP) into the Advanced Traffic Management System (ATMS) platform can expedite traffic responses due to more rapidly-received incident information. This practice supports the automated transfer of information which acts as a notification to the TMC of an incident event taking place. Such an approach relieves a possibly overburdened 911 call center or PSAP dispatcher from having to make the notifications by phone at a time when they are extremely busy dealing with the event itself. This technology is currently used in operations centers such as the West Virginia Division of Highways Operations Center where the CAD data is integrated into their ATMS.

Traffic Signal Control

There are SSP programs, such as the SSP program at the Washington State Department of Transportation, in which patrollers have the capability to re-time or manually control traffic signals extending the green time to accommodate traffic flow which has been diverted from a freeway or facility to another route. This minimizes delays associated with the diversion.

Automatic Vehicle Location Applications

Automatic Vehicle Location (AVL) applications, such as implemented on Georgia's Highway Emergency Response Operators (HERO) vehicles, involve Operations Centers and service patrols using AVL technology which assists the TMC with an understanding of the location of service patrol resources. The SSP location data is used to manage and dispatch the service patrol resources closest to an incident. This practice reduces response times, facilitates reduced clearance time, and reduces other factors associated with incident-related delays such as responder safety and secondary incidents.

Traffic Incident Management Teams

The implementation and regular meetings of multi-agency Traffic Incident Management Teams are very important to efficient incident response. These teams have proven to be instrumental in building coordination, relationships and trust between the agencies which respond together at the scenes of roadway incidents. They are mechanisms for multi-agency training and information sharing. Examples of Traffic Incident Management (TIM) team implementations exist in many locations across the country such as the Georgia Traffic Incident Management Enhancement (TIME) and the Indiana Traffic Incident Management Effort (IN-TIME) groups.

Debriefs

Debriefs, "After" Actions, and Critiques following an incident are considered a best practice. Regions such as the Milwaukee area have a well-established Traffic Incident Management debrief. When incident debriefs occur on a regular basis following major incidents, any issues which may arise at an incident scene can be discussed and addressed. This supports the continual improvement of incident response by all agencies involved. Debriefs should focus on actions and approaches that went well as well as lessons learned. Improvement suggestions identified during the debriefs should be documented, assigned and tracked. This is another area where the Traffic Incident Management teams can be of assistance.

Multi-Agency Training and Exercises

Multi-Agency training and exercises are another way to build relationships and awareness of each responding agency's functions and capabilities. The Strategic Highway Research Program 2 (SHRP2) TIM National Traffic Incident Management Training course is available for any agency to receive. Training with towing companies can also prove beneficial for responders to learn what capabilities tow companies possess and what they need to do their job effectively and efficiently to reopen lanes at an incident scene. Exercises are another way for responders to meet away from live traffic to evaluate what they have learned from their training and reinforce the roles and goals of each agency. Exercises show agencies how they can work together in harmony to realize safety and efficiency in accomplishing their missions.

Specialized Incident Response Vehicles

Some agencies have specialized vehicles which are specifically designed to provide assistance during major freeway incidents. These trucks have additional equipment and supplies to provide

a higher level of maintenance of traffic and capabilities than a typical SSP and are only deployed during major incidents. The Florida Road Ranger program has implemented this concept with their Severe Incident Response Vehicles (SIRV).

LESSONS LEARNED

The study team inquired of several SSP operators what they would do differently if they were starting a new program or enhancing their current program and what advice they would give to other agencies. There were many responses that were similar, illustrating that many programs face the same challenges or obstacles during the day-to-day operations of the service patrol programs. These lessons learned are important to pass along to other agencies that are operating patrols. Every program is unique in nature and some practices may not be applicable to all programs. A listing of comments received presented below. Some of the comments are similar and were not combined to illustrate where some of the most common comments are focused.

Patrol Routes

- Establish patrol routes based on need and continually review and revise these routes to realize efficiencies and ensure areas with the highest need are patrolled. This is very important when there are limited patrol resources available.

- Establish patrol routes and constantly review the routes and revise as conditions or data warrant.

- In hindsight, they would have started with a broader area of coverage for the patrols.

Program Marketing

- Develop and implement better marketing of the patrol program and the capabilities they possess to the legislature and decision-makers, other responder agencies such as law enforcement and fire, as well as the public. Constant marketing will help to improve the awareness of the program and help with funding. When possible, try and have the awareness of the program reflected in other response agency's academy classes.

