

TOOLS AND TECHNIQUES

To comprehensively plan and manage special event activities, efforts should focus on (1) disseminating motorist information, (2) managing and controlling traffic, and (3) managing travel demand. This chapter describes techniques planned or currently in use by stakeholders to accomplish those tasks.

A brief description of each of the tools and techniques is provided, supported primarily from findings in the literature. Tables 3 and 4 indicate the level of use of each of these tools and techniques, reported in order of frequency by survey respondents. Related issues regarding communication protocols and event follow-up are discussed in this chapter as well.

Notably, many of the tools and techniques described in this chapter also apply to incident management or construction and maintenance activities. Thus, the investment in these tools and techniques does not have to be justified solely in improvements to special event traffic. For example, variable message signs (VMS) on an Interstate highway may direct traffic to the event venue before an event, but they may also be used to warn drivers of incidents, poor weather, and other situations during times when there are no special events.

MOTORIST INFORMATION

Providing motorists with information is intended to (1) allow motorists to select the best route, (2) direct motorists

TABLE 3
TOOLS AND TECHNIQUES CURRENTLY USED—RANKING

| Tools and Techniques | Frequency |
|---|-----------|
| Motorist Information | |
| Variable message signs | 29 |
| Media partnerships | 25 |
| Pre-event informational campaigns | 25 |
| Highway advisory radio | 10 |
| Other | 4 |
| Traffic Management | |
| Traffic cones | 29 |
| Temporary lane closures | 29 |
| Portable static signs | 28 |
| Traffic management teams | 22 |
| Traffic management centers | 20 |
| Law enforcement motorcycle patrols | 18 |
| Non-law enforcement service patrols | 18 |
| Traffic responsive signal systems | 18 |
| Law enforcement service patrols | 15 |
| Video and closed-circuit television | 15 |
| Reversible lanes/moveable barriers/temporary contraflow | 15 |
| Electronic loop detection | 13 |
| Aircraft patrols | 11 |
| Portable traffic signals | 6 |
| Major capacity improvements | 6 |
| Ramp metering | 4 |
| Other | 1 |
| Travel Demand Management | |
| Park-and-ride lots | 24 |
| Alternative routes | 18 |
| Parking management | 16 |
| Economic or preferential incentives for public transportation | 9 |
| Automobile-restricted zones | 8 |
| Economic or preferential incentives for ridesharing | 5 |
| Major transit improvements | 4 |
| Economic or preferential incentives for walking/biking | 2 |
| Alternate travel hours incentives/congestion pricing | 2 |
| Other | 1 |

TABLE 4
TOOLS AND TECHNIQUES PLANNED FOR USE—RANKING

| Tools and Techniques | Frequency |
|---|-----------|
| Motorist Information | |
| Highway advisory radio | 7 |
| Variable message signs | 3 |
| Media partnerships | 3 |
| Pre-event informational campaigns | 1 |
| Other | 1 |
| Traffic Management | |
| Video and closed-circuit television | 5 |
| Traffic management centers | 5 |
| Major capacity improvements | 5 |
| Electronic loop detection | 4 |
| Traffic responsive signal systems | 4 |
| Ramp metering | 4 |
| Traffic management teams | 3 |
| Non-law enforcement service patrols | 2 |
| Portable traffic signals | 2 |
| Aircraft patrols | 1 |
| Traffic cones | 1 |
| Portable static signs | 1 |
| Temporary lane closures | 1 |
| Reversible lanes/moveable barriers/temporary contraflow | 1 |
| Other | 1 |
| Law enforcement motorcycle patrols | 0 |
| Law enforcement service patrols | 0 |
| Travel Demand Management | |
| Major transit improvements | 4 |
| Economic or preferential incentives for walking/biking | 3 |
| Economic or preferential incentives for ridesharing | 2 |
| Economic or preferential incentives for public transportation | 2 |
| Park-and-ride lots | 2 |
| Parking management | 2 |
| Other | 2 |
| Automobile-restricted zones | 1 |
| Alternative travel hours incentives/congestion pricing | 1 |
| Alternative routes | 1 |

to available parking areas, (3) reduce driver frustration, and (4) inform non-event traffic to encourage the use of alternate routes.

Motorist information tools and techniques commonly used for special event planning and management include the following:

- VMS,
- Highway advisory radio (HAR),
- Media partnerships, and
- Pre-event informational campaigns.

Variable Message Signs

VMS have a changeable display, allowing for a variety of pertinent information to be given to motorists. These displays inform about lane closures, warnings, and parking lot closures, or simply provide directional information. It is generally recommended that predetermined message sets be developed to lend consistency to the dis-

plays and speed the messaging process. VMS require active monitoring to ensure that the information is timely and accurate. VMS can be permanently installed on the roadside or be made portable by mounting them on trucks or trailers.

Highway Advisory Radio

HAR uses a specific radio frequency to provide information to motorists by means of their in-vehicle radio systems. This information is typically broadcast over the 530 AM or 1610 AM frequencies, with various ranges depending on the location of the transmission antennae. HAR messaging should be updated frequently with timely, accurate information. The benefit to using HAR is the ability to provide detailed messages of moderate length. Both permanent and portable HAR is available. For venues with frequent special events, permanent HAR may be worth the investment. The obvious benefit of portable HAR is the ability to transport it to various special event locations on an as-needed basis.

That HAR is readily available needs to be advertised and it should be used consistently for all events. This will help its credibility with motorists, who may discontinue using HAR if it is selectively used and not advertised.

It should also be noted that HAR use is limited by geographic conditions. The AM frequencies used for HAR are not consistently reliable or effective in all areas of the country (e.g., mountainous regions). Therefore, this technology should be investigated further for use within a specific geographic region before an investment is made.

Media Partnerships

The media can be used to provide both pre-trip and en-route information to motorists. Radio, television, and print media are used, with radio having the best ability to provide en-route information. Print media such as newspapers are also beneficial because they provide hard-copy, printed maps of detour routes, parking, and transit. Another media source is the Internet, which can be used to publish suggested driving directions and parking. Efforts should be made to both coordinate and educate media personnel if brought in as a partner in motorist information activities. Personnel coordinating traffic for NASCAR races at Phoenix International Raceway witnessed firsthand how limited coordination among various media sources can result in inconsistent and often confusing information to motorists (Wall et al. 2000). To help prevent such problems and to provide accurate information, media information should be obtained from a single source, such as the lead traffic engineer, lead law enforcement officer, or a traffic management center (TMC).

Pre-Event Informational Campaigns

Pre-event information campaigns inform motorists about traffic and parking conditions prior to a special event. The most common method of information dissemination is through brochures, informational flyers, or pamphlets to event patrons (Baker 1990; Chester and Himes 2000; Gibson and Rifkin 2000; Wall et al. 2000). Patrons are typically provided with suggested parking areas, recommended routes, and even suggestions encouraging early arrival.

For the Tennessee Titans' Adelphia Coliseum in Nashville, Tennessee, patrons with on-site parking are advised to use one Interstate highway to reach the site, whereas patrons with off-site parking are directed to an alternate route to reach central business district parking (Chester and Himes 2000).

In preparation for the Detroit Grand Prix in 1988, officials provided advance publicity by means of television,

radio, local newspapers, and special brochures. The information was directed not only to patrons, but also nonpatrons, in the hope of avoiding the accompanying increased traffic demand and road closures (Aggarwal and Kobran 1989).

TRAFFIC MANAGEMENT

A wide range of tools and techniques exist to control and manage traffic at or near a special event site. Those commonly used for special event planning and management can be categorized as follows:

- Traffic control devices,
- Patrols,
- Electronic surveillance,
- Signalization,
- Geometric modifications, and
- Other.

Traffic Control Devices

Traffic control devices represent a standard set of tools used to regulate, warn, and guide traffic. Traffic control devices used for special event planning and management may include traffic cones, portable static signs, or portable traffic signals.

Traffic Cones

Traffic cones are used to channel vehicles, divide opposing traffic, or divide multiple lanes in the same direction [*Manual on Uniform Traffic Control Devices (MUTCD) 2000*]. The cones should be mostly orange with retroreflective material and of a material such that when struck by a vehicle, the vehicle is not damaged. The standard height for cones in low-speed situations is 450 mm (18 in.) and 700 mm (28 in.) on freeways and other high-speed highways. The standards for traffic cone use are provided in the MUTCD (Chapter 6F.56).

Portable Static Signs

The most commonly used traffic control device is the static sign. For special event planning and management, temporary static signs are most useful unless the event is a frequent one. Temporary signs can be exposed during the event and covered at its completion, mounted on temporary posts or trailer mounted and staged only for the event. Static signs, both temporary and permanent, should follow the standards for size, placement, and color set forth in the MUTCD.

Portable Traffic Signals

Two types of portable traffic signals may be used for special event planning and management. For long-duration special events such as the Winter Olympic Games, traffic signal poles and lights can be installed in a semipermanent fashion. Alternatively, trailer-mounted portable traffic signal systems can be used (Figure 4). The clear advantages of a portable system are the ease of transport and its use for different events throughout the jurisdiction. Additional information on portable (temporary) traffic signals can be found in the MUTCD (Chapter 4D.20).

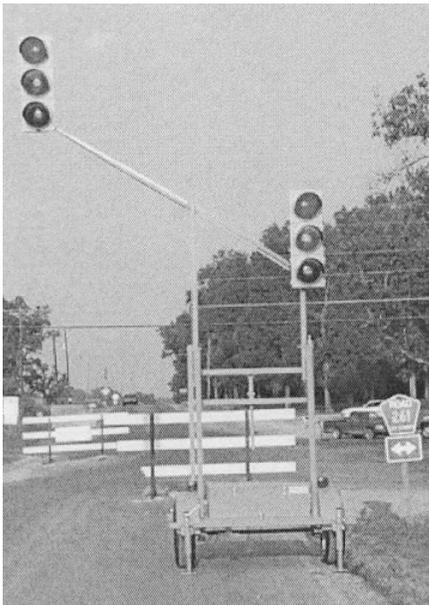


FIGURE 4 Portable traffic signal (Courtesy: K & K Systems, Inc.)

Patrols

Manual patrols to monitor traffic conditions during special event times are common, although the composition of these patrols can vary.

Law Enforcement Motorcycle Patrols

Law enforcement motorcycle patrols provide an effective means to monitor ingress and egress routes during special events. One advantage is their ability to move more quickly than foot patrols and to maneuver in confined spaces more effectively than a patrol car. A disadvantage is their inability to operate in adverse weather conditions.

Law Enforcement Service Patrols

Law enforcement service patrols serve much the same function as motorcycle patrols except they are either in vehicles

or on foot. Common responsibilities for these patrols include directing traffic at staffed traffic control points as well as writing citations or summoning a tow truck for such infractions as parking violations. The advantage of using staffed traffic posts over signalized control is the presence of authority and the ability to make dynamic changes to the traffic flow. Public safety is also a primary responsibility of these patrols. Often, their mere presence can prevent problems. In addition, these personnel generally have some form of first aid training for treating minor injuries.

Non-Law Enforcement Service Patrols

Non-law enforcement service patrols typically consist of transportation, public works, event, or other personnel. These individuals have a different set of skills and a different level of authority than do law enforcement personnel, which may be both beneficial and not so to the management of special events. For example, transportation personnel have a heightened knowledge of traffic control and management, but they may not gain the same respect and responsiveness from the motoring public because of their lack of enforcement authority. However, these patrols may provide services to motorists, such as gas and air, to reduce the impacts of stranded vehicles.

Traffic Management Teams

As an alternative, multidisciplinary teams can be formed to provide a balance between knowledge and authority. Traffic management teams are groups of individuals who work together in executing a traffic plan and who are all under one central command. For frequent special events these teams become highly familiar with each member's role and responsibilities. One advantage of using such a team under the command of a single person or unit is the ease in relocating personnel to more critical event areas (Ogura 1994).