- Continual marketing of the program to all responder disciplines and their associated academy classes, and the public.

Performance Measures

- Begin developing the performance matrices and capturing the data at the start of the program or as close to the start as possible to measure improvements and background for cost benefit development which can be used for justification of expansion.

- Keep striving to improve response times to incidents.

Funding

- Look for innovative funding sources such as roadwork projects, grants, and other sources to supplement current budgets.

Training

- Training is paramount for the patrollers. A good training program coupled with the appropriate Standard Operation Procedures or guidelines will help keep the patrollers at a high level of competence while performing their duties. Cross training between patrollers and the TMC personnel is recommended to help them learn what each of their responsibilities are for their job requirements. Cross training builds relationships and trust, and raises the awareness of what exactly each party has to do at the expected level. Inter-agency training and exercises are a great way to build relationships, trust, and an understanding of each agency's missions and how they can work together to achieve the common goal of responder safety and safe quick clearance. The SHRP2 National Traffic Incident Management Training course is a good training to implement.

- Provide training to the patrollers on techniques to improve response times.

- Provide more formalized training for the Patrollers.

- Safety would be most important. A good training program would be vital. TIM training for all first responders.

- Create a formal and thorough training program and ensure all of the patrollers are trained early.

Vehicles

- Patrol vehicles can accumulate high mileage very quickly, and the wear and tear on these vehicles can be extensive, especially if they are used for removing wrecked and disabled vehicles or debris from the travel portion of the roadway.

- Lower the life cycle replacement for vehicles to every two to three years.

- Budget for and replace SSP vehicles every three years or sooner if conditions warrant.

- Work to establish, with their Department of General Services, budgeting for and replacing their vehicles every three years as they are wearing the vehicles out faster than they are replacing them.

- Have backup vehicles as part of the fleet that can be used when vehicles are down due to maintenance, crashes, or for other issues. Taking a route out of service due to a truck not being available is noticed very quickly by the motoring public.

- Design and specify vehicles based on the terrain of the area they will be serving.

- Would like to have had more trucks starting out with the program.
- Install push bumpers on all vehicles.

Technology

- Include additional technology deployed on the patrol vehicles, such as on-board cameras, mobile data terminals with mapping and routing capabilities, and AVL to help the TMC dispatch the closest unit.
- Install more technology in the patrol vehicles such as AVL, mapping and routing software, cameras, and other tools to help the patrols perform their jobs more efficiently.
- Introduce AVL to assist the TMC in dispatching the closest patrol.
- Include technology such as closed circuit television (CCTV) cameras mounted on the vehicles along with AVL units for keeping track of the patrols.

Policies

- Improve their quick clearance practices.
- Adhere to Quick Clearance policies they have in place allowing them to move stuff out of the roadway with no liability as long as they are not grossly negligent.

Miscellaneous

- Increase the patrol numbers in the metropolitan areas.
- The incident management field is constantly evolving, so it is imperative to stay up-to-date with all the latest best practices and technologies.

SUMMARY

In summary, some of the key factors to remember when implementing or enhancing a service patrol operation include:

- Determine the level of service that the patrol will need to provide to meet the agency's expectations on a spectrum of a motorist assist patrol to a full function or mid-level patrol capable of providing traffic control and quick clearance as well as motorist assistance. Motorist assist patrols do serve a purpose, but may not be able to deliver the expected benefits which can be realized from higher level service patrols.
- Identify staffing of the patrols. The preferred staffing would be agency personnel, however, contracted services may be a more viable option given agency staffing or funding constraints. The key issues with contracted services is the liability associated with moving obstructions out of the roadway. In cases where the contractor is required to

carry their own liability insurance and perform quick clearance duties there are some concerns, but when the contractors are covered under the State's liability and perform the duties as an agent of the State, they can perform at a much higher level when clearing the travel lanes of obstructions.

- Hours of operation for the patrols should, at a minimum, cover the morning and evening weekday peak hours as well as time prior to each of these periods. Ideally, the patrols should operate weekdays at least 16 hours per day to cover prior to, between, and following the peak hours of travel so as to clear up any incidents prior to peak hours. This approach can have significant effects on the transportation system by clearing an incident prior to the peak hours. Each region has different needs and demands but the metropolitan areas should strive to achieve 24 hours per day/7 days per week patrols. Patrols operating 24 hours per day/7 days per week patrols have a greater awareness of what is taking place on the roadway network as well as having an agency response on duty when services are needed, negating having to call-in a maintenance crew on overtime to respond.

  Missouri Department of Transportation addressed the issue of after-hours response by supplementing their patrols when they are not on duty with an after-hours Emergency Response unit which is staffed seven days per week, with availability on holidays. These operators address major vehicle accidents, obstructions and clean-ups on the interstates and highways. Unlike Day Shift Emergency Responders, these units do not patrol specific coverage areas and they can be called on as needed anywhere as they operate within metropolitan Kansas City as well as the rural surrounding areas. They assist law enforcement, fire departments and other emergency agencies in clearing accident sites, emergency roadway and debris clearing, pothole patching and many other functions to maintain the safety of the roadway during the off peak hours.

- Develop a set of standard criteria that proposed patrol routes need to meet in order to be considered as a patrol route. This supports the use of the existing or proposed fleet efficiently. There are examples of what agencies, such as the Pennsylvania Department of Transportation (PennDOT), have done in the way of creating formulas to prioritize these routes but the contributing factors should include the volume of traffic and the accident rates. Pilot program implementations can evaluate the need and benefits which can be realized by selecting certain routes. Patrol routes should be reviewed periodically to ensure they remain viable candidates.

- The type of SSP vehicle to be deployed should take into consideration the patrol characteristics, services and functions to be performed. These factors will determine how the vehicle should be equipped and the tools and equipment the vehicle will be carrying. It is important to identify the type of vehicle, the chassis, the drivetrain, and everything that will be on or in the vehicle along with the approximate weight of each item. This will determine the design of the vehicle that is capable of performing with the weight load it will carry. The proper maintenance of the vehicle will result in a longer service life with less non-routine maintenance issues.

- The operations of the service patrols complement the mission of the TMC/TOCs. The service patrols act as the eyes and ears for the operations center. In order for an agency to have a successful TIM program, there have to be strong communication linkages between the TMC and the patrollers. There needs to be a clear understanding of each participant's role and what each needs from the other to support reaching their goals as safely and efficiently as possible. In order to develop a strong relationship between the operations center and the service patrol, there should be cross training between the two parties with practical exercises conducted regularly to enforce the training.

- Service patrols need to have a clear set of standard operating procedures or guidelines to guide their activities and responses. These procedures must support patroller safety and meet the agency's expectations for performance. It is important to craft the policies and operating procedures to meet the expectations of the program as well as avoiding conflicts with the policies and procedures of other responders. MOUs between the service patrol program and other response agencies should be established and provide clear guidance to all agencies about how to operate together, safely and efficiently, while allowing each agency to complete the necessary tasks that they are required to perform. It is helpful to outline the duties and responsibilities of each agency which are required at the scene of a traffic-related incident scene. These documents should outline common goals and operational procedures to follow when working together to complement each organization's activities.

- Inter-agency coordination is an important element of successful service patrol program. It relies on the sharing of reliable, timely information between agencies and a coordinated vision for resolving traffic incidents in a safe and efficient manner. Building the relationships and trust between the various responder agencies as well as learning each organization's roles, goals, and capabilities is vital. One of the most successful ways to develop the team environment is through TIM Team meetings which many agencies hold on a regular basis. Metropolitan Planning Organizations can be instrumental in organizing and sustaining TIM teams. Inter-Agency agreements should be established to ensure a clear, consistent consensus between agencies. These agreements should be revisited from time to time to ensure they are still applicable.

- There is no standard curriculum for training service patrol operators and the level of training for service patrol programs depends on the level of service that the patrol is expected to provide. Service patrol training should be delivered on a regular basis with refresher courses to maintain certification in some skills and proficiency in others. The number one priority in these training sessions needs to be safety. Cross-training and operational exercises with other responder agencies build trust, relationships, and knowledge of each organization's resources and capabilities. The Federal Highway Administration (FHWA) has developed a training curriculum through the SHRP2 program entitled the "National Traffic Incident Management Responder Training Program." The SHRP2 training combines classroom training with tabletop exercises. Although there needs to be a training curriculum developed specifically for the patrollers about how to perform their duties, a multi-agency training program has the added benefit of building relationships between the different response disciplines and the patrollers.