Aircraft Patrols

Using either fixed-wing aircraft or helicopters, personnel can monitor traffic and identify problem locations or bottlenecks that are more difficult to detect from the ground. This information can then be relayed to personnel on the ground for appropriate action. Aircraft can also provide a vantage point for media personnel to obtain traffic information, which can then be passed on directly to motorists. Coordination among the various media should occur to avoid the dissemination of conflicting information. However, it should be recalled that aircraft use is subject to air-space restrictions and weather conditions.

Electronic Surveillance

In addition to the manual surveillance provided by ground or air patrols, electronic surveillance can be used to monitor traffic conditions during special event times. Predominant electronic surveillance tools include the following:

- Electronic loop detection,
- Video and closed-circuit television (CCTV), and
- TMCs.

Electronic Loop Detection

Electronic loop detection can monitor traffic volumes and vehicle speeds on various routes serving the special event venue. This information can then be used to re-route traffic from congested routes to less congested routes. The data collected by the electronic loops can also be stored for later analysis and improvement of related traffic control and signal timing plans.

Video and Closed-Circuit Television

Video and CCTV provide the opportunity to observe survey traffic conditions from many points of view and locations. The cameras, usually mounted on poles or other infrastructure to provide a bird's-eye view, can be placed at strategic locations throughout the roadway network serving the special event. An image of volume as well as speed data describing traffic conditions can be saved for later analysis and planning.

Traffic Management Centers

TMCs are generally the central communication hub for traffic-related information. TMCs collect information from personnel or electronically through electronic loops and video/CCTV. Pertinent information is then disseminated to motorists through an established motorist information system and used to control traffic flow through ramp metering, traffic signal systems, etc. TMCs can also dispatch personnel and other resources as needed based on the information they receive.

For some special event venues a secondary TMC may be used. For example, the Los Angeles City DOT has a satellite TMC near the Staples Center. Although not as well equipped as the central TMC, it has the tools needed to manage traffic during special events at the site.

The development of a TMC is a capital-intensive effort and therefore not economically feasible in areas where the center cannot be used to benefit daily operations and congestion

management. The Minnesota DOT (Mn/DOT) developed a Portable Traffic Management System (PTMS) as an alternative to a costly permanent TMC (Hill and Garrett 1996).

The PTMS comprises VMS, HAR, spread spectrum radio, a portable traffic signal, CCTV, and a link to the permanent TMC. The spread spectrum radio allows data transfer between the CCTV and the TMC without hardwired connections. The VMS are used to disseminate traffic and travel information and are linked to the PTMS by means of a cellular phone. The HAR has internally stored, 1-minute message capabilities activated by means of a cellular phone. The CCTV cameras, capable of tilt, pan, and zoom, are mounted on extendable poles attached to the bed of service vehicles and placed at strategic locations to monitor traffic congestion and send compressed images to the PTMS. The portable traffic signals are used to improve traffic and pedestrian safety on congested routes near the special event site. The reception of the PTMS has been positive, resulting in improved traffic flow during special events.

Signalization

Permanent traffic signal systems and ramp metering can be used to control and manage traffic during special event times.

Standard Signal Systems

Standard signal systems require timing plans to be adjusted for changing traffic conditions. For frequent events, special timing plans can be developed and stored in the controllers or system to assist in expediting special event traffic flows. For infrequent events, special timing plans can be implemented on the day of the event. Care needs to be taken to restore the original timing plan once the event has finished and traffic returns to normal.

Traffic-Responsive Signal Systems

Traffic-responsive signal systems allow for the dynamic adjustment of cycle characteristics (e.g., splits, phasing, and offsets) in response to real-time traffic condition data. Electronic loop detectors, CCTV, and other resources can provide the real-time traffic data necessary to support this system. In turn, signal cycle lengths and characteristics are adjusted to optimize the performance of the roadway network. For roads that lead to or from a special event venue, an extended green time may allow for greater traffic volumes to move toward or away from the venue. Small-scale events that result in only minor and temporary increases in traffic flow may not warrant investment in such a dynamic system.

Ramp Metering

Ramp metering is used to manage traffic entering controlled access facilities and prevent bottlenecks from forming at the access points. The use of ramp metering to ensure efficient operation of the controlled access facility may lead to problematic queues or congestion on the ramps and secondary facilities.

Geometric Modifications

Both temporary and permanent modifications can be made to the geometrics of a roadway to better accommodate the increased traffic demand resulting from special events.

Temporary Lane Closures

Certain types of special events, such as parades or marathons, require temporary lane or road closures. When this is done and by ensuring that adequate alternate routes are available and that the motoring public is well informed about those alternate routes, overall traffic flow through the region may improve.

Reversible Lanes/Temporary Contraflow/Movable Barriers

Reversible lanes and contraflow traffic, designated with movable barriers or other means, can temporarily add capacity in a single direction during times of increased traffic demand. For example, two-way streets can be temporarily converted to two-lane, one-way streets. Contraflow traffic on multilane facilities can accomplish similar capacity gains. A four-lane facility with two lanes in each direction can be altered to provide three lanes in one direction. When using this technique, proper care must be taken to ensure proper traffic control and signing. Some signs and markings may need to be hidden or removed to eliminate driver confusion (Wolshon 2001).

When enough width is available, roadway shoulders can be used as temporary travel lanes to accommodate increased traffic flow. One common concern with this technique for long-term events is that it will prevent emergency response vehicles from reaching a downstream incident, because emergency response vehicles will commonly use the shoulder as a travel lane when congestion prevents their use of the general travel lanes.

Major Capacity Improvements

Many special event venues around the country simply do not have transportation facilities with the capacity to handle

the increased demand of special event traffic. For this reason, the construction of additional capacity to, from, and near the venue may be required. Examples of major capacity improvements include widening lanes or roadways, building additional roads, adding additional interchanges or intersections, or adding turning lanes.