These relationships carry over to responses to incidents and an elevated level of coordination and cooperation can be realized between the agencies.

- Technology is beginning to find its way into patrol vehicles, and there are great benefits being derived from these technology implementations. Mobile data terminals, vehicle-mounted CCTV streaming live video to the operations center, and other technologies are beginning to become standard equipment on some agencies' patrol vehicles. The technologies in the patrol vehicles are about to increase dramatically with the rapidly approaching connected vehicle initiative and will bring a new wave of applications geared toward service patrols. Some of these technologies include warning of errant vehicles approaching the incident scene, alerts sent out to motorists of the patrols or other responders ahead in the traffic lanes including possible options the approaching vehicles should take, and possibly alerting the service patrols when motorists become disabled. Connected vehicle technology could inform the SSP of vehicle issues being experienced. It will be important for agencies to keep up with the emerging technologies and decide which options they may need to deploy as funding budgets allows.

- When evaluating program funding, the public and legislative awareness of the program can aid in increasing the current funding or sustaining the current funding level for these types of programs.

- Service patrol justification is important to initiate, sustain, and enhance the growth or level of service of a patrol program. Insightful performance measures coupled with benefit cost ratios are invaluable tools in making the case for supporting these efforts. Public awareness and support of these programs is important. There are examples of programs that have demonstrated the benefit of the implementation and, as a result, have expanded patrols, hours, and/or routes. In justifying the program, the executive level agency management must be engaged and armed to be able to sell the service patrol program. It is beneficial to prepare a one- to two-page document with executive talking points highlighting the SSP benefits along with any data to back the benefit claims up. Having benefits data available to the agency as well as the traveling public can add to the support needed to obtain funding. The funding needs to cover the implementation or enhancement of the program and it needs to become a line item in the budget to ensure that the implementations can be sustained over time. Research will be needed to identify the potential funding streams between the State and federal sources. There are program sponsorship options which should be left open to accommodate more than one sponsor for additional funding if needed.

State and local departments of transportation and other agencies are looking for ways operate the roadway networks in a safer, more efficient manner. In order to do this, one of the most efficient tools to deploy is a Traffic Incident Management Program consisting of a very strong TMC/TOC and service patrols that operate as a well-coordinated team. The benefits that these programs can bring compared to the cost invested needs to be made apparent to all stakeholders. The decision-makers, armed with SSP benefits data, will be able to steer funding to these programs. Another awareness campaign should target the traveling public. The majority of the public does not understand or even know that some of these programs exist, nor do they know the benefits they as travelers realize as a result of the TIM programs. Inter-agency coordination and

communication are at an all-time high thanks in part to FHWA and their efforts in promoting TIM programs and the development of the SHRP2 multi-agency TIM training program. These programs are touching more responders and raising awareness of clearing the roads in a safe and efficient manner than any other program has ever achieved. The introduction of connected vehicles will only serve to make the operations centers and the service patrols much more efficient in their duties.

APPENDIX A. REFERENCES AND RESOURCES

- Safety Service Patrol Idea Sharing Network – Session II: Performance Measures Presentation by Scott Yinger
- California Highway Patrol Monterey County Freeway Service Patrol Manual
- FHWA Service Patrol Handbook
- FHWA 2010 Traffic Incident Management Handbook Update
- Regional Emergency Action Coordinating Team (REACT) Equipment Needs Assessment Report
- Manual of Uniform Traffic Control Devices (2009)
- FHWA Traffic Incident Management Handbook (2010)
- NFPA 1091 (2015): Standard for Traffic Control Incident Management Professional Qualifications
- FHWA manual "Field Operations Guide for Safety/Service Patrols"
- Washington State Department of Transportation Grey Notebook
- The Evaluation of Motorists Assist Program" February 2010 report compiled by the University of Missouri-Columbia, HDR Engineering and Missouri Department of Transportation
- FHWA publication "Traffic Incident Management Quick Clearance Laws: A National Review of Best Practices" (Report #: FHWA-HOP-09-005) December 2008

APPENDIX B. HOLD HARMLESS LIABILITY LEGISLATION EXAMPLE

The 2015 Florida Statutes

Title XXIII

MOTOR VEHICLES

Chapter 316

STATE UNIFORM TRAFFIC CONTROL

View Entire Chapter

316.061 Crashes involving damage to vehicle or property.—

(1) The driver of any vehicle involved in a crash resulting only in damage to a vehicle or other property which is driven or attended by any person shall immediately stop such vehicle at the scene of such crash or as close thereto as possible, and shall forthwith return to, and in every event shall remain at, the scene of the crash until he or she has fulfilled the requirements of s. 316.062. A person who violates this subsection commits a misdemeanor of the second degree, punishable as provided in s. 775.082 or s. 775.083. Notwithstanding any other provision of this section, $5 shall be added to a fine imposed pursuant to this section, which $5 shall be deposited in the Emergency Medical Services Trust Fund.

(2) Every stop must be made without obstructing traffic more than is necessary, and, if a damaged vehicle is obstructing traffic, the driver of such vehicle must make every reasonable effort to move the vehicle or have it moved so as not to block the regular flow of traffic. Any person failing to comply with this subsection shall be cited for a nonmoving violation, punishable as provided in chapter 318.

(3) Employees or authorized agents of the Department of Transportation, law enforcement with proper jurisdiction, or an expressway authority created pursuant to chapter 348, in the exercise, management, control, and maintenance of its highway system, may undertake the removal from the main traveled way of roads on its highway system of all vehicles incapacitated as a result of a motor vehicle crash and of debris caused thereby. Such removal is applicable when such a motor vehicle crash results only in damage to a vehicle or other property, and when such removal can be accomplished safely and will result in the improved safety or convenience of travel upon the road. The driver or any other person who has removed a motor vehicle from the main traveled way of the road as provided in this section shall not be considered liable or at fault regarding the cause of the accident solely by reason of moving the vehicle.

History.—s. 1, ch. 71-135; s. 3, ch. 74-377; s. 2, ch. 75-72; s. 9, ch. 76-31; s. 22, ch. 85-167; s. 3, ch. 85-337; s. 30, ch. 92-78; s. 296, ch. 95-148; s. 6, ch. 96-350; s. 83, ch. 99-248; s. 3, ch. 2002-235.

Road Ranger Safety Service Patrol

Liability Exemption for Safety Patrol Operators

Appendix "D"

Wrecker Operator liability exemption:

Title XL- REAL AND PERSONAL PROPERTY

Chapter 713-LIENS, GENERALLY

713.78 Liens for recovering, towing, or storing vehicles and vessels.--

(7)(a) A wrecker operator recovering, towing, or storing vehicles or vessels is not liable for damages connected with such services, theft of such vehicles or vessels, or theft of personal property contained in such vehicles or vessels, provided that such services have been performed with reasonable care and provided, further, that, in the case of removal of a vehicle or vessel upon the request of a person purporting, and reasonably appearing, to be the owner or lessee, or a person authorized by the owner or lessee, of the property from which such vehicle or vessel is removed, such removal has been done in compliance with s. 715.07.

Further, a wrecker operator is not liable for damage connected with such services when complying with the lawful directions of a law enforcement officer to remove a vehicle stopped, standing, or parked upon a street or highway in such a position as to obstruct the normal movement of traffic or in such a condition as to create a hazard to other traffic upon the street or highway.

APPENDIX C. TRAFFIC INCIDENT MANAGEMENT INTER-AGENCY MEMORANDUM OF UNDERSTANDING EXAMPLES

MEMORANDUM OF UNDERSTANDING

FOR COORDINATION OF TRAFFIC INCIDENT MANAGEMENT

ON ROADWAYS MAINTAINED BY THE

MARYLAND STATE HIGHWAY ADMINISTRATION

WHEREAS, it is mutually recognized by the Traffic Incident Management (TIM) Team Agency Member that the National Traffic Incident Management Coalition (NTIMC) estimates that traffic incidents are the cause of about one-quarter of the congestion of United States roadways, and that for every minute a freeway lane is blocked during a peak travel period, four minutes of travel delay results after the incidents is cleared. First responders to these incidents routinely face dangers and are sometimes victims of secondary crashes, as are other motorists. Traffic incidents result in substantial economic impact, increased air pollution and motorist frustration as well as cause an adverse impact on the quality of life;