An excellent example of major capacity improvement is the Arena Drive interchange in Prince George's County, Maryland. The Maryland State Highway Administration engineered a new interchange on I-95/I-495 (Capital Beltway) at Arena Drive in 1996. "The new interchange was necessary to minimize the effect of a new Washington Redskin Football Team stadium and USAir Arena events on operation of traffic along this segment of the Capital Beltway and its interchanges at MD 202 and MD 214." The interchange, a partial diamond with only one exit and one entrance ramp for the southbound lane, was to be open only during special events to reduce the existing and anticipated congestion on the beltway and the two current interchanges. The entrance ramp is closed before the game to discourage people from attempting to use it as an entrance to I-95/I-495 and the exit ramp is closed after the game to discourage motorists from using that exit to access Arena Drive for other purposes (*Approval Request for Access . . . 1996*).

Other

In addition to the array of tools and techniques described thus far for special event planning and management, survey respondents cited two other tools and techniques that were not noted on the survey questionnaire's list of alternatives: (1) contracts with towing companies and (2) increased snow removal activities.

Towing contracts help to speed the removal of unauthorized (i.e., illegally parked either in the right-of-way or in other no parking zones) or disabled vehicles from the roadway. Unauthorized or disabled vehicles can significantly reduce the existing capacity of the roadway; the effects are magnified during times of increased traffic demand.

An increase in regular snow removal activities benefits in two ways. When roadways are kept free and clear of ice and snow, vehicles can travel at higher speeds, increasing the overall vehicle throughput of the facility. Also, snow and ice removal improves the level of safety for the motoring public and prevents the occurrence of incidents that would restrict roadway capacity.

TRAVEL DEMAND MANAGEMENT

In addition to managing existing vicinity traffic, TDM techniques can be employed to actually reduce the vicinity

traffic demand. Formally defined, “travel demand management is the reduction of automobile travel demand, or the spreading of this demand over space or in time, by altering peoples’ behavior” (Orski 2000).

Common TDM tools and techniques can be categorized as follows:

- Economic or preferential incentives and disincentives for alternate mode use and alternate travel times,
- Alternate routes,
- Parking strategies, and
- Major transit improvements.

Economic or Preferential Incentives and Disincentives

In the survey questionnaire, economic or preferential incentives and disincentives are distinguished by transportation mode. Incentives for walking, biking, ridesharing, and public transit attempt to encourage the reduction of the number of single-occupancy vehicles (SOVs) in the traffic stream, thereby reducing overall traffic demand at the special event site.

Economic Incentives/Disincentives for Alternate Mode Use

Economic incentives for alternate mode use typically come in the form of free or reduced parking rates. The University of Washington charges different rates for SOVs and high-occupancy vehicles (HOVs) (Crandell and Hobson 1989). In 1987, the charge for parking a SOV was \$9, whereas the parking charge for a HOV was \$6.

The transportation planners for the Seattle Mariner’s new baseball park, Safeco Field, also developed a program to promote HOV use to and from games (Rankin 1998). Their strategy involved advertising parking lot services to advance ticket holders in exchange for reduced HOV parking rates. Participating lot locations are also listed on the ballpark website and telephone hotline.

An additional technique includes offering free or reduced transit fares for event ticket holders. This method was used during the 2002 Winter Olympic Games held in Salt Lake City, Utah (“TRAX Facts” 2001).

Preferential Incentives/Disincentives for Alternate Mode Use

Added convenience through preferential incentives is another approach to encouraging alternate mode use. At the Seattle Mariner’s Safeco Field, the stadium provides secure, on-site, weather-protected bicycle storage facilities for attendees and employees (Rankin 1998).

For the Staples Center and the Los Angeles Convention Center, larger crosswalks were developed, signal phases were extended, and some streets were closed off for pedestrian use only (Gibson and Rifkin 2000). Specific close-in loading areas and off-street storage for buses helps to encourage transit use. Pedestrian access between the venues and the nearby light-rail station was also improved.

Other preferential incentives to encourage alternate mode use include HOV or bus lanes, which are intended to decrease ingress and egress travel times for the venue.

Auto-Restricted Zones

An extreme example of preferential disincentives for alternate mode use is auto-restricted zones. Auto-restricted zones eliminate automobile traffic on specific routes or portions of routes. These zones may be closed to all forms of motorized travel or closed to all automobile traffic but left open for transit vehicles. The result is a more pedestrian-friendly zone.

Economic Incentives/Disincentives for Alternate Travel Times and Congestion Pricing

Incentives and disincentives are also used to encourage alternate travel times. Often referred to as “congestion pricing,” there may be a fee charged of individuals choosing to travel during peak traffic demand periods. This fee may be in the form of a toll, higher parking rates, or some other form.

Table 5 shows fan arrival and departure patterns for Qualcomm Stadium in San Diego, California. Note that 32% and 56% of the traffic arrives between 1 and 2 h before game time and less than 1 h before game time, respectively. Incentives for early arrivals would shift a higher percentage of patrons to the category of 1 to 2 h before game time arrival. Unfortunately, departure patterns are more concentrated, with 72% of patrons departing within 1 h of the end of the game.

TABLE 5
TURNSTILE ARRIVALS—SUNDAY BASEBALL

| Patterns | Percentage |
|----------------------------------|------------|
| Fan Arrival | |
| 1 to 2 h before game starts | 32 |
| Less than 1 h before game starts | 56 |
| After game starts | 12 |
| Fan Departure | |
| Before game ends | 10 |
| Within 1 h after game ends | 72 |
| More than 1 h after game ends | 18 |

(Source: Peterson et al. 2000).

As a second example, an air show was held at Gallatin Field in Belgrade, Montana, in August 2001. The gates opened at 10:00 a.m. and except for a minor influx of people at that time, attendees arrived intermittently throughout the day up to the main attraction, the Navy's Blue Angels scheduled for 2:30 p.m. Because of the dispersed arrival pattern, ingress traffic was relatively insignificant. At the conclusion of the Blue Angels' air show, however, the majority of attendees left, resulting in unexpected traffic congestion that did not dissipate for hours. If attendees had been offered incentives to remain longer at the air show, this situation might have been avoided.

Alternate Routes

TDM strategies encourage alternate mode use, alternate travel times, and the use of alternate routes to better disperse traffic demand over the roadway network. Alternate routes are not only beneficial for motorists accessing the special event site but also for those wishing to avoid it. To be most effective, the availability and characteristics (e.g., capacity, construction activity, vertical clearances for overpasses, and weight restrictions) of alternate routes should be carefully investigated and monitored to ensure safe travel for all traffic, including commercial vehicle traffic.

Parking Strategies

Once patrons are at the special event site, the challenge becomes providing adequate parking. On-site, parking management strategies can be used to efficiently direct traffic to vacant parking spaces or lots. Off-site, park-and-ride lots can relieve some of the parking demand if combined with alternate modes of transportation to access the site.

Parking Management Systems

Parking management systems can monitor the use of spaces and inform motorists of vacancies and even the approximate location of those vacancies. This is particularly helpful for large parking garages where significant time can be spent "trolling" for a vacant space. Furthermore, patrons can avoid queues at parking lot entrances by paying for parking when they buy advance tickets.

Park-and-Ride Lots

Park-and-ride lots provide a dual benefit for special event planning and management: (1) the need for on-site parking facilities is reduced, and (2) the traffic demand near the event site is reduced. In many areas, especially dense urban areas, the number of on-site parking spaces is severely

limited. To accommodate those wishing to drive, remote lots can be used, and patrons can be bused to the event location. To encourage such behavior, incentives like those described in the previous section for ridesharing and public transportation can be offered. An example is Coors Field in Denver, Colorado. Because of the limited amount of on-site parking, extensive use is made of park-and-ride lots from throughout the Denver area.

A common challenge for park-and-ride lots is accommodating persons with disabilities. During the 2002 Winter Olympic Games, shuttle buses were handicapped accessible, allowing disabled patrons to take full advantage of the system. The Phoenix International Raceway provides handicapped-accessible bus transportation, but also issues special parking tickets to disabled attendees that allow them special access to parking lots immediately adjacent to the raceway.

Major Transit Improvements

Overall, the best way to improve transit use is to improve transit accessibility and service. By locating a subway, rail station, or bus terminal in the proximity of the special event venue, the convenience of using such a mode encourages increased patronage. In some cases, the increased patronage that can be realized even exceeds facility capacity.

In Chicago, Illinois, the Addison Rail Station serves Wrigley Field (Abrams 2000). When it became obvious the station was not able to service the crowds of the baseball games, the facility was redesigned. Adequate space to shelter all riders as they waited for each train was provided. Also, the fare collection system was redesigned to efficiently service all riders. Additional turnstiles were installed and portable fare collection boxes were developed to assist in the processing of passengers.

Even for an infrequent major special event such as the Salt Lake City 2002 Winter Olympic Games, the development of a new transit system was undertaken. The primary purpose of building the TRAX system was to accommodate the extremely high demand anticipated during the Olympics. Existing bus routes operated by the Utah Transit Authority were reoriented to serve TRAX ("TRAX Facts" 2001).

CONSISTENCY OF USE

Consistent use of the tools and techniques as described accomplishes two things: (1) motorists become accustomed to using the tools and techniques to navigate through traffic as they enter or exit special events and (2) responsible stakeholders become proficient at using the tools and techniques, thus improving the overall management of traffic during

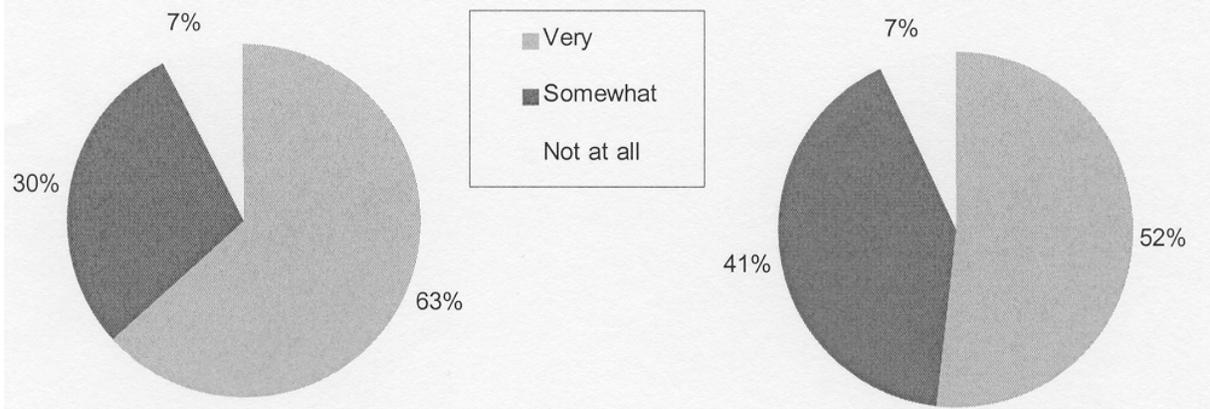


FIGURE 5 Consistency of tools and techniques used for similar events (left, frequent events; right, infrequent events).

special events. Overall, survey respondents rated their consistency of use as very consistent, although consistency in use was slightly lower for infrequent events (see Figure 5). For example, all respondents used VMS for medium-sized, medium-duration, frequent events.

COORDINATION AND COMMUNICATION

Although this chapter has described the various tools and techniques individually, the overall success of transportation management during special events requires the combination and coordination of multiple tools and techniques. Without adequate coordination, conflict or duplication may take place, or misinformation and misdirection may be provided to the motoring public.

The development of formal protocols to assist in the coordination of the responsible personnel during special events is essential. One common protocol is the Incident Command System, which allows for the effective management of interagency teams. When such a method is used, all personnel managing a special event should be knowledgeable about that system’s terms and concepts.

In the survey questionnaire, 61% of the respondents reported having formal communication and coordination protocols. When respondents were asked to identify who is formally trained to use the protocol, the responses varied. Many reported a wide variety of personnel from police, fire, and transportation agencies. Others mentioned that all participants involved with traffic management had been formally trained.

SUPPORTING GUIDANCE DOCUMENTATION

Effective communication and coordination among the various stakeholders will help to ensure successful special event planning and management activities. One method to encourage effective communication and coordination is with the use of supporting guidance documentation (i.e., an operations or response guide).