WHEREAS, it is understood the Maryland State Highway Administration (MDSHA) has developed a TIM Strategic Plan to identify programs and actions to sustain the commitment to, and expand, the TIM program in Maryland to better meet our travel needs. Moreover, the SHA has reached a milestone where the Department can now strengthen its already successful TIM Program to reach new levels of leadership and vision. The program's future success will include; increased TIM Team Agency Membership, an in depth understanding of stakeholder needs, a statewide and national perspective on transportation management and operations, and credibility to lead the TIM community to achieve new goals;

WHEREAS, it is mutually agreed by the TIM Team Agency Member that the result of efficient traffic incident management through safe, quick clearance, prompt and reliable response as well as interoperable communications enhances responder safety and is consistent with the Traffic Incident Management National Unified Goal (NUG).

WHEREAS, it is understood by the TIM Team Agency Member that this MOU is intended to provide the framework and guidelines to promote a collaborative effort in Maryland to further refine and promote the TIM program within the State. This may be accomplished by identifying goals, delineating scene roles and responsibilities, establishing consistent emergency lighting guidelines, implement TIM training and understand the advantages of a central informational system;

WHEREAS, it is recognized that the TIM Team Agency Member understands the importance of data and resource-sharing and public safety through efficient and timely use of TIM most promising practices, and,

WHEREAS, it is understood this MOU does not obligate the TIM Team Agency Member or their representatives to commit or donate funds, equipment or personnel to the association's activities or initiatives. The TIM Team Agency Member does however commit to participating in collaborative efforts intended to advance the interest of the TIM program for the benefit of public safety.

NOW, THEREFORE, we the undersigned do hereby agree to the provisions of this Memorandum of Understanding for Coordination of Traffic Incident Management on roadways maintained by the Maryland State Highway Administration.

I. Endorsement of the MD/SHA-MSP "Clear the Road" Policy

The parties hereto agree the MD/SHA-MSP "Clear the Road" Policy as shown as Attachment A. This agreement by and between SHA and the Maryland State Police (MSP) establishes a policy for SHA personnel to expedite the removal of vehicles, cargo, and debris from roadways maintained by SHA to restore, in an URGENT MANNER the safe and orderly flow of traffic following a motor vehicle crash or other incident on Maryland's roadways.

The Policy establishes an overall time goal for roadway and incident scene clearance times as follows:

All incidents cleared from the roadway within 90 minutes of the arrival of the first responding officer.

By recognizing and understanding the importance of the Statewide Clear the Road Policy, the TIM Team Agency Member agrees to work toward meeting and/or exceeding this goal.

II. Delineation of Incident Scene Roles and Responsibilities

This section of the Memorandum of Understanding provides the definition of the incident scene roles for participating TIM Team Agency Members based on National Incident Management System and Incident Command System structure. These roles and responsibilities are as follows:

1. Law Enforcement

Including State, County, City and Municipality Departments of Law Enforcement

A. Secures incident scene

B. Performs first responder duties

C. Assists responders in accessing the incident scene

D. Establishes emergency access routes

E. Controls arrival and departure of incident responders

F. Polices perimeter of incident scene and impact area

G. Conducts crash investigation

H. Performs traffic control

I. Assumes role of Incident Commander, if appropriate

J. Supports unified command, as necessary

2. Fire and Rescue

Including State, County, City and Local Volunteer Fire and Rescue Departments

A. Protects incident scene

B. Rescues/extricates victims

C. Extinguishes fires

D. Responds to and assesses incidents involving a hazardous materials release

E. Contains or mitigates a hazardous materials release

F. Performs traffic control

G. Assumes role of Incident Commander, if appropriate

H. Supports unified command, as necessary

3. Emergency Medical Services (EMS)

Including State, County, City and other Municipality Medical Services

A. Provides medical treatment to those injured at the incident scene

B. Determines destination and transportation requirements for injured victims

C. Transports victims for additional medical treatment

D. Supports unified command, as necessary

4. Emergency Management Agencies

Including State, County and City Emergency Operations Centers

A. Coordinates government response and resources

B. Provides technical expertise

C. Provides evacuation recommendations

D. Facilitates communication and coordination across jurisdictions

E. Coordinates response from other State and Federal agencies

F. Assumes role of Incident Commander, if appropriate

5. Environmental Agencies

Including the Department of Environment and other similar, local agencies

A. Provide technical expertise

B. Ensure hazardous material releases are remediated properly

C. Respond to and assess incidents involving hazardous materials

D. Coordinate the responsible party response to the incident

E. Support unified command, as necessary

III. Establishment of Incident Scene Emergency Lighting Guidelines

The section of the Memorandum of Understanding creates a Lighting Policy establishing the on-scene lighting procedures developed with the guidance of the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) Section 6I.05 shown as Attachment B.