As part of the survey questionnaire, respondents were asked if they have a formal guide to support special event planning and management activities. Respondents from only seven states indicated having such supporting documentation. This chapter details the motivation for document development, stakeholder involvement, usage, updates, and flexibility. In addition, specific examples of guidance documents are detailed.

MOTIVATION

The most common motivation for the development of guidance documentation was the need to better coordinate interagency resources to ease the impacts of special events. Formal documentation of protocol and resources helps to eliminate duplication and confusion.

STAKEHOLDER INVOLVEMENT

As with other special event planning and management activities, development of guidance documentation is usually

spearheaded by a single champion, but requires the cooperation and support of multiple stakeholders. Figure 6 depicts stakeholder involvement. Of the seven survey respondents, six were affiliated with state DOTs. Hence, their involvement in guide development was the most common among various groups. Law enforcement is also commonly involved; police agencies routinely provide traffic control for special events. Local politicians may also be involved.

USAGE

Not surprisingly, almost all respondents indicating a role in documentation development also indicated regular use of the guide. It makes little practical sense to develop a guide that will coordinate and facilitate special event planning and management and then not use it.

UPDATABILITY AND FLEXIBILITY

An important characteristic of effective guidance documentation is its updatability. Personnel contact information and available resources need to be kept up-to-date to ensure use of the guide. Furthermore, guide procedures or protocols found to be ineffective or inefficient should be modified.

In addition to staying up-to-date, the guide should be flexible to respond to a variety of situations. Special events

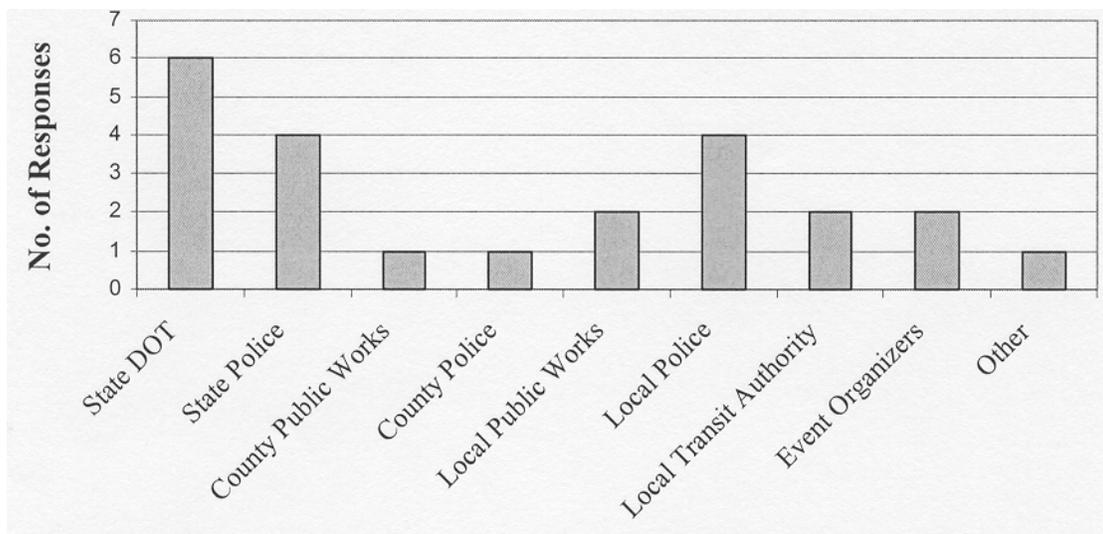


FIGURE 6 Stakeholder involvement in guidance documentation development.

are dynamic. The number of people attending a special event may exceed expectations, creating unforeseen traffic problems. Road construction and maintenance near a special event venue may temporarily reduce the capacity of the roadway network serving it. Documented procedures should accommodate these unexpected occurrences.

NATIONAL EXAMPLES

Three of the seven respondents indicating the existence of supporting documentation provided copies of actual documentation in use: (1) New Hampshire [New Hampshire DOT (NHDOT)], (2) Florida (Daytona Beach Police Department), and (3) Maryland (Maryland DOT). Appendices B through F contain copies of the documentation received from New Hampshire, Florida (three documents), and Maryland, respectively.

New Hampshire

The NHDOT's *Implementation and Traffic Control Plan* details procedures for the New England 300 NASCAR Winston Cup Race at the New Hampshire International Speedway in July 2001. Specifically, the guide details procedures for the "Borrow-A-Lane" strategy that relies on the use of opposing direction capacity during times of increased traffic flow. For example, if an abnormally high southbound traffic demand is created by a special event, a northbound lane may be used for excess southbound traffic during the affected times. The directions may reverse at the conclusion of the event.

The "need to document and formalize the many interdependent tasks undertaken by various agencies" motivated the development of this guide (survey questionnaire response Michael Dugas, NHDOT). Stakeholders involved in both the development of the guide and in the day-to-day special event planning and management process include the New Hampshire Turnpike Authorities, the NHDOT's District 5 and Bridge Maintenance Division, and the New Hampshire State Police. Supplemental involvement in the guide development came from local politicians and event organizers.

The guide details the roles and responsibilities of each stakeholder, even naming individuals responsible for specific days and times. This level of detail helps to eliminate confusion in activities and improve overall process efficiency.

Florida

In Florida, the Daytona Beach Police Department has developed several different operational guides for these special events: (1) July 4th through the conclusion of the NASCAR Pepsi 400 Winston Cup Race, (2) Speed Weeks, and (3) Bike Week/Spring Break. Unlike New Hampshire's guidance documentation, the Daytona Beach Police Department's operational plans primarily focus on the assignments of local police officers.

Specifically, the guides identify the procedure for news releases, arrests, and radio communications, and provide an overview of the events taking place, including event times, crowd sizes, and officers involved. A proposed traffic management plan is briefly described. The guide concludes with detailed duty hours for the police officers for the duration of the event. One benefit of this guide is that in addition to providing individual officers information regarding their responsibilities, an overview of all event activities is provided. An understanding of other stakeholder roles and responsibilities is invaluable in ensuring successful cooperative efforts.

Maryland

The Maryland DOT State Highway Administration's Chesapeake Highway Advisory Routing Traffic (CHART) operation manual details procedures to provide "more efficient and safer highway capacity through the application of advanced technology in high-traffic volume corridors" (*CHART Operations Manual* 1998). The five main elements of the CHART program are (1) Congestion Monitoring and Detection, (2) Motorist Information and Guidance, (3) Incident Response Service, (4) Traffic Management, and (5) Communication Network and System Integration. In addition to detailing procedures to deal with congestion and incidents, the *CHART Operations Manual* has procedures defined for special events.

EFFECTIVENESS OF CURRENT EFFORTS

To ensure that the goals of safe and efficient traffic movement during special event times are met and often to secure funding for improvements, the effectiveness of special event planning and management efforts needs to be assessed. This assessment is most beneficial if formally quantified, although much can be learned as well through a qualitative assessment. This chapter details findings for both types of assessment.

QUANTITATIVE ASSESSMENTS

Survey respondents were asked to detail their efforts to quantitatively assess their special event planning and management activities, pertaining to the performance measures by which their activities are judged, data collection efforts to support the determination of these performance measures, and evaluation tools used including simulation.

Performance Measures

When evaluating the effectiveness of special event planning and management efforts, performance measures should capture and reflect improvements in the provision of safe and efficient travel during special event times. Therefore, performance measures may include such aspects as increased travel speeds, increased vehicle throughput, increased transit ridership, or reduced vehicular or pedestrian crashes.

Of the 36 survey respondents, only 1 responded that it had predefined performance measures to gauge its special event planning and management performance. Traffic flow rates for arriving and departing traffic, including the duration of higher than normal flow rates, were used to evaluate the performance of traffic management plans.

Data Collection

Consistent with the low affirmative response rate to predefined performance measures, only eight survey respondents indicated that they actively collect data in support of special event planning and management efforts. Of the data collected, the most frequent was all or a subset of traffic speeds, volumes, and crashes. Traffic speeds and related travel times indicate mobility levels into and out of the event. Traffic volumes can be used to support parking management activities and capacity improvement decisions. High traffic volumes can also encourage TDM strategies to be implemented. Finally, historical crash data

indicate where additional traffic control devices may be needed or where traffic separation should occur.

Simulation

For large-scale special events that are expected to significantly disrupt traffic flow and that may require substantive traffic management efforts, traffic simulation may be used to better predict the impacts and the success of the efforts prior to the event. A variety of traffic simulation software packages are available for use, differing in their underlying theories and assumptions about traffic flow and their macroscopic or microscopic focus on traffic parameters, and include the following:

| | |
|---------------------------------|------------|
| CORFLO | SimTraffic |
| CORSIM | Synchro |
| Highway Capacity Software (HCS) | TEAPAC |
| Integration | TRAFFIX |
| PARAMICS | VISSIM |

Despite the previous low response for formally defined performance metrics and limited data collection, almost 25% of the survey respondents indicated using traffic simulation in the special event planning and management process.

QUALITATIVE ASSESSMENTS

Special event planning and management activities can be assessed qualitatively as well. Comments from event organizers, the media, and the general public can indicate the perceived success of special event planning and management efforts. No survey respondents had formally surveyed the public's perception of traffic planning or management of special events.

In addition to their comments on external factors, survey respondents were asked to rate the effectiveness of their own agency in the special event planning and management process. The majority (59%) reported being satisfied with the efforts of their agency, 34% reported being somewhat satisfied, and 7% were not satisfied.

Respondents were also asked to rate their agency's special event planning and management activities on a scale of 1 to 5, with 5 being proactive and 1 being reactive. The majority again indicated proactive efforts (Figure 7). An interesting correlation was noted between the respondent's level of satisfaction with his or her agency's efforts and

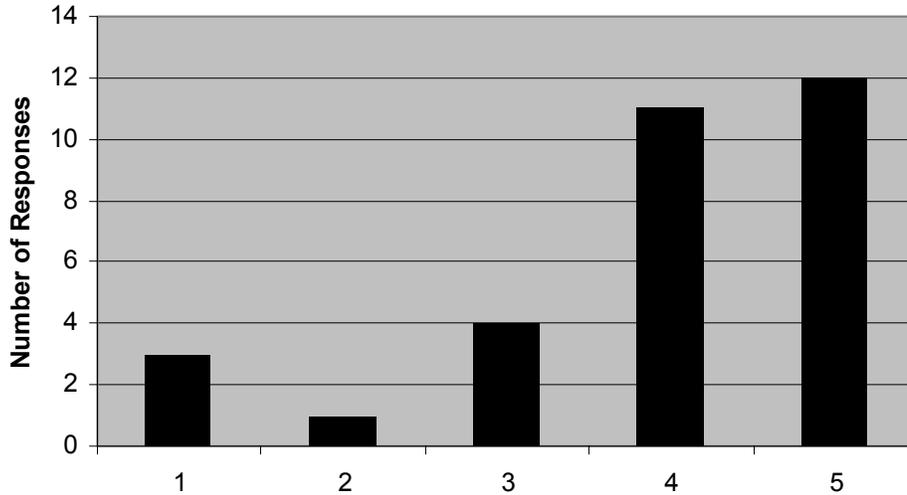


FIGURE 7 Reactive (1) versus proactive (5) special event planning and management efforts.

whether he or she felt that the agency was reactive or proactive; proactive efforts resulted in a higher level of respondent satisfaction.

Challenges

To better understand the challenges associated with effective special event planning and management, respondents were asked directly to cite difficulties that they encountered both within and external to their agency. The results of this question are summarized here.

Challenges within the agency:

- Communication Challenges
 - Misinformation
 - Untimely information.
- Agency Roles and Awareness Challenges
 - Lack of operations focus
 - Lack of appropriate media involvement
 - Isolationist attitudes (planners versus engineers, states versus districts).
- Resource Challenges
 - Lack of
 - Personnel;
 - Equipment, including traffic control resources;
 - Training; and
 - Funds.
 - Untimely mobilization of resources
 - Limited detours and accessibility.
- Administrative and Commitment Challenges
 - Unsupportive organizational structure for multi-agency/jurisdictional activities
 - Lack of accountability
 - Lack of coordination.