Public safety agencies should examine their policies on the use of emergency vehicle lighting, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward facing emergency vehicle lighting, especially on divided roadways, to reduce distractions to on coming motorists.

By recognizing and understanding the importance of the local Emergency Lighting guidelines, the TIM Team Agency Member agrees to restrict the use of incident scene lighting as noted in the policy.

IV. Establishment and Implementation of Traffic Incident Management Training

The section of the Memorandum of Understanding establishes the standard for first responder traffic incident management training as Federal Highway Administration's Strategic Research Highway Project 2 (SHRP2) as the preferred resource. The TIM Team Agency Member agrees to establish, endorse, implement and/or maintain SHRP2 traffic incident management training to all sworn, uniformed and first responders within their agency.

V. Recognition of an Informational Clearinghouse for Incident Information

The TIM Team Agency Member is resolved to improve incident communications by establishing the Office of CHART & ITS Development's Statewide Operations Center (SOC) as a clearinghouse for incident information. The purpose of this resolve is to ensure that all

participating TIM Team Agency Members are committed to notifying the SOC of all incident information including but not limited to notification of the incident, response taken to the incident, verification of incident information and clearance actions taken during an incident.

Review and/or Cancellation of Memorandum

The parties agree to review the provisions of this Memorandum of Understanding at least every two (2) years and make any changes, modifications, or revisions to this Memorandum which are deemed necessary to ensure continued efficient management and operations of Maryland roadways.

It is mutually understood by the parties, that this Memorandum of Understanding for Coordination of Traffic Incident Management on roadways maintained by the Maryland State Highway Administration shall remain in effect until canceled by written notification of any party or their successors to the other.

AS WITNESS, our hands this _____ day of _____, 2014.

DOT Head

Partner Agency Head

MEMORANDUM OF UNDERSTANDING

MD/SHA-MSP
"CLEAR THE ROAD" POLICY
(Attachment A)

This agreement made this 22nd day of August, 2014, by and between the Maryland State Highway Administration (SHA) and the Maryland State Police (MSP) is to provide guidance for State Police and State Highway personnel in removing vehicles from roadways in certain situations to maintain a safe and orderly flow of traffic.

WITNESSETH: Whereas, the SHA is proposing to remove certain vehicles from the roadway on an urgent basis following crashes, disabled vehicles or where vehicles are abandoned and are causing a hazardous situation to exist.

1. General:

Whenever the travel lanes of a roadway are closed or partially blocked by a crash, disabled or unattended vehicle and traffic delays or safety problems may occur as a result, the SHA representative in cooperation with the trooper in charge should attempt to reopen the roadway as soon as possible ON AN URGENT BASIS. All those involved realize that public safety is the highest priority and must be maintained, especially if injuries or hazardous materials are involved. It is understood that damage to vehicles or cargo may occur as a result of clearing the road on an urgent basis. While reasonable attempts to avoid such damage should be taken, the highest priority is public safety.

2. Procedure/Requirements – SHA

A. General

The SHA representative is to assign the necessary equipment and manpower to reopen the road or lane as soon as possible.

If materials being transported are involved and displaced, the SHA will make every effort to relocate the materials in the shortest possible time, using whatever equipment is necessary. All such materials will be relocated within as close proximity to the primary incident scene as possible, but not be placed as to present a traffic hazard.

The SHA representative shall prepare a list of the personnel and equipment used and the work hours involved so that the owner of the vehicle and/or cargo can be billed for the work. Appropriate warning devices (traffic control devices, signs, arrow boards, barricades etc.) are to be placed on the scene should either damaged vehicle(s) or cargo remains adjacent to a lane or shoulder once the primary responders have completed their investigation and debris removal.

B. Personal Injury Crashes

The SHA understands that personal injury and fatality collisions involve a higher degree of investigation than property damage collisions. If SHA is first on the scene and injuries are reported or observed, SHA will seek emergency medical assistance and contact the proper authorities prior relocating any vehicles or evidence from its original location.

C. Hazardous/Flammable/Exploding Materials

No attempt is to be made by SHA personnel/equipment to move any hazardous, flammable or explosive material for any reason. If SHA is first on the scene and the cargo content is not readily identifiable, the SHA representative will contact the proper authorities to ascertain if special measures should be taken.

As soon as the public safety has been secured then reopening of the roadway is to proceed as described under "General" in this agreement.

3. MSP Duties and Responsibilities

A. General

Members of the MSP who are on-scene crash investigators will work in cooperation with other Emergency Service Personnel and members of SHA who are at the scene. Members of the MSP will conduct their required investigation in as expedient a manner as possible, considering the severity of the crash and the quality of their investigation. Lengthy investigations will require investigators to work diligently in an attempt to minimize traffic delays. This may mean that certain "non-critical" portions of an investigation be conducted at a later time when traffic congestion is non-existent (i.e. non-peak periods).

B. Release of Responders

It should be understood that as fire/rescue/EMS service personnel complete their required tasks of extrication, administration of medical assistance and removal of the injured, the MSP trooper in charge may chose to release them unless a HAZMAT situation exists. This will also hold true for allied police personnel, additional troopers and members of the SHA as each complete their required functions, returning the roadway to normal as soon as possible.

C. Relocating Vehicles

Once the primary investigation is complete, members of the MSP will allow SHA personnel to relocate vehicles and or debris from the roadway with any means possible while following the guidelines of SHA policy and procedures. This

includes relocating vehicles and or property prior to a private contract tow company arriving on scene.

D. Private Towing/Cargo Off-Loading

When exigent circumstances exist requiring immediate response and the MSP determines that a reliable towing business can provide the required service in a more efficient or expeditious manner to quickly alleviate the situation, the MSP may deviate from the normal procedure and request that towing business to restore the flow of traffic.

Members of the MSP in cooperation with SHA shall determine if the owner or contractor of any displaced cargo will be permitted to immediately off-load such cargo where this action will result in additional traffic delays or hazardous circumstances during peak traffic periods.

4. Liability Issues

Maryland SHA's policy, for the immediate removal of certain vehicles from roadways on an URGENT BASIS utilizing available resources, recognizes that public safety is of the highest priority. Furthermore, SHA realizes that damage to the vehicles or cargo contained therein may occur as the result of their clearing the roadway and SHA assumes liability under these circumstances for said damage, should that become as issue. SHA's liability under these circumstances would be no greater than they might expect from negligence, etc. on the part of snow equipment operations. As outlined in the "Limits of Liability" portion of the MD Tort Claims Act, SHA is only responsible for the first $1,000.00 in damages and the Maryland State Treasurer's Office would cover any additional damages under the State's Self-Insurance Program. SHA would not automatically be liable for damages resulting from clearing the roadway unless there was clear evidence on the part of SHA that negligence was used in said operation.

In Witness Whereof, each party hereto has caused this agreement to be executed in its name and on its behalf by its duly authorized officer or agent as of this day and year first above written

APPENDIX D. ACKNOWLEDGEMENTS

California Department of Transportation
Colorado Department of Transportation
Florida Department of Transportation
Georgia Department of Transportation
Harris County Toll Road Authority
Hawaii Department of Transportation
Houston TranStar
Iowa Department of Transportation
Kansas City Scout
Los Angeles County Metropolitan Transportation Authority
Maricopa County Department of Transportation
Maryland State Highway Administration
Massachusetts Highway Department
Michigan Department of Transportation
Missouri Department of Transportation
Nevada Department of Transportation
New Hampshire Department of Transportation
New Jersey Department of Transportation
New York State Department of Transportation
North Carolina Department of Transportation
North Central Texas Council of Governments
Pennsylvania Department of Transportation
South Carolina Department of Transportation
Tennessee Department of Transportation
Texas Tollway Authority
Utah Department of Transportation
Virginia Department of Transportation
Washington, DC Department of Transportation
Washington State Department of Transportation

APPENDIX E. BIBLIOGRAPHY

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