Challenges external to the agency:

- Communication Challenges
 - Misinformation
 - Untimely information.
- Agency Roles and Awareness Challenges
 - Lack of
 - Common goals,
 - Teamwork and unified partnering,
 - Trust,
 - Experience and training, and
 - Proper oversight.
 - Indecision
 - Political pressure.
- Resource Challenges
 - Lack of
 - Time,
 - Access,
 - Equipment,
 - Technical support,
 - Crowd control resources, and
 - Traffic control resources.
- Administrative and Commitment Challenges
 - Lack of administrative support
 - Lack of coordination
 - Unsupportive organizational structure for multi-agency/jurisdictional activities
 - Dynamic organizational structures.

By and large, the predominant challenge noted both internal and external to the agency relates to communication and coordination among all stakeholders. This common theme stresses the need to develop formal interagency communication, establish communication protocols, and develop formal guidance documentation.

FUNDING SOURCES

Transportation-related projects of all types are typically funded through both traditional and innovative sources at the federal, state, and local levels and through private sources. Special event funding is no different. Available funding often limits the dedication of personnel and the procurement of supporting tools and techniques to special event planning and management. This chapter describes the funding sources used to support the special event planning and management process.

FEDERAL

Common sources of funding for special event planning and management at the federal level include the Congestion Mitigation and Air Quality Improvement Program (CMAQ), the FTA, and the FHWA.

Congestion Mitigation and Air Quality Improvement Program

CMAQ was identified by survey respondents as being the most widely used federal source of funding for special events. CMAQ, first authorized in the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and reauthorized with the Transportation Equity Act for the 21st Century (TEA-21), provides funding for surface transportation and other related projects that improve air quality and help mitigate congestion. Because the program is intended for air quality improvement, its application is primarily limited to areas that do not meet the National Ambient Air Quality Standards (NAAQS) or that have just recently met the NAAQS and are attempting to maintain it, although states with no air quality problem areas are still eligible to receive a some funding. When that criterion is met, a wide array of projects to improve air quality or reduce congestion is eligible for funding.

Survey respondents reported using CMAQ funding for the development of a TMC and the deployment of VMS, CCTV, HAR, and traffic signal control systems. The purchase of service patrol vehicles was also identified by several agencies as eligible under CMAQ funding.

Although not identified by any of the survey respondents, various transit or public transportation, bicycle, and pedestrian projects also qualify for CMAQ funding. CMAQ funds can be used to offset reduced or free transit

fares designed to encourage transit usage and reduce overall traffic demand during special event times.

Federal Transit Administration

The FTA operates a grant program designed to provide funding to transit agencies for transit-related purposes: Section 5307 for urbanized areas, Section 5309 for bus and bus facilities, and Section 5311 for rural and small urban areas (for more information on these grants, the reader is referred to the FTA website, www.fta.dot.gov). Only a single survey respondent mentioned using these grants; Sections 5307 and 5309 were used for capital improvements and transit system planning. Grants available through the FTA not only benefit special event-related activities but the larger transportation system in the locale.

Federal Highway Administration

The FHWA also has a variety of grant programs available to support special event planning and management. For the 2002 Winter Olympic Games in Salt Lake City, Utah, both the FHWA and FTA provided grants to the Utah DOT and the Utah Transit Authority (UTA) to support their preparation for this large-scale event. Many of the projects funded through these grants directly integrate into the long-range plans of UDOT and UTA; the 2002 Winter Olympic Games simply accelerated their time line.

STATE

At the state level, the most common funding source cited by survey respondents for special event planning and management was from state DOTs. Transportation department operating budgets have been used to support personnel, traditional traffic control devices, and equipment such as VMS. Transportation department operating budgets have also reportedly been used to provide 20% of matching funds for CMAQ and FTA grants.

Aside from this traditional source of state-level funding, the state of Kansas initiated its “Intelligent Transportation Systems (ITS) Set Aside Program” in which \$2 million is set aside annually for various ITS projects. Recently, a portion of these funds was used to purchase ITS event

management equipment for the Kansas Speedway located in Kansas City, Kansas.

COUNTY AND LOCAL

Funding for special event activities at the county and local levels is used to support similar tools and techniques as that of state level funding (e.g., personnel and traffic control devices). If state level labor or equipment is used in special event activities in a county or local jurisdiction, the county or local jurisdictions may be asked to reimburse the state for expenses.

PRIVATE

Private partners and event organizers also provide funding for planning and managing special events, though at varying levels. At the lowest level, an event organizer may be required to pay a permit fee to cover the cost of reviewing the event request and issuing the permit.

In other instances, event organizers may be responsible for all or a portion of the special event costs. One survey respondent reported requiring the event organizer to pay 50% of all costs associated with the setup, maintenance, and removal of all traffic control devices. Other survey respondents indicated that special event organizers were re-

sponsible for providing traffic control equipment, such as temporary static signs, VMS, HAR, and others.

For frequent special events, developer or impact fees have become an increasingly popular source of funding. Developers pay the costs associated with improving the transportation infrastructure to a level that can adequately support the increase in traffic demand resulting from the special event. Efforts may include adding traffic control devices, increasing roadway capacity by adding lanes, or installing motorist communication devices. This type of fee works best for special event venues where activities are frequent enough to justify the long-term expenditures.

A second type of innovative financing technique is public-private partnerships, where a public entity (e.g., state DOT) and the private industry work together to deploy an ITS technology. Through this deployment, the technology can be field tested to determine if it is capable of accomplishing what it was designed to do. Furthermore, private industry has the opportunity to demonstrate their technology in a real-world setting as a means for advertisement. Finally, the public entity has the chance to test new tools and techniques with minimal investment. Some risk is incurred when field testing equipment during high traffic, high profile special event times. Accordingly, an agency may want to temporarily commit traditional traffic management resources to back up the technology being tested on an as-needed basis.